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

1.1. Product identifier

Commercial name: **Solid hexahydrophthalic anhydride**
Registration number: 01-2119486666-21-0000
Index No: 607-102-00-X
International Chemical Identification: cyclohexane-1,2-dicarboxylic anhydride
CAS No: 85-42-7
EC No: 201-604-9

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

Industrial use as an intermediate in chemical synthesis or process
Industrial use as a hardener for epoxy resins
Industrial use as a monomer in the manufacture of resins

1.3. Details of the supplier of the safety data sheet

Polynt S.p.A.
Via Enrico Fermi 51
IT 24020 Scanzorosciate, BG
Tel.: +39 035 652 111
msds@polynt.it

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

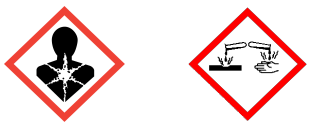
Hazard Class Codes	Hazard Category Codes
Serious eye damage/eye irritation H318: Causes serious eye damage.	Eye Dam. 1
Respiratory/skin sensitization H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.	Resp. Sens. 1
Respiratory/skin sensitization H317: May cause an allergic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

Reg CE 548/1967 o Reg CE 45/1999

Xi - Irritant; R41 - Risk of serious damage to eyes.
Xn - Harmful; R42/43 - May cause sensitization by inhalation and skin contact.

2.2. Label elements

Pictograms:



DANGER

Hazard statement:

H317: May cause an allergic skin reaction.
H318: Causes serious eye damage.

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

Precautionary statements:

P261: Avoid breathing vapours and dust.

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

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

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

P304+P341: IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.

P280: Wear protective gloves/eye protection/face protection.

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

P285: In case of inadequate ventilation wear respiratory protection.

P310: Immediately call a POISON CENTER or doctor/physician.

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

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

P363: Wash contaminated clothing before reuse.

2.3. Other hazards

No other known.
For PBT and/or vPvB see section 12.5.

SECTION 3: Composition/information on ingredients

3.1. Substances

Cyclohexane-1,2-dicarboxylic anhydride

International Chemical Identification: cyclohexane-1,2-dicarboxylic anhydride
Index No: 607-102-00-X

Chemical formula: C8H10O3
Concentration range: > 99 %
Registration number: 01-2119486666-21-0000
CAS No: 85-42-7
EC No: 201-604-9

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation:
Remove to fresh air. If breathing is irregular or stopped, administer artificial respiration. If symptoms persist, call a physician.

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 and drink afterwards plenty of 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, 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.
Avoid dust formation.

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.
Clean the spilled material mechanically and put it in an appropriate container 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.
Take precautionary measures against static discharges.
Avoid formation of respirable particles.
Avoid breathing dust.

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

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

Ecotoxicological information
PNEC aqua (freshwater) 90.5 µg/L Assessment factor 1000
PNEC aqua (marine water) 9.05 µg/L Assessment factor 10000
PNEC aqua (intermittent releases) 905 µg/L Assessment factor 100
PNEC STP 10000 µg/L Assessment factor 10 Extrapolation
PNEC sediment (Freshwater) 0.445 mg/kg sediment dw
PNEC sediment (Marine water) 0.0445 mg/kg sediment dw
PNEC soil 0.801 mg/kg soil dw
PNEC oral 20 mg/kg food Assessment factor 300

Toxicological information
Acute / short-term exposure local effects

Dermal DN(M)EL No-threshold effect and/or no dose-response information available Most sensitive endpoint sensitisation (skin)

Inhalation DN(M)EL No-threshold effect and/or no dose-response information available mg/m3 Most sensitive endpoint sensitisation (respiratory tract)

Long term exposure

Dermal DN(M)EL DNEL (Derived No Effect Level) 1 mg/kg bw/day Assessment factor 300 Dose descriptor starting point NOAEL Most sensitive endpoint repeated dose toxicity

Inhalation DN(M)EL DNEL (Derived No Effect Level) 7.05 mg/m3 Assessment factor 75 Dose descriptor starting point NOAEC Most sensitive endpoint repeated dose toxicity

General population

Acute / short-term exposure

Dermal DN(M)EL DNEL (Derived No Effect Level) 2.5 mg/kg bw/day Assessment factor 120 Dose descriptor starting point NOAEL Most sensitive endpoint repeated dose toxicity

Inhalation DN(M)EL DNEL (Derived No Effect Level) 8.7 mg/m3 Assessment factor 30 Dose descriptor starting point NOAEC Most sensitive endpoint repeated dose toxicity

Oral DN(M)EL DNEL (Derived No Effect Level) 2.5 mg/kg bw/day Assessment factor 120 Dose descriptor starting point NOAEL Most sensitive endpoint repeated dose toxicity

Acute / short-term exposure local effects

Dermal DN(M)EL No-threshold effect and/or no dose-response information available Dose descriptor starting point NOAEL Most sensitive endpoint sensitisation (skin)

Inhalation DN(M)EL No-threshold effect and/or no dose-response information available Most sensitive endpoint sensitisation (respiratory tract)

Long term exposure

Dermal DN(M)EL DNEL (Derived No Effect Level) 0.5 mg/kg bw/day Assessment factor 600 Dose descriptor starting point NOAEL Most sensitive endpoint repeated dose toxicity

Inhalation DN(M)EL DNEL (Derived No Effect Level) 1.74 mg/m3 Assessment factor 150 Dose descriptor starting point NOAEC Most sensitive endpoint repeated dose toxicity

Oral DN(M)EL DNEL (Derived No Effect Level) 0.5 mg/kg bw/day Assessment factor 600 Dose descriptor starting point NOAEL Most sensitive endpoint repeated dose toxicity

8.2. Exposure controls

Appropriate engineering controls:
See annexe of this file.

Eye / face protection:
Goggles or protective visor.

Skinprotection / 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 P3 dust filter if solid or type A filter for vapours and organic gases with a boiling point > 65°C if molten. (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: Solid

a2) Color: White

b) Odour: Characteristics

c) Odour threshold: NOT AVAILABLE

d) pH: NOT APPLICABLE

e1) Melting point: 31.9 °C

f1) Initial boiling point: 290.6 °C

g) Flash point: 152 °C

h) Evaporation rate: NOT AVAILABLE

i) Flammability (solid, gas): NOT AVAILABLE

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: 93 Pa

l) Vapour density: NOT AVAILABLE

m) Relative density: 1.191 g/ml @ 40°C

n) Solubility(ies): 4.2 g/l @ 20°C

o) Partition coefficient: n-octanol/water: 1.59 @ 40°C

p) Auto-ignition temperature: 395 °C

q) Decomposition temperature: NOT AVAILABLE

r) Viscosity: 47 mPa.s @ 40°C

s) Explosive properties: NOT AVAILABLE

t) Oxidising properties: NOT AVAILABLE

9.2. Other information

Not any

SECTION 10: Stability and reactivity

10.1. Reactivity

No specific hazards known in 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 the build-up of electrostatic charges.
Avoid exposure to heat sources.

10.5. Incompatible materials

Oxidizing agents, strong acids and bases, alkali metals.

10.6. Hazardous decomposition products

Unknown

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity:
Dermal
OECD Guideline 402; rabbit (New Zealand White) male/female; semiocclusivo
LD50: > 2000 mg/kg bw (male/female) based on: test mat.

oral:
standard acute method rat oral: gavage
LD50 4040 mg/kg bw

Inhalation
standard acute method rat
LC0 1100 mg/m3 air (nominal)
LC50 > 1100 mg/m3 air (nominal)

Cutaneous corrosion/irritation
In vivo rabbit Type of coverage semiocclusive: not irritating

Serious ocular lesions/serious ocular irritation:
in vivo rabbit: moderately irritating cornea temorarily in parts opaque
Respiratory sensitisation or dermal sensitisation

Skin sensitisation in vivo Guinea pig maximisation test guinea pig sensitising

Skin sensitisation in vivo Mouse local lymphnode assay (LLNA) mouse sensitising
Skin sensitisation in vivo Mouse local lymphnode assay (LLNA) mouse sensitising
Respiratory sensitisation in vivo guinea pig sensitising

Mutagenicity of the germinal cells
Genetic toxicity in vitro gene mutation bacterial reverse mutation assay (e.g. Ames test) S. typhimurium TA 1535, TA 1537, TA 98 and TA 100 Metabolic activation with and without Genotoxicity:
negative
Genetic toxicity in vitro gene mutation mammalian cell gene mutation assay Chinese hamster lung fibroblasts (V79) Metabolic activation with and without Genotoxicity:
negative
Genetic toxicity in vitro chromosome aberration in vitro mammalian chromosome aberration test Chinese hamster Ovary (CHO) Metabolic activation with and without Genotoxicity:

negative
Genetic toxicity in vitro chromosome aberration in vitro mammalian chromosome aberration test Chinese hamster Ovary (CHO) Metabolic activation with and without Genotoxicity:

positive
Genetic toxicity in vitro gene mutation bacterial reverse mutation assay (e.g. Ames test) S. typhimurium TA 1535, TA 1537, TA 98 and TA 100 Metabolic activation with and without Genotoxicity:

negative
Genetic toxicity in vitro DNA damage and/or repair sister chromatid exchange assay in mammalian cells Chinese hamster Ovary (CHO) Metabolic activation with and without Genotoxicity:

negative

Carcinogenicity:
Oral: effect level NOAEL 1000 mg/kg bw/day

Toxicity for reproduction:
Toxicity to reproduction 'other: reproductive organs in a 2 years study were examined

mouse oral: feed
NOAEL other: all major orans incl. reproductive organs were examined 3570 mg/kg bw/day (nominal)
NOAEL other: all major orans incl. reproductive organs were examined 1785 mg/kg bw/day (nominal)
Toxicity to reproduction 'other: reproductive organs in a 2 years study were examined

rat oral: feed
NOAEL P 1000 mg/kg bw/day (nominal)
Developmental toxicity / teratogenicity 'rat oral: feed
NOAEL maternal toxicity 1000 mg/kg bw/day
NOAEL teratogenicity 1700 mg/kg bw/day
Embryotoxic / teratogenic effects: yes

Specific Target Organ Toxicity (STOT) - single exposure: NOT AVAILABLE

Specific Target Organ Toxicity (STOT) - repeated exposure: NOT AVAILABLE

Hazardous if inhaled: NOT AVAILABLE

SECTION 12: Ecological information

12.1. Toxicity

Short-term toxicity to fish:
Brachydanio rerio (new name: Danio rerio)
static
freshwater
Exposure duration 96 h LC50 > 1000 mg/L
Exposure duration 96 h NOEC 1000 mg/L
Exposure duration 96 h LOEC 1000 mg/L

Toxicity to aquatic algae and cyanobacteria:
Pseudokirchnerella subcapitata
freshwater
Exposure duration 72 h NOEC 46.9 mg/L
Exposure duration 72 h LOEC 94.8 mg/L
Exposure duration 72 h EC50 72.9 mg/L
Exposure duration 72 h NOEC 91.9 mg/L
Exposure duration 72 h LOEC > 91.9 mg/L
Exposure duration 72 h EC50 > 91.9 mg/L
Exposure duration 72 h NOEC 46.9 mg/L
Exposure duration 72 h LOEC 94.8 mg/L
Exposure duration 72 h EC50 90.5 mg/L
Exposure duration 72 h NOEC 91.9 mg/L
Exposure duration 72 h LOEC > 91.9 mg/L
Exposure duration 72 h EC50 > 91.9 mg/L
Exposure duration 72 h NOEC 46.9 mg/L
Exposure duration 72 h LOEC 94.8 mg/L
Exposure duration 72 h EC50 70.2 mg/L
Exposure duration 72 h NOEC 91.9 mg/L
Exposure duration 72 h LOEC > 91.9 mg/L
Exposure duration 72 h EC50 > 91.9 mg/L
Purpose flag:key study

Long-term toxicity to aquatic invertebrates: NOT AVAILABLE

Long-term toxicity to fish: NOT AVAILABLE

Toxicity to microorganisms:
activated sludge, domestic freshwater
Exposure duration 3 h NOEC 100 mg/L
Exposure duration 3 h other: EC20 220 mg/L
Exposure duration 3 h EC50 370 mg/L

Toxicity to soil macroorganisms except arthropods: NOT AVAILABLE

Toxicity to terrestrial arthropods.: NOT AVAILABLE

Toxicity to terrestrial plants: NOT AVAILABLE

12.2. Persistence and degradability

Biodegradation:
screening tests:ready biodegradability aerobic
%Degr. 4 Parameter DOC removal Sampling time 7 d
%Degr. 17 Parameter DOC removal Sampling time 14 d
%Degr. 76 Parameter DOC removal Sampling time 21 d
%Degr. 97 Parameter DOC removal Sampling time 27 d
%Degr. 98 Parameter DOC removal Sampling time 28 d
readily biodegradable

Persistence:
The substance is hydrolytically unstable, hydrolysing to the corresponding dicarboxylic acid with a half-life of minutes.
The substance is readily biodegradable. It is reasonable to assume, as testing was undertaken in aqueous media, that the degradation product of the substance is degradable. These data indicate that the substance is not persistent (P).

12.3. Bioaccumulative potential

Bioaccumulation
The octanol water partition coefficient of the substance is low (Log Kow = 1.59) suggesting only a low potential for the substace to be bioaccumulative.
For organic substances with a log Kow value below 4.5 it is assumed that the affinity for the lipids of an organism is insufficient to exceed the criterion for bioaccumulation (a BCF value > 2000 L/kg).

BCF has been calculated using the computer program BCFBAF (v3.00).
It is predicted that the substance has a BCF of 5.2 L/kg wet weight.

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

12.4. Mobility in soil

Adsorption/desorption:
The adsorption coefficient (Koc) using high performance liquid chromatography (HPLC) was estimated according to OECD test methods. Log Koc was estimated to be 2.3 The substance is regarded as having medium mobility in soil.

The Henry's Law constant of 2.18 Pa-m3/mole indicates that the substance is not significantly volatile from surface water.

Distribution in environmental compartments has been calculated using a Fugacity model according to Mackay, Level III. Distribution in various environmental compartments is estimated as: Air - 5.63%; Water - 38.9%; Soil - 55.4% and Sediment -0.0876%. Refining modelling to examine distribution following emissions to waste water
results in the following distribution: Air - 9.01%; Water - 90.9%; Soil -0.000359% and Sediment - 0.0519%

12.5. Results of PBT and vPvB assessment

Available information indicate that the substance does not require classification as a PBT or vPvB substance.

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

NOT APPLICABLE

14.2. UN proper shipping name

NOT APPLICABLE

14.3. Transport hazard class(es)

NOT APPLICABLE

14.4. Packing group

NOT APPLICABLE

14.5. Environmental hazards

NOT APPLICABLE

14.6. Special precautions for user

NOT APPLICABLE

ADR/RID

- Tunnel restriction code: NOT APPLICABLE
- Category - limited quantities per transport unit: NOT APPLICABLE
- LQ code - limited quantities per pack unit: NOT APPLICABLE
- E code excepted qualities: NOT APPLICABLE

IMDG

- LQ code - limited quantities per pack unit: NOT APPLICABLE
- E code excepted qualities: NOT APPLICABLE
- Ems: NOT APPLICABLE

ICAO/IATA

- Packing Instructions / max. net quantities per package per plane - combi and cargo: NOT APPLICABLE
- Packing Instructions / max. net quantities per package in limited quantity regime: NOT APPLICABLE
- EQ code for excepted qualities regime: NOT APPLICABLE

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

Regulation 1907/2006/CE.
Directive 98/24/CE.
Directive 2004/37/CE.
Directive 99/92/CE.
Directive 96/82/CE.

15.2. Chemical safety assessment

CSA available.

SECTION 16: Other information

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

Complete revision of the SDS.

Acronyms:

ACGIH:	American Conference of Governmental Industrial Hygienist
ADN:	Accord européen relative au tranpsort international des merchandises Dangereuses par voies de Naviagation intérieures
ADR:	the european Agreement concerning the international carriage og Dangerous goods by Road
B:	Bioaccumulative
BCF:	BioConcentration Factor
CSA:	Chemical Safety Assessment
CSR:	Chemical Safety Report
DIN:	Deutsches Institut für Normung
DNEL:	Derived No Effect Level
Ec:	Effective concentration
EC50:	median Effective Concentration
IATA:	International Air Transport Association
IBC:	International Bulk Chemical code
ICAO:	International Civil Aviation Organization
IMGD:	International Maritime Dangerous Goods code
KoC:	adsorpion coefficient
KoW:	partial coefficient (octanolo/water)
LC50:	Lethal Concentration 50
LD50:	Lethal Dose 50
LLNA:	Local LymphNode Assay
LOAEL:	Lowest Observed Adverse Effect Level
MARPOL:	international convention for the prevention of MArine POLlution
NOAEL:	No Observed Adverse Effect Level
NOEC:	No Observed Effect Concentration
NOEL:	No Observed Effect Level
OECD:	Organisation for Economic Cooperation and Development
P:	Persistent
PBT:	Persistent, Bioaccumulative and Toxic
PNEC:	Predicted No Effect Concentration
(Q)SAR:	Quantitative Structure Activity Relationship
RID:	Regulations concerning the International carriage of Dangerous good by rail
SDS:	Safety Data Sheet
STEL:	Short Term Exposure Limit
TLV:	Threshold Limit Value
TWA:	Time Weighted Average
vPvB:	very Persistent very Bioaccumulative

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 Safety Data Sheet
Hexahydrophthalic anhydride

Substance name: cyclohexane-1,2-dicarboxylic anhydride (HHPA)
EC Number: 201-604-9 **CAS Number: 85-42-7**
Exposure Scenario: Industrial use as intermediate in chemical synthesis or process
Exposure route of relevance: Industrial (Industrial End-use)

		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	No-threshold effect and/or no dose-response information available	No-threshold effect and/or no dose-response information available	-	-	-	-	-	-	-	-
	Long term, systemic effects	7.05 mg/m³	1 mg/kg bw/day	-	-	0.05 mg/kg/day	Freshwater: 0.0905 mg/l Marine water: 9.05E-03 mg/l	-	Agricultural and grassland: 0.801 mg/kg	0.445 mg/kg	10 mg/l
	Short term, local effects	No-threshold effect and/or no dose-response information available	No-threshold effect and/or no dose-response information available	-	-	-	-	-	-	-	-
	Short term, systemic effects	35.26 mg/m³	5 mg/kg bw/day	-	-	-	-	-	-	-	-
Use descriptors		PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (syn-thesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)		ERC 6a: Industrial use resulting in manufacture of another substance (use of interme-diates)							
Operating conditions		Physical state of the substance: liquid Concentration of substance in product: 100% Duration of exposure: > 4 hours per day Frequency of exposure: ≤ 345 days per year Domain: industrial Location: indoors (for all identified PROCs)		Physical state of the substance: liquid Concentration of substance in product: 100% Duration of exposure: > 4 hours per day Frequency of exposure: ≤ 345 days per year Water based process							
Risk Management Measures (RMM)		Local exhaust ventilation (LEV): • Relevant for PROC 3, 4, 8b and 9 if no personal protective equipment is used (respiratory protective equipment) • Mandatory for PROC 5 and 8a in addition to the use of personal protective equipment LEV effectiveness: 90% **PPE** **Respiratory protective equipment (Half-face mask, Dust filter P3 or Air-purifying system):** **• Relevant for PROC 3, 4, 8b and 9 if no LEV is in place** **• Mandatory for PROC 5 and 8a in addition to a LEV system** **Respiratory protective equipment effectiveness: 90%** **Use of gloves with specific activity training:** **• Mandatory for PROC 2, 4, 5, 8a, 8b and 9** **Gloves effectiveness: 95%**		<u>Water discharge:</u> • Wastewater needs to be treated either on site or externally. • Wastewater can be discharged either in freshwater or in seawater. • Required STP efficiency: at least 85.4% • Sludge can be applied on agricultural soil <u>Municipal STP (required if there is no onsite STP):</u> • Wastewater can be discharged either in freshwater or in seawater. • Required STP efficiency: at least 85.4% • Sludge can be applied on agricultural soil <u>Waste:</u> Waste should be treated as hazardous waste.							
Risk Caracterisation Ratio (RCR)		PROC 1: 0.01 PROC 2: 0.09 PROC 3: 0.27 PROC 4: 0.46 PROC 5: 0.05 PROC 8a: 0.09 PROC 8b: 0.46 PROC 9: 0.46	PROC 1: 0.34 PROC 2: 0.14 PROC 3: 0.34 PROC 4: 0.34 PROC 5: 0.69 PROC 8a: 0.69 PROC 8b: 0.34 PROC 9: 0.34	-	-	9.54E-04	Freshwater: 4.44E-01 Marine water: 6.32E-01	(*1)	Agricultural soil: 3.90E-01 Grassland: 4.49E-02	4.45E-01	5.66E-02

(*1): PEClocal for air not compared with the PNEC air because this latter was not available. PEClocal air was used for estimations of exposure and risk of humans.
(*2): not relevant for this life cycle step

Critical physical parameters: solubility, flammability, corrosivity.
Solubility: 4.2g/L at 20°C and pH 2.9; flammability: not flammable; corrosivity: no data available

Exposure route of relevance: Professional (*2)

		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	-	-	-	-	-	-	-	-	-	-
	Long term, systemic effects	-	-	-	-	-	-	-	-	-	-
	Short term, local effects	-	-	-	-	-	-	-	-	-	-
	Short term, systemic effects	-	-	-	-	-	-	-	-	-	-
Use descriptors		-		-							
Operating conditions		-		-							
Risk Management Measures (RMM)		-		-							
Risk Caracterisation Ratio (RCR)		-	-	-	-	-	-	-	-	-	-

Exposure route of relevance: Consumer (*2)

		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	-	-	-	-	-	-	-	-	-	-
	Long term, systemic effects	-	-	-	-	-	-	-	-	-	-
	Short term, local effects	-	-	-	-	-	-	-	-	-	-
	Short term, systemic effects	-	-	-	-	-	-	-	-	-	-
Use descriptors		-		-							
Operating conditions		-		-							
Risk Management Measures (RMM)		-		-							
Risk Caracterisation Ratio (RCR)		-	-	-	-	-	-	-	-	-	-

Substance name: cyclohexane-1,2-dicarboxylic anhydride (HHPA)											
EC Number: 201-604-9						**CAS Number: 85-42-7**					
Exposure Scenario: Industrial use as hardener for epoxy resins											
Exposure route of relevance: Industrial (Formulation/Industrial End-use)											
		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	No-threshold effect and/or no dose-response information available	No-threshold effect and/or no dose-response information available	-	-	-	-	-	-	-	-
	Long term, systemic effects	7.05 mg/m³	1 mg/kg bw/day	-	-	0.05 mg/kg/day	Freshwater: 0.0905 mg/l Marine water: 9.05E-03 mg/l	-	Agricultural and grassland: 0.801 mg/kg	0.445 mg/kg	10 mg/l
	Short term, local effects	No-threshold effect and/or no dose-response information available	No-threshold effect and/or no dose-response information available	-	-	-	-	-	-	-	-
	Short term, systemic effects	35.26 mg/m³	5 mg/kg bw/day	-	-	-	-	-	-	-	-
Use descriptors		PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (syn-thesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 13: Treatment of articles by dipping andpouring PROC 15: Use as laboratory reagent		ERC 2: Formulation of preparations ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers							
Operating conditions		Physical state of the substance: liquid or solid Concentration of substance in product: 100% Duration of exposure: > 4 hours per day Frequency of exposure: ≤ 345 days per year Domain: industrial Location: indoors (for all identified PROCs)		Physical state of the substance: liquid or solid Concentration of substance in product: 100% Duration of exposure: > 4 hours per day Frequency of exposure: ≤ 345 days per year Water based process							
Risk Management Measures (RMM)		Liquids Local exhaust ventilation (LEV): • Relevant for PROC 3, 4, 8b, 9 and 15 if no personal protective equipment is used (respiratory protective equipment) • Mandatory for PROC 5, 8a and 13 in addition to the use of personal protective equipment LEV effectiveness: 90% **PPE** **Respiratory protective equipment (Half-face mask, Dust filter P3 or Air-purifying system):** **• Relevant for PROC 3, 4, 8b, 9 and 15 if no LEV is in place** **• Mandatory for PROC 5, 8a and 13 in addition to a LEV system** **Respiratory protective equipment effectiveness: 90%** **Use of gloves with specific activity training:** **• Mandatory for PROC 2, 4, 5, 8a, 8b, 9 and 13** **Gloves effectiveness: 95%** Solid **PPE** **Use of gloves with specific activity training: mandatory for PROC 2, 4, 5, 8a, 8b, 9 and 13** **Gloves effectiveness: 95%**		Water discharge: • Wastewater needs to be treated either on site or externally. • Wastewater can be discharged either in freshwater or in seawater. • Required STP efficiency: at least 85.4% • Sludge can be applied on agricultural soil Municipal STP (required if there is no onsite STP): • Wastewater can be discharged either in freshwater or in seawater. • Required STP efficiency: at least 85.4% • Sludge can be applied on agricultural soil Waste: Waste should be treated as hazardous waste.							
Risk Caracterisation Ratio (RCR)		Liquid PROC 1: 0.01 PROC 2: 0.09 PROC 3: 0.27 PROC 4: 0.46 PROC 5: 0.05 PROC 8a: 0.09 PROC 8b: 0.46 PROC 9: 0.46 PROC 13: 0.09 PROC 15: 0.46 Solid PROC 1: 0.001 PROC 2: 0.001 PROC 3: 0.01 PROC 4: 0.07 PROC 5: 0.07 PROC 8a: 0.07 PROC 8b: 0.01 PROC 9: 0.01 PROC 13: 0.01 PROC 15: 0.01	Liquid PROC 1: 0.34 PROC 2: 0.14 PROC 3: 0.34 PROC 4: 0.34 PROC 5: 0.69 PROC 8a: 0.69 PROC 8b: 0.34 PROC 9: 0.34 PROC 13: 0.69 PROC 15: 0.34 Solid PROC 1: 0.34 PROC 2: 0.07 PROC 3: 0.34 PROC 4: 0.34 PROC 5: 0.69 PROC 8a: 0.69 PROC 8b: 0.34 PROC 9: 0.34 PROC 13: 0.69 PROC 15: 0.34	-	-	1.04E-03	Freshwater: 4.10E-01 Marine water: 5.81E-01	(*1)	Agricultural soil: 3.61E-01 Grassland: 4.84E-02	4.09E-01	0.0518
(*1): PEClocal for air not compared with the PNEC air because this latter was not available. PEClocal air was used for estimations of exposure and risk of humans. (*2): not relevant for this life cycle step											
Critical physical parameters: solubility, flammability, corrosivity. Solubility: 4.2g/L at 20°C and pH 2.9; flammability: not flammable; corrosivity: no data available											
Exposure route of relevance: Professional (*2)											
		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	-	-	-	-	-	-	-	-	-	-
	Long term, systemic effects	-	-	-	-	-	-	-	-	-	-
	Short term, local effects	-	-	-	-	-	-	-	-	-	-
	Short term, systemic effects	-	-	-	-	-	-	-	-	-	-
Use descriptors		-		-							
Operating conditions		-		-							
Risk Management Measures (RMM)		-		-							
Risk Caracterisation Ratio (RCR)		-	-	-	-	-	-	-	-	-	-
Exposure route of relevance: Consumer (*2)											
		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	-	-	-	-	-	-	-	-	-	-
	Long term, systemic effects	-	-	-	-	-	-	-	-	-	-
	Short term, local effects	-	-	-	-	-	-	-	-	-	-
	Short term, systemic effects	-	-	-	-	-	-	-	-	-	-
Use descriptors		-		-							
Operating conditions		-		-							
Risk Management Measures (RMM)		-		-							
Risk Caracterisation Ratio (RCR)		-	-	-	-	-	-	-	-	-	-

Substance name: cyclohexane-1,2-dicarboxylic anhydride (HHPA)											
EC Number: 201-604-9						**CAS Number: 85-42-7**					
Exposure Scenario: Industrial use as monomer in the manufacture of resins											
Exposure route of relevance: Industrial											
		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	No-threshold effect and/or no dose-response information available	No-threshold effect and/or no dose-response information available	-	-	-	-	-	-	-	-
	Long term, systemic effects	7.05 mg/m³	1 mg/kg bw/day	-	-	0.05 mg/kg/day	Freshwater: 0.0905 mg/l Marine water: 9.05E-03 mg/l	-	Agricultural and grassland: 0.801 mg/kg	0.445 mg/kg	10 mg/l
	Short term, local effects	No-threshold effect and/or no dose-response information available	No-threshold effect and/or no dose-response information available	-	-	-	-	-	-	-	-
	Short term, systemic effects	35.26 mg/m³	5 mg/kg bw/day	-	-	-	-	-	-	-	-
Use descriptors		PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (syn-thesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 13: Treatment of articles by dipping andpouring PROC 15: Use as laboratory reagent PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles	ERC 6c: Industrial use of monomers for manufacture of thermoplastics								
Operating conditions		Physical state of the substance: liquid or solid Concentration of substance in product: 100% Duration of exposure: > 4 hours per day Frequency of exposure: ≤ 345 days per year Domain: industrial Location: indoors (for all identified PROCs)	Physical state of the substance: liquid or solid Concentration of substance in product: 100% Duration of exposure: > 4 hours per day Frequency of exposure: ≤ 345 days per year Water based process								
Risk Management Measures (RMM)		Liquids Local exhaust ventilation (LEV): • Relevant for PROC 3, 4, 8b, 9 and 15 if no personal protective equipment is used (respiratory protective equipment) • Mandatory for PROC 5, 8a and 13 in addition to the use of personal protective equipment LEV effectiveness: 90% **PPE** **Respiratory protective equipment (Half-face mask, Half-face mask, Dust filter P3 or Air-purifying system):** **• Relevant for PROC 3, 4, 8b, 9 and 15 if no LEV is in place** **• Mandatory for PROC 5, 8a and 13 in addition to a LEV system** **Respiratory protective equipment effectiveness: 90%** **Use of gloves with specific activity training mandatory for PROC 2, 4, 5, 8a, 8b, 9 and 13 - Gloves effectiveness: 95%** Solid Local exhaust ventilation (LEV): • Relevant for PROC 24 if no personal protective equipment is used (respiratory protective equipment) LEV effectiveness: 90% **PPE** **Respiratory protective equipment (Half-face mask, Half-face mask, Dust filter P3 or Air-purifying system):** **• Relevant for PROC 24 if no LEV is in place** **Respiratory protective equipment effectiveness: 90%** **Use of gloves with specific activity training: Mandatory for PROC 2, 4, 5, 8a, 8b, 9, 13 and 24 Gloves effectiveness: 95%**				Water discharge: • Wastewater needs to be treated either on site or externally. • Wastewater can be discharged either in freshwater or in seawater. • Required STP efficiency: at least 85.4% • Sludge can be applied on agricultural soil Municipal STP (required if there is no onsite STP): • Wastewater can be discharged either in freshwater or in seawater. • Required STP efficiency: at least 85.4% • Sludge can be applied on agricultural soil Waste: Waste should be treated as hazardous waste.				
Risk Caracterisation Ratio (RCR)		Liquid PROC 1: 0.01 PROC 2: 0.09 PROC 3: 0.27 PROC 4: 0.46 PROC 5: 0.05 PROC 8a: 0.09 PROC 8b: 0.46 PROC 9: 0.46 PROC 13: 0.09 PROC 15: 0.46 PROC 24: not applicable Solid PROC 1: 0.001 PROC 2: 0.001 PROC 3: 0.01 PROC 4: 0.07 PROC 5: 0.07 PROC 8a: 0.07 PROC 8b: 0.01 PROC 9: 0.01 PROC 13: 0.01 PROC 15: 0.01 PROC 24: 0.14	Liquid PROC 1: 0.34 PROC 2: 0.14 PROC 3: 0.34 PROC 4: 0.34 PROC 5: 0.69 PROC 8a: 0.69 PROC 8b: 0.34 PROC 9: 0.34 PROC 13: 0.69 PROC 15: 0.34 PROC 24: not applicable Solid PROC 1: 0.34 PROC 2: 0.07 PROC 3: 0.34 PROC 4: 0.34 PROC 5: 0.69 PROC 8a: 0.69 PROC 8b: 0.34 PROC 9: 0.34 PROC 13: 0.69 PROC 15: 0.34 PROC 24: 0.14	-	-	3.60E-03	Freshwater: 3.19E-01 Marine water: 4.54E-01	(*1)	Agricultural soil: 2.78E-01 Grassland: 3.26E-02	3.19E-01	0.0405
(*1): PEClocal for air not compared with the PNEC air because this latter was not available. PEClocal air was used for estimations of exposure and risk of humans. (*2): not relevant for this life cycle step											
Critical physical parameters: solubility, flammability, corrosivity. Solubility: 4.2g/L at 20°C and pH 2.9; flammability: not flammable; corrosivity: no data available											
Exposure route of relevance: Professional (*2)											
		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	-	-	-	-	-	-	-	-	-	-
	Long term, systemic effects	-	-	-	-	-	-	-	-	-	-
	Short term, local effects	-	-	-	-	-	-	-	-	-	-
	Short term, systemic effects	-	-	-	-	-	-	-	-	-	-
Use descriptors		-		-							
Operating conditions		-		-							
Risk Management Measures (RMM)		-		-							
Risk Caracterisation Ratio (RCR)		-	-	-	-	-	-	-	-	-	-
Exposure route of relevance: Consumer (*2)											
		Human inhalation	Human dermal	Human indirect exposure via environment: inhalation	Human indirect exposure via environment: dermal	Human indirect exposure via environment: oral	Environmental: water	Environmental: air	Environmental: soil	Environmental: sediment	Environmental: Sewage Treatment Plant
DNELs, DMELs, PNECs (Derived No Effect Levels, Derived Minimal Effect Levels, Predicted No Effect Levels)	Long term, local effects	-	-	-	-	-	-	-	-	-	-
	Long term, systemic effects	-	-	-	-	-	-	-	-	-	-
	Short term, local effects	-	-	-	-	-	-	-	-	-	-
	Short term, systemic effects	-	-	-	-	-	-	-	-	-	-
Use descriptors		-		-							
Operating conditions		-		-							
Risk Management Measures (RMM)		-		-							
Risk Caracterisation Ratio (RCR)		-	-	-	-	-	-	-	-	-	-