

**Safety Data Sheet dated 4-6-2012, version 1**

**Supersedes previous Safety Data Sheet dated 18/03/2011**

**In compliance with the requirement of the Regulation (EC) N°1907/2006**

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## **SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**

### 1.1. Product Identifier

Mixture identification:

Trade name: TELENE © 1811 A

Trade code: 1811 A

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

Recommended use:

Reactive liquid resin for production of plastic parts.

### 1.3. Details of the supplier of the safety data sheet

Company:

TELENE SAS

2 rue Marie Curie

F-59910 BONDUES - FRANCE

Telephone contact (office hours): +33 (0)3 20 69 57 10

Competent person responsible for the safety data sheet:

[msds@telene.com](mailto:msds@telene.com)

### 1.4. Emergency telephone number

Poison Centers in Europe: <http://www.eapcct.org/index.php?page=links>

For all information in the event of a transport accident or other emergency: +1 703 527 3887  
(CHEMTREC - International - 24/24).

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## **SECTION 2. HAZARDS IDENTIFICATION**

### 2.1. Classification of the substance or mixture

Directive criteria, 67/548/CE, 99/45/EC and following amendments thereof:

Properties / Symbols:

Xn Harmful

Xi Irritant

N Dangerous for the environment

R Phrases:

R10 Flammable.

R20/22 Harmful by inhalation and if swallowed.

R36/37/38 Irritating to eyes, respiratory system and skin.

R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

EC regulation criteria 1272/2008 (CLP)

Flam. Liq. 3, Flammable liquid and vapour.

Acute Tox. 4, Harmful if swallowed.

Acute Tox. 3, Toxic if inhaled.

Skin Irrit. 2, Causes skin irritation.

Eye Irrit. 2, Causes serious eye irritation.

STOT SE 3, May cause respiratory irritation.

Aquatic Chronic 2, Toxic to aquatic life with long lasting effects.

Adverse physicochemical, human health and environmental effects:  
Prolonged or repeated contact may cause skin irritation and dermatitis.

## 2.2. Label elements

Symbols:



Danger

Hazard statements:

- H226 Flammable liquid and vapour.
- H302 Harmful if swallowed.
- H331 Toxic if inhaled.
- H315 Causes skin irritation.
- H319 Causes serious eye irritation.
- H335 May cause respiratory irritation.
- H411 Toxic to aquatic life with long lasting effects.

Precautionary statements:

- P210 Keep away from heat/sparks/open flames/hot surfaces. — No smoking.
- P273 Avoid release to the environment.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.
- P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P308+P313 IF exposed or concerned: Get medical advice/attention.
- P332+P313 If skin irritation occurs: Get medical advice/attention.
- P403+P233 Store in a well-ventilated place. Keep container tightly closed.

Special Provisions:

None.

## 2.3. Other hazards

vPvB Substances: None - PBT Substances: None.

Other Hazards:

Shavings, dust and/or very fine powder formed during the processing of parts/molded products as with most finely divided materials constitute under certain conditions both a fire and explosion hazard.

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## SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1. Substances

Not Relevant.

### 3.2. Mixtures

Hazardous components within the meaning of EEC directive 67/548 and CLP regulation and related classification:

- 80% - 90% 3a,4,7,7a-tetrahydro-4,7-methanoindene  
REACH No.: 01-2119463601-44, Index number: 601-044-00-9, CAS: 77-73-6, EC: 201-052-9  
F,T,Xn,Xi,N; R23-11-22-36/37/38-51/53  
Flam. Liq. 3 H226  
Oral Acute Tox. 4 H302  
Inhal Acute Tox. 2 H330  
Skin Irrit. 2 H315

Eye Irrit. 2 H319  
STOT SE 3 H335  
Aquatic Chronic 2 H411

0.1% - 0.25% Trichloro(phényl)silane  
CAS: 98-13-5, EC: 202-640-8  
T,Xn,C; R21/22-23-34  
Dermal Acute Tox. 4 H312  
Inhal Acute Tox. 2 H330  
Skin Corr. 1B H314

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## **SECTION 4. FIRST AID MEASURES**

### 4.1. Description of first aid measures

In case of skin contact:

Immediately take off all contaminated clothing.

Areas of the body that have - or are only even suspected of having - come into contact with the product must be rinsed immediately with plenty of running water and possibly with soap.

Wash thoroughly the body (shower or bath).

Remove contaminated clothing immediately and dispose off safely.

After contact with skin, wash immediately with soap and plenty of water.

In case of eyes contact:

After contact with the eyes, rinse with water with the eyelids open for a sufficient length of time, then consult an ophthalmologist immediately.

Protect uninjured eye.

In case of Ingestion:

Do NOT induce vomiting.

Give nothing to eat or drink.

In case of Inhalation:

If breathing is irregular or stopped, administer artificial respiration.

In case of inhalation, consult a doctor immediately and show him packing or label.

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

All prolonged or repeated contact can cause skin irritation and dermatitis.

Dicyclopentadiene may cause liver disorder (e.g., jaundice) and/or damage, kidney disorder (e.g., edema, proteinuria) and/or damage, and breathing disorders and/or lung damage.

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

In case of accident or unwellness, seek medical advice immediately (show directions for use or safety data sheet if possible).

Treatment:

It is possible to use charcoal in a paste form (240ml water: 30g charcoal). Standard adult dose: 25 to 100g.

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## **SECTION 5. FIRE-FIGHTING MEASURES**

### 5.1. Extinguishing media

Suitable extinguishing media:

Water spray.

Dry chemical

Foam fire extinguisher

CO<sub>2</sub>

Extinguishing media which must not be used for safety reasons:

Water in the form of a solid jet.

Avoid using foam and water on a surface at the same time as the water will destroy the foam.

### 5.2. Special hazards arising from the substance or mixture

Products of combustion: carbon monoxide, carbon dioxide and smoke.

Do not inhale explosion and combustion gases.  
Combustion produces volatile vapours heavier than air (risk of spreading along the ground and distant ignition: backfire).

5.3. Advice for fire-fighters

Use suitable breathing apparatus .

Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

Move undamaged containers from immediate hazard area if it can be done safely.

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**SECTION 6. ACCIDENTAL RELEASE MEASURES**

6.1. Personal precautions, protective equipment and emergency procedures

Wear personal protection equipment.

Remove all sources of ignition.

Wear breathing apparatus if exposed to vapours/dusts/aerosols.

Provide adequate ventilation.

Use appropriate respiratory protection.

See protective measures under point 7 and 8.

6.2. Environmental precautions

Do not allow to enter into soil/subsoil. Do not allow to enter into surface water or drains.

Retain contaminated washing water and dispose it.

In case of gas escape or of entry into waterways, soil or drains, inform the responsible authorities.

Suitable material for taking up: absorbing material, organic, sand.

6.3. Methods and material for containment and cleaning up

Wash with plenty of water.

6.4. Reference to other sections

See also section 8 and 13.

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**SECTION 7. HANDLING AND STORAGE**

7.1. Precautions for safe handling

Avoid contact with skin and eyes, inhalation of vapours and mists.

Use localized ventilation system.

Don't use empty container before they have been cleaned.

Before making transfer operations, assure that there aren't any incompatible material residuals in the containers.

Contaminated clothing should be changed before entering eating areas.

Do not eat or drink while working.

See also section 8 for recommended protective equipment.

7.2. Conditions for safe storage, including any incompatibilities

Keep away from heat and sources of ignition.

Keep in a tightly-closed container in a well-ventilated place.

Keep in a dry, cool place.

Keep away from direct sunlight.

Keep away from unguarded flame, sparks, and heat sources. Avoid direct exposure to sunlight.

Keep away from food, drink and feed.

Incompatible materials:

None in particular.

Instructions as regards storage premises:

Cool and adequately ventilated.

7.3. Specific end use(s)

Release of plastic finished parts may produce a flammable mixture of vapor/air that could ignite.

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1. Control parameters

3a,4,7,7a-tetrahydro-4,7-methanoindene - CAS: 77-73-6

OEL Type: Germany - LTE: 3 mg/m<sup>3</sup>, 0.5 ppm

OEL Type: Austria - LTE: 3 mg/m<sup>3</sup>, 0.5 ppm, 1 ppm - Notes: Dicyclopentadiene

OEL Type: Belgium - LTE: 3 mg/m<sup>3</sup>, 0.5 ppm

OEL Type: Denmark - LTE: 3 mg/m<sup>3</sup>, 0.5 ppm

OEL Type: Finland - STE: 5.5 mg/m<sup>3</sup>, 1 ppm

OEL Type: France - LTE: 27 mg/m<sup>3</sup>, 5 ppm

OEL Type: Ireland - LTE: 27 mg/m<sup>3</sup>, 5 ppm

OEL Type: Portugal - LTE: 27 mg/m<sup>3</sup>, 5 ppm

OEL Type: United Kingdom - LTE: 27 mg/m<sup>3</sup>, 5 ppm

OEL Type: Switzerland - LTE: 3 mg/m<sup>3</sup>, 0.5 ppm, 0.5 ppm

TLV TWA: 5 ppm - 27 mg/m<sup>3</sup>

### DNEL Exposure Limit Values

Dicyclopentadiene - CAS: 77-73-6

Worker Industry: 160 mg/m<sup>3</sup> - Consumer: 143 mg/m<sup>3</sup> - Exposure: Human Inhalation  
Short Term, systemic effects

Worker Industry: 160 mg/m<sup>3</sup> - Consumer: 143 mg/m<sup>3</sup> - Exposure: Human Inhalation  
Short Term, local effects

Worker Industry: 0.34 mg/kg - Consumer: 0.14 mg/kg - Exposure: Human Dermal Long  
Term, systemic effects

Worker Industry: 2.3 mg/m<sup>3</sup> - Consumer: 0.49 mg/m<sup>3</sup> - Exposure: Human Inhalation  
Long Term, systemic effects

Worker Industry: 2.3 mg/m<sup>3</sup> - Consumer: 0.1 mg/kg - Exposure: Human Oral Long  
Term, systemic effects

### PNEC Exposure Limit Values

Dicyclopentadiene (DCPD-T) - CAS: 77-73-6

Worker Industry: 0.029 mg/l - Exposure: Environment: Water

Worker Industry: 0.85 mg/l - Exposure: STP

Worker Industry: 5.49 mg/kg - Exposure: sediments

Worker Industry: 0.86 mg/kg - Exposure: Environment: Soil

### 8.2. Exposure controls

#### Eye protection:

Use close fitting safety goggles, don't use eye lens.

#### Protection for skin:

Use clothing that provides comprehensive protection to the skin, e.g. cotton, rubber, PVC or viton.

#### Protection for hands:

Use protective gloves that provides comprehensive protection, e.g. P.V.C., neoprene or rubber.

#### Respiratory protection:

Use respiratory protection where ventilation is insufficient or exposure is prolonged, e.g. CEN/FFP-2 or CEN/FFP-3.

Use adequate protective respiratory equipment, e.g. CEN/FFP-2 or CEN/FFP-3.

#### Thermal Hazards:

None

#### Environmental exposure controls:

Not available.

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## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Unless otherwise indicated, tests have been carried out at 20°C and at normal atmospheric pressure (760 mm Hg - 1 atm).

### 9.1. Information on basic physical and chemical properties

Appearance and colour:	Colorless to pale liquid
Odour:	Camphor-like
Odour threshold:	N.A.
pH:	N.A.
Melting point / freezing point:	- 5 °C
Initial boiling point and boiling range:	N.A.
Solid/gas flammability:	N.A.
Upper/lower flammability or explosive limits:	N.A.
Vapour density:	N.A.
Flash point:	41 - 49 °C
Evaporation rate:	N.A.
Vapour pressure:	2.28 mmHg
Relative density:	0.98
Solubility in water:	Insoluble
Lipid solubility:	N.A.
Partition coefficient (n-octanol/water):	N.A.
Auto-ignition temperature:	N.A.
Decomposition temperature:	N.A.
Viscosity:	N.A.
Explosive properties:	N.A.
Oxidizing properties:	N.A.

### 9.2. Other information

Miscibility:	N.A.
Fat Solubility:	N.A.
Conductivity:	N.A.
Substance Groups relevant properties:	Not Relevant

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## SECTION 10. STABILITY AND REACTIVITY

### 10.1. Reactivity

Stable under normal conditions.

### 10.2. Chemical stability

Metal chloride salts or heat can act as a catalyst to polymerisation.

### 10.3. Possibility of hazardous reactions

The mixture of A and B components of resin TELENE for operations other than moulding may cause an uncontrolled exothermic reaction generating temperatures higher than 200°C and releasing vapours such as ethane and nitrogen.

It may generate toxic gases on contact with powerful oxidising agents, and powerful reducing agents.

It may catch fire on contact with powerful oxidising agents.

### 10.4. Conditions to avoid

Avoid humidity.

### 10.5. Incompatible materials

Reacts with polyols and isocyanates.

Avoid all contact with strong oxidizing agents.

Avoid contact with combustible materials. The product could catch fire.

### 10.6. Hazardous decomposition products

Decomposition gases: hydrogen chloride, carbon monoxide, carbon dioxide.

Products of combustion: carbon monoxide, carbon dioxide and smoke.

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## SECTION 11. TOXICOLOGICAL INFORMATION

### 11.1. Information on toxicological effects

There is no toxicological data available on the mixture. Consider the individual concentration of each component to assess toxicological effects resulting from exposure to the mixture. Since the mixture has not been generally tested to establish its effects on health, the information pertaining to substances set out in section 3 is provided below.

Dicyclopentadiene (DCPD-T) - CAS: 77-73-6

Test: LD50 - Route: Oral - Species: Rat 590 mg/kg

Test: LC50 - Route: Inhalation - Species: Rat 1723 mg/m<sup>3</sup> - Duration: 6H

Test: LD50 - Route: Skin - Species: Rat > 2000

Test: Skin Irritant - Route: VIVO - Species: Rabbit Positive - Notes: Moderately irritating.

Test: Eye Irritant - Route: VIVO - Species: Rabbit Negative

Test: Skin Sensitization - Route: VIVO - Species: GUINEA Negative

Test: Mutagenesis - Route: VITRO Negative

Test: Reproductive Toxicity - Species: Rat Negative

Test: NOAEL - Species: Rat 750 Ppm

Dicyclopentadiene can cause disorders and/or liver damage, disorders and/or kidney damage & respiratory and/or lung damage.

Trichloro(phényl)silane - CAS: 98-13-5

Test: LD50 - Route: Oral - Species: Rat 2390 mg/kg

Test: LC50 - Route: Inhalation - Species: Mouse 330 mg/m<sup>3</sup> - Duration: 2H

Test: LD50 - Route: IV - Species: Mouse 100 mg/kg

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## SECTION 12. ECOLOGICAL INFORMATION

### 12.1. Toxicity

Adopt good working practices, so that the product is not released into the environment.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Since no ecotoxicological data about the mixture is available, the concentration of each substance must be considered to assess the ecotoxicological effects resulting from exposure to the mixture.

Dicyclopentadiene (DCPD-T) - CAS: 77-73-6

Test: Toxicity studies N.A. - Duration h: N.A. - mg/l: 4.4

Test: NOEC Fish - Duration h: N.A. - mg/l: 0.98

Test: EC50 Daphnia - Duration h: 48 - mg/l: 0.62

Test: NOEC Daphnia - Duration h: 48 - mg/l: 0.22

Test: Study on inhibiting micro-organism growth - Duration h: 18 - mg/l: 2

### 12.2. Persistence and degradability

None.

### 12.3. Bioaccumulative potential

N.A.

### 12.4. Mobility in soil

N.A.

### 12.5. Results of PBT and vPvB assessment

vPvB Substances: None - PBT Substances: None.

### 12.6. Other adverse effects

None.

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## SECTION 13. DISPOSAL CONSIDERATIONS

### 13.1. Waste treatment methods

Recover, if possible. Send to authorised disposal plants or for incineration under controlled conditions. In so doing, comply with the local and national regulations currently in force.

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## SECTION 14. TRANSPORT INFORMATION



- 14.1. UN number  
ADR-UN Number: 2048  
IATA-UN Number: 2048  
IMDG-UN Number: 2048
- 14.2. UN proper shipping name  
ADR-Shipping Name: DICYCLOPENTADIENE  
IATA-Shipping Name: DICYCLOPENTADIENE  
IMDG-Shipping Name: DICYCLOPENTADIENE
- 14.3. Transport hazard class(es)  
ADR-Class: 3  
ADR-Label: 3  
ADR - Hazard identification number: 30  
IATA-Class: 3  
IATA-Label: 3  
IMDG-Class: 3  
IMDG-Label: 3
- 14.4. Packing Group  
ADR-Packing Group: III  
IATA-Packing group: III  
IMDG-Packing group: III
- 14.5. Environmental hazards  
ADR-Environmental Pollutant: Yes  
IMDG-Marine pollutant: Marine Pollutant
- 14.6. Special Precautions for User  
ADR-Tunnel Restriction Code: (D/E)
- 14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No.

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## SECTION 15. REGULATORY INFORMATION

- 15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture  
German water hazard class:WGK 3  
Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances  
Where applicable, refer to the following regulatory provisions:  
Dir. 98/24/EC (Risks related to chemical agents at work).  
Dir. 2000/39/EC (Occupational exposure limit values)  
Directive 2003/105/CE ('Activities linked to risks of serious accidents') and subsequent amendments.  
Regulation (EC) nr 648/2004 (detergents).  
1999/13/EC (VOC directive).
- 15.2. Chemical Safety Assessment  
No.



Two exposure scenarios for Dicyclopentadiene - CAS: 77-73-6 are attached in the appendix.

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## SECTION 16. OTHER INFORMATION

Full text of phrases referred to in Section 3:

- R11 Highly flammable.
- R21/22 Harmful in contact with skin and if swallowed.
- R22 Harmful if swallowed.
- R23 Toxic by inhalation.
- R34 Causes burns.
- R36/37/38 Irritating to eyes, respiratory system and skin.
- R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
  
- H225 Highly flammable liquid and vapour.
- H319 Causes serious eye irritation.
- H335 May cause respiratory irritation.
- H315 Causes skin irritation.
- H411 Toxic to aquatic life with long lasting effects.
- H302 Harmful if swallowed.
- H330 Fatal if inhaled.
- H312 Harmful in contact with skin.
- H314 Causes severe skin burns and eye damage.

This document was prepared by a competent person who has received appropriate training.

Main bibliographic sources:

- ECHA CHEM (European Chemicals Agency)
- eCHEMPORTAL (OECD Global Portal of Information on Chemical Substances)
- GESTIS International Limit Values (IFA)
- Chemical Safety Report (LOA REACH Consortium)

The information contained herein is based on our state of knowledge at the above-specified date. It refers solely to the product indicated and constitutes no guarantee of particular quality. It is the duty of the user to ensure that this information is appropriate and complete with respect to the specific use intended.

This safety data sheet has been completely updated in compliance with Regulation 453/2010/EU. This document supersedes any previous version.

- ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.
- CAS: Chemical Abstracts Service (division of the American Chemical Society).
- CLP: Classification, Labeling, Packaging.
- EC50: Median effective concentration.
- IATA: International Air Transport Association.
- IMDG: International Maritime Code for Dangerous Goods.
- LC50: Lethal concentration, for 50 percent of test population.
- LD50: Lethal dose, for 50 percent of test population.
- LTE: Long-term exposure.
- N.A.: Not available
- OEL: Occupational exposure limit.
- PBT: Persistent, Bioaccumulative and Toxic.
- RID: Regulation Concerning the International Transport of Dangerous Goods

STE: by Rail.  
Short-term exposure.  
vPvB: very Persistent and very Bioaccumulative.

## APPENDIX

### EXPOSURE SCENARIOS

- Distribution of 3a,4,7,7a-tetrahydro-4,7-methanoindene
- Use of 3a,4,7,7a-tetrahydro-4,7-methanoindene in polymer processing – Industrial

**Exposure scenario: Distribution of 3a,4,7,7a-tetrahydro-4,7-methanoindene**

**Exposure scenario**

Section 1	Exposure Scenario Title
Title	<b>Distribution of DCPD;CAS RN77-76-3</b>
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15
	Environmental Release Categories: ERC1 (loading) ERC2 (repacking)
Processes, tasks, activities covered	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its distribution and associated laboratory activities
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa [OC3].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20oC above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures
	<i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures, 4. Personal protection. Phrases between brackets are good practice advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>
General exposures (closed systems) [CS15].	No other specific measures identified [E120]. Wear suitable gloves tested to EN374 [PPE15].
General exposures (closed systems) [CS15]. ; With sample collection [CS56]. With occasional controlled exposure [CS137]	Ensure material transfers are under containment or extract ventilation [E66].

General exposures (closed systems) [CS15]. Use in contained batch processes [CS37].	Ensure material transfers are under containment or extract ventilation [E66].
General exposures (open systems) [CS16]. Batch process [CS55]. ; With sample collection [CS56].	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out operation for more than 4 hours [OC12].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Process sampling [CS2].	Ensure material transfers are under containment or extract ventilation [E66]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Laboratory activities [CS36].	Handle in a fume cupboard or under extract ventilation [E83].Avoid carrying out operation for more than 4 hours [OC12]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Bulk transfers [CS14]. ; (closed systems) [CS107]	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out operation for more than 4 hours [OC12].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Bulk transfers [CS14]. ; (open systems) [CS108]	Ensure material transfers are under containment or extract ventilation [E66]. Wear suitable gloves tested to EN374 [PPE15]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]
Drum and small package filling [CS6].	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. Ensure operation is undertaken outdoor [E69] or provide a good standard of general ventilation. Natural ventilation is from windows and doors etc. Controlled ventilation means air is supplied or/removed by powered fan [E1 Wear chemically resistant gloves (tested to EN374) in combination with 'specific' activity training [PPE17].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55].Apply vessel entry procedures including use of forced supplied air [AP15]. Wear suitable gloves tested to EN374 [PPE15].
Storage [CS67]With occasional controlled exposure [CS137]	Transfer via enclosed lines [E52].Ensure operation is undertaken outdoors [E69]. Locate bulk storage outdoors [E88].Avoid carrying out operation for more than 15 minutes [OC10].Wear suitable gloves tested to EN374 [PPE15].

Section 3	Exposure Estimation
<b>3.1. Health</b>	<i>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.</i>
<b>3.2. Environment</b>	<i>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted PNECs and the resulting risk characterisation ratios are expected to be less than 1. This is only applicable to the intermediate exposure scenario.</i>

<b>Section 4</b>		<b>Guidance to check compliance with the Exposure Scenario</b>
<b>4.1. Health</b>		<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A.2 for details of efficiencies and OC.</i>
<b>4.2. Environment</b>		<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. The required efficiency removal from water is 81.6% which would be typically found in wastewater treatment plant.</i>
<b>Section 5</b>		<b>Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)</b>
<b>Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.</b>		
<b>Control of Worker Exposure</b>		
<i>Selection of relevant Scenario phrases</i>	<i>Contributing</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
<b>Control of environmental exposure</b>		
<i>Selection of relevant RMM Core Phrases</i>		<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>

## Exposure estimation

### Workers exposure

The worker exposure estimates for the activities associated with the manufacturing of 3a,4,7,7a-tetrahydro-4,7-methanoindene were assessed using ECETOC TRAv2 (Further details on request).

### Consumer exposure

Not applicable.

### Indirect exposure of humans via the environment (oral)

The estimation of indirect human exposure via the environment was conducted using EUSES v2.1.1. (Further details on request.)

### Environmental exposure

The PECs are based on the factors shown in Section 2.2 (Further details on request.).

**Exposure scenario: Use of 3a,4,7,7a-tetrahydro-4,7-methanoindene in polymer processing – Industrial**

**Exposure scenario**

Section 1	Exposure Scenario Title
Title	<b>Use in polymer processing of DCPD;CAS RN77-73-6</b>
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC21
	Environmental Release Categories: ERC 6D
Processes, tasks, activities covered	Processing of formulated polymers including material transfers, additives handling (e.g. pigments, stabilisers, fillers, plasticisers, etc.), moulding, curing and forming activities, material re-works, storage and associated maintenance.
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa [OC3].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes use at not > 20oC above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	Risk Management Measures
	<i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures , 4. Personal protection. Phrases between brackets are good practice advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.</i>
Bulk transfers [CS14].(closed systems) [CS107]	No other specific measures identified [E120]. Wear suitable gloves tested to EN374 [PPE15].
Bulk transfers [CS14].(closed systems) [CS107] With occasional controlled exposure [CS137]	Ensure material transfers are under containment or extract ventilation [E66].
Bulk transfers [CS14]. Dedicated facility [CS81].	Ensure material transfers are under containment or extract ventilation [E66].

Bulk weighing [CS91](closed systems) [CS107].	No other specific measures identified [E120]. Wear suitable gloves tested to EN374 [PPE15].
Bulk weighing [CS91]With occasional controlled exposure [CS137]	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].Avoid carrying out operation for more than 4 hours [OC12].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Small scale weighing [CS90]	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out operation for more than 1 hour [OC11].
Additive premixing [CS92](closed systems) [CS107]	Ensure material transfers are under containment or extract ventilation [E66].
Additive premixing [CS92](open systems) [CS108]; With sample collection [CS56].	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out operation for more than 4 hours [OC12].
Additive premixing [CS92] General exposures (open systems) [CS16].	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out operation for more than 4 hours [OC12].
Bulk transfers [CS14]. Drum/batch transfers [CS8].	Provide enhanced mechanical ventilation by mechanical means [E48]. Ensure material transfers are under containment or extract ventilation [E66]. Wear suitable gloves tested to EN374 [PPE15].
Bulk transfers [CS14]. Small package filling [CS7].	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].; Ensure material transfers are under containment or extract ventilation [E66]. Wear suitable gloves tested to EN374 [PPE15].
Calendering (including Banburys) [CS64]	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Production of articles by dipping and pouring [CS113].	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
Extrusion and masterbatching [CS88]	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].Wear suitable gloves tested to EN374 [PPE15].
Injection moulding of articles [CS89]	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]. Provide extract ventilation to material transfer points and other openings [E82].Wear suitable gloves tested to EN374 [PPE15].



Equipment maintenance [CS5].	Drain down system prior to equipment break-in or maintenance [E65]. Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]. Avoid carrying out operation for more than 4 hours [OC12]. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training [PPE16].
Storage [CS67] With occasional controlled exposure [CS137]	Provide extract ventilation to points where emissions occur [E54].

Section 3	Exposure Estimation
<b>3.1. Health</b>	<i>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.</i>
<b>3.2. Environment</b>	<i>When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted PNECs and the resulting risk characterisation ratios are expected to be less than 1.</i>
<b>Section 4</b>	<b>Guidance to check compliance with the Exposure Scenario</b>
<b>4.1. Health</b>	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.</i>
<b>4.2. Environment</b>	<i>Confirm that RMMs and OCs are as described or of equivalent efficiency. The required efficiency removal from water is 81.6% which would be typically found in waste-water treatment plant.</i>
<b>Section 5</b>	<b>Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)</b>
<b>Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.</b>	
<b>Control of Worker Exposure</b>	
<i>Selection of relevant Contributing Scenario phrases</i>	<i>Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.</i>
<b>Control of environmental exposure</b>	

*Selection of relevant RMM Core Phrases*

*Good practice RMM phrases may be incorporated in this section or consolidated into the main sections of the SDS, depending on the preference of the Registrant and functionality of the available e-SDS system.*

## **Exposure estimation**

### **Workers exposure**

The worker exposure estimates for the activities associated with the manufacturing of 3a,4,7,7a-tetrahydro-4,7-methanoindene were assessed using ECETOC TRAv2 (Further details on request).

### **Consumer exposure**

Not applicable.

### **Indirect exposure of humans via the environment (oral)**

The estimation of indirect human exposure via the environment was conducted using EUSES v2.1.1. (Further details on request).

### **Environmental exposure**

The PECs are based on the factors shown in Section 2.2 (Further details on request).

End of the safety data sheet.