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

### 1.1. Product identifier

| | | |
|---|---|---|
| Product form | : | Substance (UVCB) |
| Trade name | : | Piperylene |
| EC Index-No. | : | 649-399-00-9 |
| EC-No. | : | 310-013-6 |
| CAS-No. | : | 102110-15-6 |
| REACH registration No. | : | 01-2119495687-16 |
| Product code | : | 510 |
| Formula | : | Unspecified |

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

#### 1.2.1. Relevant identified uses

| | | |
|---|---|---|
| Main use category | : | Industrial use |
| Industrial/Professional use spec | : | Industrial<br>For professional use only |
| Use of the substance/mixture | : | Product for industrial use only |

| Title | Use descriptors |
|---|---|
| Polymer production<br>(ES Ref.: ES16) | PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC14, PROC21, PROC28, ERC6c |

Full text of use descriptors: see section 16

#### 1.2.2. Uses advised against

No additional information available

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

Supplier (Only Representative):
Braskem Netherland BV
Weena 238-240, 9th Floor, Tower C
NL - 3012 NJ – Rotterdam
T +31 10 798 5002
productsafety@braskem.com

### 1.4. Emergency telephone number

Emergency number : CHEMTREC+1 703-741-5970 (International – 24h)

| Country | Organisation/Company | Address | Emergency number | Comment |
|---|---|---|---|---|
| Ireland | National Poisons Information Centre<br>Beaumont Hospital | PO Box 1297<br>Beaumont Road<br>9 Dublin | +353 1 809 2566 (Healthcare professionals-24/7)<br>+353 1 809 2166 (public, 8am - 10pm, 7/7) | |
| Malta | Medicines & Poisons Info Office | Mater Dei Hospital<br>Msida<br>MSD 2090 Msida | +356 2545 6508 | |

## SECTION 2: Hazards identification

### 2.1. Classification of the substance or mixture

**Classification according to Regulation (EC) No. 1272/2008 [CLP]**

| | |
|---|---|
| Flammable liquids, Category 2 | H225 |
| Acute toxicity (oral), Category 4 | H302 |
| Acute toxicity (inhal.), Category 4 | H332 |
| Skin corrosion/irritation, Category 2 | H315 |
| Serious eye damage/eye irritation, Category 2 | H319 |
| Germ cell mutagenicity, Category 2 | H341 |
| Carcinogenicity, Category 1B | H350 |
| Reproductive toxicity, Category 2 | H361 |
| Specific target organ toxicity – Single exposure, Category 3, Respiratory tract irritation | H335 |
| Specific target organ toxicity – Repeated exposure, Category 1 | H372 |
| Aspiration hazard, Category 1 | H304 |
| Hazardous to the aquatic environment – Acute Hazard, Category 1 | H400 |
| Hazardous to the aquatic environment – Chronic Hazard, Category 1 | H410 |

Full text of H- and EUH-statements: see section 16

**Adverse physicochemical, human health and environmental effects**

Highly flammable liquid and vapour. Harmful if swallowed or if inhaled. Causes damage to organs (Auditory system, nervous system, visual system) through prolonged or repeated exposure. Causes serious eye irritation. Causes skin irritation. May cause cancer (if inhaled, if swallowed). Suspected of damaging fertility or the unborn child (if inhaled, if swallowed). Suspected of causing genetic defects. May cause respiratory irritation. May be fatal if swallowed and enters airways. Very toxic to aquatic life with long lasting effects.

### 2.2. Label elements

**Labelling according to Regulation (EC) No. 1272/2008 [CLP]**

Hazard pictograms (CLP) :

GHS02 GHS07 GHS08 GHS09

Signal word (CLP) : Danger

Hazard statements (CLP) : H225 - Highly flammable liquid and vapour.
H302+H332 - Harmful if swallowed or if inhaled.
H304 - May be fatal if swallowed and enters airways.
H315 - Causes skin irritation.
H319 - Causes serious eye irritation.
H335 - May cause respiratory irritation.
H341 - Suspected of causing genetic defects.
H350 - May cause cancer (if inhaled, If swallowed).
H361 - Suspected of damaging fertility or the unborn child (if inhaled, If swallowed).
H372 - Causes damage to organs (Auditory system, nervous system, visual system) through prolonged or repeated exposure.
H410 - Very toxic to aquatic life with long lasting effects.

Precautionary statements (CLP) : P201 - Obtain special instructions before use.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260 - Do not breathe mist, spray, vapours.
P273 - Avoid release to the environment.
P280 - Wear eye protection, protective gloves, protective clothing.
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P330 - Rinse mouth.
P331 - Do NOT induce vomiting.
P370+P378 - In case of fire: Use carbon dioxide (CO2), dry extinguishing powder, foam to extinguish.
P405 - Store locked up.

### 2.3. Other hazards

other hazards which do not result in classification : Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level. Burning liquid may float on water. May spread fire.

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII
Contains no PBT and/or vPvB substances ≥ 0.1% assessed in accordance with REACH Annex XIII

| Component | |
|---|---|
| Hydrocarbons, C5-rich, dicyclopentadiene-containing (102110-15-6) | This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII<br>This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII |

The substance is not included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605

## SECTION 3: Composition/information on ingredients

### 3.1. Substances

Substance type : UVCB
Name : Hydrocarbons, C5-rich, dicyclopentadiene-containing
CAS-No. : 102110-15-6
EC-No. : 310-013-6
EC Index-No. : 649-399-00-9

| Name | Product identifier | % | Classification according to Regulation (EC) No. 1272/2008 [CLP] |
|---|---|---|---|
| Hydrocarbons, C5-rich, dicyclopentadiene-containing | CAS-No.: 102110-15-6<br>EC-No.: 310-013-6<br>EC Index-No.: 649-399-00-9<br>REACH-no: 01-2119495687-16 | 100 | See Section 2.1 |

| Name | Product identifier | % | Classification according to Regulation (EC) No. 1272/2008 [CLP] |
|---|---|---|---|
| 1,3-Pentadiene, (E)- | CAS-No.: 2004-70-8<br>EC-No.: 217-909-5 | 33 – 38 | Flam. Liq. 2, H225<br>Skin Irrit. 2, H315<br>Eye Irrit. 2, H319<br>Asp. Tox. 1, H304 |
| 1,3-Pentadiene, (Z)- | CAS-No.: 1574-41-0<br>EC-No.: 216-401-0 | 20 – 23 | Flam. Liq. 2, H225<br>Asp. Tox. 1, H304 |
| Cyclopentene | CAS-No.: 142-29-0<br>EC-No.: 205-532-9 | 14 – 17 | Flam. Liq. 2, H225<br>Acute Tox. 4 (Oral), H302<br>(ATE=500 mg/kg bodyweight)<br>Acute Tox. 4 (Dermal), H312<br>(ATE=1100 mg/kg bodyweight)<br>Skin Irrit. 2, H315<br>Asp. Tox. 1, H304 |
| Cyclopentane | CAS-No.: 287-92-3<br>EC-No.: 206-016-6<br>EC Index-No.: 601-030-00-2 | 8 – 11 | Flam. Liq. 2, H225<br>Aquatic Chronic 3, H412 |
| 2-Methyl-2-butene | CAS-No.: 513-35-9<br>EC-No.: 208-156-3 | >5 | Flam. Liq. 2, H225<br>Acute Tox. 4 (Oral), H302<br>(ATE=700 mg/kg bodyweight)<br>Skin Irrit. 2, H315<br>Muta. 2, H341<br>Carc. 2, H351<br>STOT SE 3, H336<br>Asp. Tox. 1, H304<br>Aquatic Chronic 2, H411 |
| Cyclopentadiene | CAS-No.: 542-92-7<br>EC-No.: 208-835-4 | 0 – 5 | Flam. Liq. 3, H226<br>Acute Tox. 3 (Oral), H301<br>(ATE=113 mg/kg bodyweight)<br>Acute Tox. 3 (Dermal), H311<br>(ATE=430 mg/kg bodyweight)<br>Skin Irrit. 2, H315<br>Eye Irrit. 2, H319<br>STOT SE 3, H335 |
| n-Pentane | CAS-No.: 109-66-0<br>EC-No.: 203-692-4<br>EC Index-No.: 601-006-00-1 | < 5 | Flam. Liq. 2, H225<br>STOT SE 3, H336<br>Asp. Tox. 1, H304<br>Aquatic Chronic 2, H411 |
| Dicyclopentadiene | CAS-No.: 77-73-6<br>EC-No.: 201-052-9<br>EC Index-No.: 601-044-00-9 | 0 – 4 | Flam. Liq. 2, H225<br>Acute Tox. 4 (Oral), H302<br>Acute Tox. 4 (Inhalation), H332<br>Skin Irrit. 2, H315<br>Eye Irrit. 2, H319<br>STOT SE 3, H335<br>Aquatic Chronic 2, H411 |

| Name | Product identifier | % | Classification according to Regulation (EC) No. 1272/2008 [CLP] |
|---|---|---|---|
| 2,2-dimethylbutane | CAS-No.: 75-83-2<br>EC-No.: 200-906-8<br>EC Index-No.: 601-007-00-7 | 0 – 1.5 | Flam. Liq. 2, H225<br>Skin Irrit. 2, H315<br>STOT SE 3, H336<br>Asp. Tox. 1, H304<br>Aquatic Chronic 2, H411 |
| 1,3-Butadiene, 2-methyl- | CAS-No.: 78-79-5<br>EC-No.: 201-143-3<br>EC Index-No.: 601-014-00-5 | < 1 | Flam. Liq. 1, H224<br>Muta. 2, H341<br>Carc. 1B, H350<br>Aquatic Chronic 3, H412 |
| .beta.-Amylene-trans | CAS-No.: 646-04-8<br>EC-No.: 211-461-4 | 0 – 1 | Flam. Liq. 1, H224<br>Skin Irrit. 2, H315<br>Eye Irrit. 2, H319<br>STOT SE 3, H335<br>Asp. Tox. 1, H304 |
| cis-2-Pentene | CAS-No.: 627-20-3<br>EC-No.: 210-988-7 | 0 – 1 | Flam. Liq. 2, H225<br>Skin Irrit. 2, H315<br>Eye Irrit. 2, H319<br>STOT SE 3, H335<br>Asp. Tox. 1, H304 |

Full text of H- and EUH-statements: see section 16

### 3.2. Mixtures

Not applicable

## SECTION 4: First aid measures

### 4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible). In all cases of doubt, or when symptoms persist, seek medical attention.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Do not apply mouth-to-mouth resuscitation. Get medical advice/attention if you feel unwell.

First-aid measures after skin contact : After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of water and soap. Immediately rinse with plenty of water (for at least 15 minutes). Wash contaminated clothing before reuse. Seek medical attention if ill effect or irritation develops. In case of doubt or persistent symptoms, consult always a physician.

First-aid measures after eye contact : Rinse immediately and thoroughly, pulling the eyelids well away from the eye (15 minutes minimum). Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention if ill effect or irritation develops.

First-aid measures after ingestion : If swallowed, rinse mouth with water (only if the person is conscious). Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Seek immediate medical advice.

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

| | | |
|---|---|---|
| Symptoms/effects | : | Causes damage to organs (Auditory system, nervous system, visual system) through prolonged or repeated exposure. May cause cancer (Inhalation, oral). Suspected of damaging fertility or the unborn child (Inhalation, oral). Suspected of causing genetic defects. |
| Symptoms/effects after inhalation | : | Harmful if inhaled. May cause respiratory irritation. Overexposure to vapours may result in cough. |
| Symptoms/effects after skin contact | : | Causes skin irritation. |
| Symptoms/effects after eye contact | : | Causes serious eye irritation. |
| Symptoms/effects after ingestion | : | Harmful if swallowed. May be fatal if swallowed and enters airways. May result in aspiration into the lungs, causing chemical pneumonia. Ingestion may cause nausea, vomiting and diarrhea. |

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

Treat symptomatically.

## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

| | | |
|---|---|---|
| Suitable extinguishing media | : | Carbon dioxide (CO2), dry chemical powder, foam. Sand. |
| Unsuitable extinguishing media | : | Do not use water jet. Do not use a heavy water stream. |

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

| | | |
|---|---|---|
| Fire hazard | : | Highly flammable liquid and vapour. Material can accumulate some static charge during transfer. May mass explode in fire. Vapours are heavier than air and may travel considerable distance to an ignition source and flash back to source of vapours. Incomplete combustion releases dangerous carbon monoxide, carbon dioxide and other toxic gases. |
| Explosion hazard | : | May mass explode in fire. May form flammable/explosive vapour-air mixture. |

### 5.3. Advice for firefighters

| | | |
|---|---|---|
| Firefighting instructions | : | In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion. In case of fire: stop leak if safe to do so. Hose down area with water. Cool adjacent tanks / containers / drums with water jet. Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire fighting water from entering the environment. |
| Protective equipment for firefighters | : | In case of hazardous fumes, wear autonomous breathing apparatus. Full protective flameproof clothing. Do not enter fire area without proper protective equipment, including respiratory protection. |

## SECTION 6: Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

| | | |
|---|---|---|
| General measures | : | Do not breathe mist, spray, vapours. Avoid contact with spilled material. Remove ignition sources. Use special care to avoid static electric charges. No open flames. No smoking. |

#### 6.1.1. For non-emergency personnel

| | | |
|---|---|---|
| Protective equipment | : | Complete protective clothing. For further information refer to section 8: "Exposure controls/personal protection". |

| | | |
|---|---|---|
| Emergency procedures | : | Evacuate unnecessary personnel. Avoid contact with skin, eyes and clothing. |

#### 6.1.2. For emergency responders

| | | |
|---|---|---|
| Protective equipment | : | Equip cleanup crew with proper protection. For further information refer to section 8: "Exposure controls/personal protection". |
| Emergency procedures | : | Ventilate area. Stop leak if safe to do so. In case of leakage, eliminate all ignition sources. Evacuate unnecessary personnel. Prevent the product from entering drains or confined areas. Notify authorities if liquid enters sewers or public waters. |

### 6.2. Environmental precautions

Air : Use water curtains to contain the toxic clouds. In soil and sediments : Take up liquid spill into absorbent material, e.g.: sand, earth, vermiculite or powdered limestone. Absorb remaining liquid with sand or inert absorbent and remove to safe place. Water : Containment as appropriate. Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

### 6.3. Methods and material for containment and cleaning up

| | | |
|---|---|---|
| For containment | : | Clean up any spills as soon as possible, using an absorbent material to collect it. Stop leak without risks if possible. Keep away from sources of ignition - No smoking. Wear recommended personal protective equipment. Do not touch spilled material. Evacuate unnecessary personnel. |
| Methods for cleaning up | : | Depending on the local regulations it may be disposed of as solid waste or incinerated in a suitable installation. Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents). Stop leak if safe to do so. Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials. |
| Other information | : | Dispose of in a safe manner in accordance with local/national regulations. |

### 6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For disposal of residues refer to section 13 : "Disposal considerations".

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

| | | |
|---|---|---|
| Additional hazards when processed | : | Product can accumulate electrostatic charges that may cause fire by electrical discharges. Handle empty containers with care because residual vapours are flammable. |
| Precautions for safe handling | : | Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Provide good ventilation in process area to prevent formation of vapour. Do not breathe mist, spray, vapours. Avoid contact with eyes, skin and clothing. Use grounded electrical/mechanical equipment. Use only non-sparking tools. Avoid ignition sources. No open flames. No smoking. Spilled product must never be returned to the original container for recycling. Wash contaminated clothing before reuse. |

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

### 7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment. Use explosion-proof electrical equipment.

Storage conditions : Keep away from open flames, hot surfaces and sources of ignition. Store in dry, cool, well-ventilated area. At room temperature the product is neither an irritant nor gives off hazardous vapours. Use only non-sparking tools. Keep in fireproof place. Keep container tightly closed. Store locked up.

Incompatible materials : Strong oxidizing agents. Halogens. Strong acids and oxidants. Reducing agents. Certain plastics, rubbers and coatings. Strong bases.

Storage area : Store in dry, cool, well-ventilated area. Keep away from sources of ignition. Keep away from heat and direct sunlight.

Packaging materials : Storage in steel recommended.

### 7.3. Specific end use(s)

See Section 1.

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

#### 8.1.1 National occupational exposure and biological limit values

| **2-Methyl-2-butene (513-35-9)** | |
|---|---|
| **USA - ACGIH - Occupational Exposure Limits** | |
| Local name | 2-Methyl-2-butene |
| ACGIH OEL TWA | 10 ppm |
| Remark (ACGIH) | TLV® Basis: Clastogenic eff |
| Regulatory reference | ACGIH 2024 |

| **Cyclopentane (287-92-3)** | |
|---|---|
| **Belgium - Occupational Exposure Limits** | |
| Local name | Cyclopentane # Cyclopentaan |
| OEL TWA | 1800 mg/m³ |
| | 600 ppm |
| Regulatory reference | Koninklijk besluit/Arrêté royal 16/11/2023 |
| **Denmark - Occupational Exposure Limits** | |
| Local name | Cyclopentan |
| OEL TWA | 850 mg/m³ |
| | 300 ppm |

| **Cyclopentane (287-92-3)** | |
|---|---|
| OEL STEL | 1700 mg/m³ |
| | 600 ppm |
| Regulatory reference | BEK nr 291 af 19/03/2024 |
| **France - Occupational Exposure Limits** | |
| Local name | Cyclopentane |
| VME (OEL TWA) | 1720 mg/m³ |
| | 600 ppm |
| Remark | Valeurs recommandées/admises |
| Regulatory reference | Circulaire du Ministère du travail (réf.: INRS ED 6443, 2022; Outil65) |
| **Greece - Occupational Exposure Limits** | |
| Local name | Κυκλοπεντάνιο |
| OEL TWA | 1720 mg/m³ |
| | 600 ppm |
| Regulatory reference | Π.Δ. 90/1999 - Προστασία της υγείας των εργαζομένων που εκτίθενται σε ορισμένους χημικούς παράγοντες κατά τη διάρκεια της εργασίας τους |
| **Ireland - Occupational Exposure Limits** | |
| Local name | Cyclopentane |
| OEL TWA | 1720 mg/m³ |
| | 600 ppm |
| OEL STEL | 5160 mg/m³ (calculated) |
| | 1800 ppm (calculated) |
| Remark | Advisory OELV (Advisory Occupational Exposure Limit Values) |
| Regulatory reference | Chemical Agents Code of Practice 2024 |
| **Portugal - Occupational Exposure Limits** | |
| Local name | Ciclopentano |
| OEL TWA | 600 ppm |
| Regulatory reference | Norma Portuguesa NP 1796:2014 |
| **Spain - Occupational Exposure Limits** | |
| Local name | Ciclopentano |
| VLA-ED (OEL TWA) | 1745 mg/m³ |
| | 600 ppm |
| Regulatory reference | Límites de Exposición Profesional para Agentes Químicos en España 2024. INSHT |

| **Cyclopentane (287-92-3)** | |
|---|---|
| **USA - ACGIH - Occupational Exposure Limits** | |
| Local name | Cyclopentane |
| ACGIH OEL TWA | 1000 ppm (EX - Explosion hazard) |
| Remark (ACGIH) | TLV® Basis: CNS impair |
| Regulatory reference | ACGIH 2024 |

| **Cyclopentadiene (542-92-7)** | |
|---|---|
| **Austria - Occupational Exposure Limits** | |
| Local name | 1,3-Cyclopentadien |
| MAK (OEL TWA) | 200 mg/m³ |
| | 75 ppm |
| Regulatory reference | BGBl. II Nr. 156/2021 |
| **Belgium - Occupational Exposure Limits** | |
| Local name | 1,3-Cyclopentadiène # 1,3-Cyclopentadieen |
| OEL TWA | 206 mg/m³ |
| | 75 ppm |
| Regulatory reference | Koninklijk besluit/Arrêté royal 16/11/2023 |
| **Bulgaria - Occupational Exposure Limits** | |
| Local name | Циклопентадиен |
| OEL TWA | 200 mg/m³ |
| Regulatory reference | Наредба № 13 от 30.12.2003 г. за защита на работещите от рискове, свързани с експозиция на химични агенти при работа (изм. и доп. ДВ. бр. 28 от 2024 г., в сила от 05.04.2024 г.) |
| **Denmark - Occupational Exposure Limits** | |
| Local name | Cyclopentadien |
| OEL TWA | 200 mg/m³ |
| | 75 ppm |
| OEL STEL | 400 mg/m³ |
| | 150 ppm |
| Regulatory reference | BEK nr 291 af 19/03/2024 |
| **Estonia - Occupational Exposure Limits** | |
| Local name | 1,3-tsüklopentadieen |
| OEL TWA | 200 mg/m³ |
| | 75 ppm |

| **Cyclopentadiene (542-92-7)** | |
|---|---|
| Regulatory reference | Vabariigi Valitsuse 20. märtsi 2001. a määruse nr 105 (RT I, 21.12.2022, 3) |
| **Finland - Occupational Exposure Limits** | |
| Local name | Syklopentadieeni |
| HTP (OEL TWA) | 210 mg/m³ |
| | 75 ppm |
| HTP (OEL STEL) | 330 mg/m³ |
| | 120 ppm |
| Regulatory reference | HTP-ARVOT 2020 (Sosiaali- ja terveysministeriö) |
| **France - Occupational Exposure Limits** | |
| Local name | Cyclopentadiène |
| VME (OEL TWA) | 200 mg/m³ |
| | 75 ppm |
| Remark | Valeurs recommandées/admises |
| Regulatory reference | Circulaire du Ministère du travail (réf.: INRS ED 6443, 2022; Outil65) |
| **Greece - Occupational Exposure Limits** | |
| Local name | Κυκλοπενταδιένιο, 1,3- |
| OEL TWA | 200 mg/m³ |
| | 75 ppm |
| Regulatory reference | Π.Δ. 90/1999 - Προστασία της υγείας των εργαζομένων που εκτίθενται σε ορισμένους χημικούς παράγοντες κατά τη διάρκεια της εργασίας τους |
| **Hungary - Occupational Exposure Limits** | |
| Local name | 1,3-CIKLOPENTADIÉN |
| AK (OEL TWA) | 200 mg/m³ |
| Remark | i (ingerlő anyag, amely izgatja a bőrt, nyálkahártyát, szemet vagy mindhármat); N (Irritáló anyagok, egyszerű fojtógázok, csekély egészségkárosító hatással bíró anyagok) |
| Regulatory reference | 5/2020. (II. 6.) ITM rendelet - A kémiai kóroki tényezők hatásának kitett munkavállalók egészségének és biztonságának védelméről |
| **Ireland - Occupational Exposure Limits** | |
| Local name | Cyclopentadiene |
| OEL TWA | 203 mg/m³ |
| | 75 ppm |
| OEL STEL | 609 mg/m³ (calculated) |
| | 225 ppm (calculated) |

| **Cyclopentadiene (542-92-7)** | |
|---|---|
| Remark | Advisory OELV (Advisory Occupational Exposure Limit Values) |
| Regulatory reference | Chemical Agents Code of Practice 2024 |
| **Lithuania - Occupational Exposure Limits** | |
| Local name | Ciklopentadienas |
| IPRV (OEL TWA) | 5 mg/m³ |
| Regulatory reference | LIETUVOS HIGIENOS NORMA HN 23:2011 (Nr. V-695/A1-272, 2018-06-12) |
| **Poland - Occupational Exposure Limits** | |
| Local name | Cyklopenta-1,3-dien (cyklopentadien-1,3) |
| NDS (OEL TWA) | 200 mg/m³ |
| Regulatory reference | Dz. U. 2018 poz. 1286 wraz z późn. zm. |
| **Portugal - Occupational Exposure Limits** | |
| Local name | Ciclopentadieno |
| OEL TWA | 75 ppm |
| Regulatory reference | Norma Portuguesa NP 1796:2014 |
| **Romania - Occupational Exposure Limits** | |
| Local name | Ciclopentadienă |
| OEL TWA | 100 mg/m³ |
| | 35.5 ppm |
| OEL STEL | 200 mg/m³ |
| | 75 ppm |
| Regulatory reference | Hotărârea Guvernului nr. 1.218/2006 (Hotărârea nr. 53/2021) |
| **Spain - Occupational Exposure Limits** | |
| Local name | Ciclopentadieno |
| VLA-ED (OEL TWA) | 206 mg/m³ |
| | 75 ppm |
| Regulatory reference | Límites de Exposición Profesional para Agentes Químicos en España 2024. INSHT |
| **Norway - Occupational Exposure Limits** | |
| Local name | 1,3-syklopentadien |
| Grenseverdi (OEL TWA) | 110 mg/m³ |
| | 40 ppm |
| Korttidsverdi (OEL STEL) | 137.5 mg/m³ (value calculated) |
| | 60 ppm (value calculated) |

| **Cyclopentadiene (542-92-7)** | |
|---|---|
| Regulatory reference | FOR-2023-12-18-2278 |
| **USA - ACGIH - Occupational Exposure Limits** | |
| Local name | Cyclopentadiene |
| ACGIH OEL TWA | 0.5 ppm |
| ACGIH OEL STEL | 1 ppm |
| Remark (ACGIH) | TLV® Basis: URT, LRT, & eye irr; CNS eff |
| Regulatory reference | ACGIH 2024 |

| **Dicyclopentadiene (77-73-6)** | |
|---|---|
| **Belgium - Occupational Exposure Limits** | |
| Local name | Dicyclopentadiène # Dicyclopentadieen |
| OEL TWA | 27 mg/m³ |
| | 5 ppm |
| Regulatory reference | Koninklijk besluit/Arrêté royal 16/11/2023 |
| **Bulgaria - Occupational Exposure Limits** | |
| Local name | Дициклопентадиен |
| OEL TWA | 20 mg/m³ |
| Regulatory reference | Наредба № 13 от 30.12.2003 г. за защита на работещите от рискове, свързани с експозиция на химични агенти при работа (изм. и доп. ДВ. бр. 28 от 2024 г., в сила от 05.04.2024 г.) |
| **Croatia - Occupational Exposure Limits** | |
| Local name | Diciklopentadien; 3a,4,7,7a-tetrahidro-4,7-metanoinden |
| GVI (OEL TWA) | 27 mg/m³ |
| | 5 ppm |
| Remark | Koža (razvrstana kao tvar koja nadražuje kožu (H315)) |
| OEL chemical category | Skin notation |
| Regulatory reference | Pravilnik o zaštiti radnika od izloženosti opasnim kemikalijama na radu, graničnim vrijednostima izloženosti i biološkim graničnim vrijednostima (NN 148/2023) |
| **Czech Republic - Occupational Exposure Limits** | |
| Local name | Dicyklopentadien |
| PEL (OEL TWA) | 3 mg/m³ |
| | 0.55 ppm |
| NPK-P (OEL C) | 6 mg/m³ |
| | 1.1 ppm |
| Remark | I - dráždí sliznice (oči, dýchací cesty) resp. kůži. |

| **Dicyclopentadiene (77-73-6)** | |
|---|---|
| Regulatory reference | Nařízení vlády č. 361/2007 Sb. (Předpis 330/2023 Sb.) |
| **Denmark - Occupational Exposure Limits** | |
| Local name | Dicyclopentadien |
| OEL TWA | 2.7 mg/m³ |
| | 0.5 ppm |
| OEL STEL | 5.4 mg/m³ |
| | 1 ppm |
| Regulatory reference | BEK nr 291 af 19/03/2024 |
| **Finland - Occupational Exposure Limits** | |
| Local name | Disyklopentadieeni |
| HTP (OEL STEL) | 5.5 mg/m³ |
| | 1 ppm |
| Regulatory reference | HTP-ARVOT 2020 (Sosiaali- ja terveysministeriö) |
| **France - Occupational Exposure Limits** | |
| Local name | Dicyclopentadiène |
| VME (OEL TWA) | 30 mg/m³ |
| | 5 ppm |
| Remark | Valeurs recommandées/admises |
| Regulatory reference | Circulaire du Ministère du travail (réf.: INRS ED 6443, 2022; Outil65) |
| **Germany - Occupational Exposure Limits (TRGS 900)** | |
| Local name | 3a,4,7,7a-Tetrahydro-4,7-methanoinden |
| AGW (OEL TWA) | 2.7 mg/m³ |
| | 0.5 ppm |
| Peak exposure limitation factor | 1(I) |
| Remark | DFG - Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe der DFG (MAK-Kommission) |
| Regulatory reference | TRGS900 |
| **Greece - Occupational Exposure Limits** | |
| Local name | Δικυκλοπενταδιένιο |
| OEL TWA | 30 mg/m³ |
| | 5 ppm |
| Regulatory reference | Π.Δ. 90/1999 - Προστασία της υγείας των εργαζομένων που εκτίθενται σε ορισμένους χημικούς παράγοντες κατά τη διάρκεια της εργασίας τους |

| Dicyclopentadiene (77-73-6) | |
|---|---|
| **Ireland - Occupational Exposure Limits** | |
| Local name | Dicyclopentadiene |
| OEL TWA | 30 mg/m³ |
| | 5 ppm |
| OEL STEL | 90 mg/m³ (calculated) |
| | 15 ppm (calculated) |
| Remark | Advisory OELV (Advisory Occupational Exposure Limit Values) |
| Regulatory reference | Chemical Agents Code of Practice 2024 |
| **Lithuania - Occupational Exposure Limits** | |
| Local name | Diciklopentadienas |
| IPRV (OEL TWA) | 1 mg/m³ |
| Remark | K (kancerogeninis poveikis); M (mutageninis poveikis); O (medžiaga į organizmą gali prasiskverbti pro nepažeistą odą) |
| OEL chemical category | Mutagen, Carcinogen, Skin notation |
| Regulatory reference | LIETUVOS HIGIENOS NORMA HN 23:2011 (Nr. V-695/A1-272, 2018-06-12) |
| **Poland - Occupational Exposure Limits** | |
| Local name | 3a,4,7,7a-Tetrahydro-4,7-metanoinden (dicyklopentadien) |
| NDS (OEL TWA) | 10 mg/m³ |
| Regulatory reference | Dz. U. 2018 poz. 1286 wraz z późn. zm. |
| **Portugal - Occupational Exposure Limits** | |
| Local name | Diciclopentadieno |
| OEL TWA | 5 ppm |
| Regulatory reference | Norma Portuguesa NP 1796:2014 |
| **Slovenia - Occupational Exposure Limits** | |
| Local name | 3a,4,7,7a-tetrahidro-4,7-metanoinden |
| OEL TWA | 2.7 mg/m³ |
| | 0.5 ppm |
| OEL STEL | 2.7 mg/m³ |
| | 0.5 ppm |
| Regulatory reference | Uradni list RS, št. 29/2024 z dne 4. 4. 2024 - Pravilnik o varovanju delavcev pred tveganji zaradi izpostavljenosti kemičnim snovem pri delu |
| **Spain - Occupational Exposure Limits** | |
| Local name | Diciclopentadieno |

| **Dicyclopentadiene (77-73-6)** | |
|---|---|
| VLA-ED (OEL TWA) | 5 ppm |
| Regulatory reference | Límites de Exposición Profesional para Agentes Químicos en España 2024. INSHT |
| **Norway - Occupational Exposure Limits** | |
| Local name | Disyklopentadien |
| Grenseverdi (OEL TWA) | 30 mg/m³ |
| | 5 ppm |
| Korttidsverdi (OEL STEL) | 45 mg/m³ (value calculated) |
| | 10 ppm (value calculated) |
| Regulatory reference | FOR-2023-12-18-2278 |
| **USA - ACGIH - Occupational Exposure Limits** | |
| Local name | Dicyclopentadiene, including Cyclopentadiene |
| ACGIH OEL TWA | 0.5 ppm |
| ACGIH OEL STEL | 1 ppm (including Cyclopentadiene) |
| Remark (ACGIH) | TLV® Basis: URT, LRT, & eye irr; CNS eff |
| Regulatory reference | ACGIH 2024 |

| **n-Pentane (109-66-0)** | |
|---|---|
| **EU - Indicative Occupational Exposure Limit (IOEL)** | |
| Local name | Pentane |
| IOEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | COMMISSION DIRECTIVE 2006/15/EC |
| **Austria - Occupational Exposure Limits** | |
| Local name | Pentan (alle Isomeren): n-Pentan |
| MAK (OEL TWA) | 1800 mg/m³ |
| | 600 ppm |
| MAK (OEL STEL) | 3600 mg/m³ (3x 60(Mow) min) |
| | 1200 ppm (3x 60(Mow) min) |
| Regulatory reference | BGBl. II Nr. 156/2021 |
| **Belgium - Occupational Exposure Limits** | |
| Local name | Pentane, tous isomères # Pentaan, alle isomeren |
| OEL TWA | 1800 mg/m³ |
| | 600 ppm |
| OEL STEL | 2250 mg/m³ |

| **n-Pentane (109-66-0)** | |
|---|---|
| | 750 ppm |
| Regulatory reference | Koninklijk besluit/Arrêté royal 16/11/2023 |
| **Bulgaria - Occupational Exposure Limits** | |
| Local name | n-Пентан |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Remark | • (Химични агенти, за които са определени гранични стойности във въздуха на работната среда за Европейската общност) |
| Regulatory reference | Наредба № 13 от 30.12.2003 г. за защита на работещите от рискове, свързани с експозиция на химични агенти при работа (изм. и доп. ДВ. бр. 28 от 2024 г., в сила от 05.04.2024 г.) |
| **Croatia - Occupational Exposure Limits** | |
| Local name | Pentan |
| GVI (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| Remark | Direktiva: 2006/15/EZ |
| Regulatory reference | Pravilnik o zaštiti radnika od izloženosti opasnim kemikalijama na radu, graničnim vrijednostima izloženosti i biološkim graničnim vrijednostima (NN 148/2023) |
| **Cyprus - Occupational Exposure Limits** | |
| Local name | Πεντάνιο |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Κανονισμοί του 2007 (Κ.Δ.Π. 295/2007) |
| **Czech Republic - Occupational Exposure Limits** | |
| Local name | Pentan |
| PEL (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| NPK-P (OEL C) | 4500 mg/m³ (1) Je brán zřetel na fyzikálně-chemické vlastnosti (například výbušnost). |
| | 1500 ppm |
| Regulatory reference | Nařízení vlády č. 361/2007 Sb. (Předpis 330/2023 Sb.) |
| **Denmark - Occupational Exposure Limits** | |
| Local name | Pentan, alle isomere: Pentan |
| OEL TWA | 1500 mg/m³ |

| **n-Pentane (109-66-0)** | |
|---|---|
| | 500 ppm |
| OEL STEL | 3000 mg/m³ (Pentane, all isomers) |
| | 1000 ppm (Pentane, all isomers) |
| Remark | E (betyder, at stoffet har en EF-grænseværdi) |
| Regulatory reference | BEK nr 291 af 19/03/2024 |
| **Estonia - Occupational Exposure Limits** | |
| Local name | Pentaan |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Vabariigi Valitsuse 20. märtsi 2001. a määruse nr 105 (RT I, 21.12.2022, 3) |
| **Finland - Occupational Exposure Limits** | |
| Local name | n-Pentaani |
| HTP (OEL TWA) | 1500 mg/m³ |
| | 500 ppm |
| HTP (OEL STEL) | 1900 mg/m³ |
| | 630 ppm |
| Regulatory reference | HTP-ARVOT 2020 (Sosiaali- ja terveysministeriö) |
| **France - Occupational Exposure Limits** | |
| Local name | n-Pentane |
| VME (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| Remark | Valeurs règlementaires contraignantes |
| Regulatory reference | Article R4412-149 du Code du travail (réf.: INRS ED 6443, 2022; Outil65; Décret n° 2019-1487; Décret n° 2020-1546; Décret n° 2021-434; Décret n° 2021-1849) |
| **Germany - Occupational Exposure Limits (TRGS 900)** | |
| Local name | Pentan |
| AGW (OEL TWA) | 3000 mg/m³ (the risk of damage to the embryo or fetus can be excluded when AGW and BGW values are observed) |
| | 1000 ppm (the risk of damage to the embryo or fetus can be excluded when AGW and BGW values are observed) |
| Peak exposure limitation factor | 2(II) |

| **n-Pentane (109-66-0)** | |
|---|---|
| Remark | DFG - Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe der DFG (MAK-Kommission); EU - Europäische Union (Von der EU wurde ein Luftgrenzwert festgelegt: Abweichungen bei Wert und Spitzenbegrenzung sind möglich); Y - Ein Risiko der Fruchtschädigung braucht bei Einhaltung des Arbeitsplatzgrenzwertes und des biologischen Grenzwertes (BGW) nicht befürchtet zu werden |
| Regulatory reference | TRGS900 |
| **Gibraltar - Occupational Exposure Limits** | |
| Local name | Pentane |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Factories (Control of Chemical Agents at Work) Regulations 2003 (LN. 2018/181) |
| **Greece - Occupational Exposure Limits** | |
| Local name | Πεντάνιο (όλα τα ισομερή) |
| OEL TWA | 2950 mg/m³ |
| | 1000 ppm |
| OEL STEL | 2950 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Π.Δ. 90/1999 - Προστασία της υγείας των εργαζομένων που εκτίθενται σε ορισμένους χημικούς παράγοντες κατά τη διάρκεια της εργασίας τους |
| **Hungary - Occupational Exposure Limits** | |
| Local name | n-PENTÁN |
| AK (OEL TWA) | 3000 mg/m³ |
| Remark | EU2 (2006/15/EK irányelvben közölt érték); R (Azok az anyagok, amelyek egészségkárosító hatása RÖVID expozíció hatására jelentkezik) |
| Regulatory reference | 5/2020. (II. 6.) ITM rendelet - A kémiai kóroki tényezők hatásának kitett munkavállalók egészségének és biztonságának védelméről |
| **Ireland - Occupational Exposure Limits** | |
| Local name | Pentane |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| OEL STEL | 3000 ppm (calculated) |
| Remark | IOELV (Indicative Occupational Exposure Limit Values) |
| Regulatory reference | Chemical Agents Code of Practice 2024 |

| **n-Pentane (109-66-0)** | |
|---|---|
| **Italy - Occupational Exposure Limits** | |
| Local name | Pentano |
| OEL TWA | 2000 mg/m³ |
| | 667 ppm |
| Regulatory reference | Allegato XXXVIII del D.Lgs. 9 aprile 2008, n. 81 e s.m.i. |
| **Latvia - Occupational Exposure Limits** | |
| Local name | Pentāns |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Ministru kabineta 2007. gada 15. maija noteikumiem Nr. 325 (Grozījumi Ministru kabineta 2024. gada 26. martā noteikumiem Nr. 191). |
| **Lithuania - Occupational Exposure Limits** | |
| Local name | Pentanas |
| IPRV (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | LIETUVOS HIGIENOS NORMA HN 23:2011 (Nr. V-695/A1-272, 2018-06-12) |
| **Luxembourg - Occupational Exposure Limits** | |
| Local name | Pentane |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Mémorial A Nº 226 de 2021 concernant la protection de la sécurité et de la santé des salariés contre les risques liés à des agents chimiques sur le lieu de travail |
| **Malta - Occupational Exposure Limits** | |
| Local name | Pentane |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | S.L. 424.24 - Chemical Agents at Work Regulations (L.N. 356 of 2021) # L.S. 424.24 - Regolamenti dwar Aġenti Kimiċi fuq il-Post tax-Xogħol (A.L. 356 tal-2021) |
| **Netherlands - Occupational Exposure Limits** | |
| Local name | n-Pentaan |
| TGG-8u (OEL TWA) | 1800 mg/m³ |
| | 600 ppm |

| **n-Pentane (109-66-0)** | |
|---|---|
| Regulatory reference | Arbeidsomstandighedenregeling 2024 |
| **Poland - Occupational Exposure Limits** | |
| Local name | Pentan |
| NDS (OEL TWA) | 3000 mg/m³ |
| Regulatory reference | Dz. U. 2018 poz. 1286 wraz z późn. zm. |
| **Portugal - Occupational Exposure Limits** | |
| Local name | Pentano, todos os isómeros |
| OEL TWA | 3000 mg/m³ (indicative limit value) |
| | 1000 ppm |
| Regulatory reference | Norma Portuguesa NP 1796:2014 |
| **Romania - Occupational Exposure Limits** | |
| Local name | Pentan |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Hotărârea Guvernului nr. 1.218/2006 (Hotărârea nr. 53/2021) |
| **Slovakia - Occupational Exposure Limits** | |
| Local name | Pentán |
| NPHV (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Nariadenie vlády č. 355/2006 Z. z. (122/2024 Z. z.) |
| **Slovenia - Occupational Exposure Limits** | |
| Local name | pentan |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| OEL STEL | 6000 mg/m³ |
| | 2000 ppm |
| Remark | Y (Snovi, pri katerih ni nevarnosti za zarodek ob upoštevanju mejnih vrednosti in bat vrednosti), EU |
| Regulatory reference | Uradni list RS, št. 29/2024 z dne 4. 4. 2024 - Pravilnik o varovanju delavcev pred tveganji zaradi izpostavljenosti kemičnim snovem pri delu |
| **Spain - Occupational Exposure Limits** | |
| Local name | n-Pentano |
| VLA-ED (OEL TWA) | 3000 mg/m³ (indicative limit value) |
| | 1000 ppm (indicative limit value) |

| **n-Pentane (109-66-0)** | |
|---|---|
| Remark | VLI (Agente químico para el que la U.E. estableció en su día un valor límite indicativo). |
| Regulatory reference | Límites de Exposición Profesional para Agentes Químicos en España 2024. INSHT |
| **Sweden - Occupational Exposure Limits** | |
| Local name | n-Pentan |
| NGV (OEL TWA) | 1800 mg/m³ (Pentanes) |
| | 600 ppm (Pentanes) |
| KGV (OEL STEL) | 2000 mg/m³ (Pentanes) |
| | 750 ppm (Pentanes) |
| Remark | V (Vägledande korttidsgränsvärde ska användas som ett rekommenderat högsta värde som inte bör överskridas) |
| Regulatory reference | Hygieniska gränsvärden (AFS 2018:1) |
| **Norway - Occupational Exposure Limits** | |
| Local name | Pentan |
| Grenseverdi (OEL TWA) | 750 mg/m³ |
| | 250 ppm |
| Korttidsverdi (OEL STEL) | 937.5 mg/m³ (value calculated) |
| | 312.5 ppm (value calculated) |
| Remark | E: EU har en veiledende grenseverdi og/eller anmerkning for stoffet. |
| Regulatory reference | FOR-2023-12-18-2278 |
| **USA - ACGIH - Occupational Exposure Limits** | |
| Local name | Pentane |
| ACGIH OEL TWA | 1000 ppm |
| Remark (ACGIH) | TLV® Basis: Narcosis; resp tract irr |
| Regulatory reference | ACGIH 2024 |

| **1,3-Butadiene, 2-methyl- (78-79-5)** | |
|---|---|
| **Austria - Occupational Exposure Limits** | |
| OEL chemical category | Group A2 Carcinogen |
| **Bulgaria - Occupational Exposure Limits** | |
| Local name | Изопрен (2-метил-1,3-бутадиен) |
| OEL TWA | 40 mg/m³ |
| Regulatory reference | Наредба № 13 от 30.12.2003 г. за защита на работещите от рискове, свързани с експозиция на химични агенти при работа (изм. и доп. ДВ. бр. 28 от 2024 г., в сила от 05.04.2024 г.) |

| **1,3-Butadiene, 2-methyl- (78-79-5)** | |
|---|---|
| **Germany - Occupational Exposure Limits (TRGS 900)** | |
| Local name | Isopren |
| AGW (OEL TWA) | 8.4 mg/m³ (carcinogenic substance Cat. 1A/1B) |
| | 3 ppm (carcinogenic substance Cat. 1A/1B) |
| Peak exposure limitation factor | 8(II) |
| Remark | AGS - Ausschuss für Gefahrstoffe; X - Krebserzeugender Stoff der Kat. 1A oder 1B oder krebserzeugende Tätigkeit oder Verfahren nach § 2 Absatz 3 Nr. 4 der Gefahrstoffverordnung – es ist zusätzlich § 10 GefStoffV zu beachten |
| Regulatory reference | TRGS900 |
| **Latvia - Occupational Exposure Limits** | |
| Local name | Izoprēns (2-metilbutadiēns-1,3) |
| OEL TWA | 40 mg/m³ |
| Remark | Carc. 1B; Muta. 2 |
| Regulatory reference | Ministru kabineta 2008. gada 29. septembra noteikumi Nr. 803 (Grozījumi Ministru kabineta 2024. gada 26. martā noteikumiem Nr. 190). |
| **Lithuania - Occupational Exposure Limits** | |
| Local name | Izoprenas |
| IPRV (OEL TWA) | 40 mg/m³ |
| Remark | K (kancerogeninis poveikis); M (mutageninis poveikis) |
| OEL chemical category | Mutagen, Carcinogen |
| Regulatory reference | LIETUVOS HIGIENOS NORMA HN 23:2011 (Nr. V-695/A1-272, 2018-06-12) |
| **Poland - Occupational Exposure Limits** | |
| Local name | Izopren |
| NDS (OEL TWA) | 100 mg/m³ |
| NDSCh (OEL STEL) | 300 mg/m³ |
| Regulatory reference | Dz. U. 2018 poz. 1286 wraz z późn. zm. |

| **Isopentane (78-78-4)** | |
|---|---|
| **EU - Indicative Occupational Exposure Limit (IOEL)** | |
| Local name | Isopentane |
| IOEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | COMMISSION DIRECTIVE 2006/15/EC |

| **Isopentane (78-78-4)** | |
|---|---|
| **Austria - Occupational Exposure Limits** | |
| Local name | Pentan (alle Isomeren): Isopentan (2-Methylbutan) |
| MAK (OEL TWA) | 1800 mg/m³ |
| | 600 ppm |
| MAK (OEL STEL) | 3600 mg/m³ (3x 60(Mow) min) |
| | 1200 ppm (3x 60(Mow) min) |
| Regulatory reference | BGBl. II Nr. 156/2021 |
| **Belgium - Occupational Exposure Limits** | |
| Local name | Pentane, tous isomères # Pentaan, alle isomeren |
| OEL TWA | 1800 mg/m³ |
| | 600 ppm |
| OEL STEL | 2250 mg/m³ |
| | 750 ppm |
| Regulatory reference | Koninklijk besluit/Arrêté royal 16/11/2023 |
| **Bulgaria - Occupational Exposure Limits** | |
| Local name | Изопентан |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Remark | • (Химични агенти, за които са определени гранични стойности във въздуха на работната среда за Европейската общност) |
| Regulatory reference | Наредба № 13 от 30.12.2003 г. за защита на работещите от рискове, свързани с експозиция на химични агенти при работа (изм. и доп. ДВ. бр. 28 от 2024 г., в сила от 05.04.2024 г.) |
| **Croatia - Occupational Exposure Limits** | |
| Local name | Izopentan; 2-metilbutan |
| GVI (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| Remark | Direktiva: 2006/15/EZ |
| Regulatory reference | Pravilnik o zaštiti radnika od izloženosti opasnim kemikalijama na radu, graničnim vrijednostima izloženosti i biološkim graničnim vrijednostima (NN 148/2023) |
| **Cyprus - Occupational Exposure Limits** | |
| Local name | Ισοπεντάνιο |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |

| **Isopentane (78-78-4)** | |
|---|---|
| Regulatory reference | Κανονισμοί του 2007 (Κ.Δ.Π. 295/2007) |
| **Czech Republic - Occupational Exposure Limits** | |
| Local name | Isopentan |
| PEL (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| NPK-P (OEL C) | 4500 mg/m³ (1) Je brán zřetel na fyzikálně-chemické vlastnosti (například výbušnost). |
| | 1500 ppm |
| Regulatory reference | Nařízení vlády č. 361/2007 Sb. (Předpis 330/2023 Sb.) |
| **Denmark - Occupational Exposure Limits** | |
| Local name | Pentan, alle isomere: Isopentan |
| OEL TWA | 1500 mg/m³ |
| | 500 ppm |
| OEL STEL | 3000 mg/m³ (Pentane, all isomers) |
| | 1000 ppm (Pentane, all isomers) |
| Remark | E (betyder, at stoffet har en EF-grænseværdi) |
| Regulatory reference | BEK nr 291 af 19/03/2024 |
| **Estonia - Occupational Exposure Limits** | |
| Local name | Isopentaan (2-metüülbutaan) |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Vabariigi Valitsuse 20. märtsi 2001. a määruse nr 105 (RT I, 21.12.2022, 3) |
| **Finland - Occupational Exposure Limits** | |
| Local name | 2-Metyylibutaani |
| HTP (OEL TWA) | 1500 mg/m³ |
| | 500 ppm |
| HTP (OEL STEL) | 1900 mg/m³ |
| | 630 ppm |
| Regulatory reference | HTP-ARVOT 2020 (Sosiaali- ja terveysministeriö) |
| **France - Occupational Exposure Limits** | |
| Local name | Isopentane |
| VME (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |

| **Isopentane (78-78-4)** | |
|---|---|
| Remark | Valeurs règlementaires indicatives |
| Regulatory reference | Arrêté du 30 juin 2004 modifié (réf.: INRS ED 6443, 2022; Outil65; Arrêté du 26 octobre 2007) |
| **Germany - Occupational Exposure Limits (TRGS 900)** | |
| Local name | Methylbutan |
| AGW (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| Peak exposure limitation factor | 2(II) |
| Remark | DFG - Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe der DFG (MAK-Kommission); EU - Europäische Union (Von der EU wurde ein Luftgrenzwert festgelegt: Abweichungen bei Wert und Spitzenbegrenzung sind möglich) |
| Regulatory reference | TRGS900 |
| **Gibraltar - Occupational Exposure Limits** | |
| Local name | Isopentane |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Factories (Control of Chemical Agents at Work) Regulations 2003 (LN. 2018/181) |
| **Greece - Occupational Exposure Limits** | |
| Local name | Ισοπεντάνιο |
| OEL TWA | 2950 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Π.Δ. 90/1999 - Προστασία της υγείας των εργαζομένων που εκτίθενται σε ορισμένους χημικούς παράγοντες κατά τη διάρκεια της εργασίας τους |
| **Hungary - Occupational Exposure Limits** | |
| Local name | IZOPENTÁN |
| AK (OEL TWA) | 3000 mg/m³ |
| Remark | EU2 (2006/15/EK irányelvben közölt érték); N (Irritáló anyagok, egyszerű fojtógázok, csekély egészségkárosító hatással bíró anyagok) |
| Regulatory reference | 5/2020. (II. 6.) ITM rendelet - A kémiai kóroki tényezők hatásának kitett munkavállalók egészségének és biztonságának védelméről |
| **Ireland - Occupational Exposure Limits** | |
| Local name | iso-Pentane |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |

| **Isopentane (78-78-4)** | |
|---|---|
| OEL STEL | 3000 ppm (calculated) |
| Remark | IOELV (Indicative Occupational Exposure Limit Values) |
| Regulatory reference | Chemical Agents Code of Practice 2024 |
| **Italy - Occupational Exposure Limits** | |
| Local name | Isopentano |
| OEL TWA | 2000 mg/m³ |
| | 667 ppm |
| Regulatory reference | Allegato XXXVIII del D.Lgs. 9 aprile 2008, n. 81 e s.m.i. |
| **Latvia - Occupational Exposure Limits** | |
| Local name | Izopentāns |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Ministru kabineta 2007. gada 15. maija noteikumiem Nr. 325 (Grozījumi Ministru kabineta 2024. gada 26. martā noteikumiem Nr. 191). |
| **Lithuania - Occupational Exposure Limits** | |
| Local name | Izopentanas |
| IPRV (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | LIETUVOS HIGIENOS NORMA HN 23:2011 (Nr. V-695/A1-272, 2018-06-12) |
| **Luxembourg - Occupational Exposure Limits** | |
| Local name | Isopentane |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Mémorial A Nº 226 de 2021 concernant la protection de la sécurité et de la santé des salariés contre les risques liés à des agents chimiques sur le lieu de travail |
| **Malta - Occupational Exposure Limits** | |
| Local name | Isopentane |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | S.L. 424.24 - Chemical Agents at Work Regulations (L.N. 356 of 2021) # L.S. 424.24 - Regolamenti dwar Aġenti Kimiċi fuq il-Post tax-Xogħol (A.L. 356 tal-2021) |

| **Isopentane (78-78-4)** | |
|---|---|
| **Netherlands - Occupational Exposure Limits** | |
| Local name | Isopentaan |
| TGG-8u (OEL TWA) | 1800 mg/m³ |
| | 600 ppm |
| Regulatory reference | Arbeidsomstandighedenregeling 2024 |
| **Poland - Occupational Exposure Limits** | |
| Local name | Izopentan (metylobutan) |
| NDS (OEL TWA) | 3000 mg/m³ |
| Regulatory reference | Dz. U. 2018 poz. 1286 wraz z późn. zm. |
| **Portugal - Indicative Occupational Exposure Limit (IOEL)** | |
| Local name | Isopentano |
| IOEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Decreto-Lei n.º 1/2021 de 6 de janeiro |
| **Portugal - Occupational Exposure Limits** | |
| Local name | Pentano, todos os isómeros |
| OEL TWA | 3000 mg/m³ (indicative limit value) |
| | 1000 ppm |
| Regulatory reference | Norma Portuguesa NP 1796:2014 |
| **Romania - Occupational Exposure Limits** | |
| Local name | 2-metil butan/Izopentan |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Hotărârea Guvernului nr. 1.218/2006 (Hotărârea nr. 53/2021) |
| **Slovakia - Occupational Exposure Limits** | |
| Local name | Metylbután (izopentán) |
| NPHV (OEL TWA) | 3000 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Nariadenie vlády č. 355/2006 Z. z. (122/2024 Z. z.) |
| **Slovenia - Occupational Exposure Limits** | |
| Local name | izopentan (metilbutan) |
| OEL TWA | 3000 mg/m³ |
| | 1000 ppm |

| **Isopentane (78-78-4)** | |
|---|---|
| OEL STEL | 6000 mg/m³ |
| | 2000 ppm |
| Remark | EU |
| Regulatory reference | Uradni list RS, št. 29/2024 z dne 4. 4. 2024 - Pravilnik o varovanju delavcev pred tveganji zaradi izpostavljenosti kemičnim snovem pri delu |
| **Spain - Occupational Exposure Limits** | |
| Local name | Isopentano (Metilbutano) |
| VLA-ED (OEL TWA) | 3000 mg/m³ (indicative limit value) |
| | 1000 ppm (indicative limit value) |
| Remark | VLI (Agente químico para el que la U.E. estableció en su día un valor límite indicativo). |
| Regulatory reference | Límites de Exposición Profesional para Agentes Químicos en España 2024. INSHT |
| **Sweden - Occupational Exposure Limits** | |
| Local name | iso-Pentan |
| NGV (OEL TWA) | 1800 mg/m³ (Pentanes) |
| | 600 ppm (Pentanes) |
| KGV (OEL STEL) | 2000 mg/m³ (Pentanes) |
| | 750 ppm (Pentanes) |
| Remark | V (Vägledande korttidsgränsvärde ska användas som ett rekommenderat högsta värde som inte bör överskridas) |
| Regulatory reference | Hygieniska gränsvärden (AFS 2018:1) |
| **Norway - Occupational Exposure Limits** | |
| Local name | Isopentan |
| Grenseverdi (OEL TWA) | 750 mg/m³ |
| | 250 ppm |
| Korttidsverdi (OEL STEL) | 937.5 mg/m³ (value calculated) |
| | 312.5 ppm (value calculated) |
| Remark | E: EU har en veiledende grenseverdi og/eller anmerkning for stoffet. |
| Regulatory reference | FOR-2023-12-18-2278 |
| **USA - ACGIH - Occupational Exposure Limits** | |
| Local name | Isopentane |
| ACGIH OEL TWA | 1000 ppm |
| Remark (ACGIH) | TLV® Basis: Narcosis; resp tract irr |
| Regulatory reference | ACGIH 2024 |

| **2,2-dimethylbutane (75-83-2)** | |
|---|---|
| **Austria - Occupational Exposure Limits** | |
| Local name | Hexan (alle Isomeren außer n-Hexan und Methylcyclopentan): 2,2-Dimethylbutan |
| MAK (OEL TWA) | 715 mg/m³ |
| | 200 ppm |
| MAK (OEL STEL) | 2860 mg/m³ (4x 15(Miw) min) |
| | 800 ppm (4x 15(Miw) min) |
| Regulatory reference | BGBl. II Nr. 156/2021 |
| **Czech Republic - Occupational Exposure Limits** | |
| Local name | Hexan isomery: 2,2-Dimethylbutan |
| PEL (OEL TWA) | 1000 mg/m³ (252) |
| | 279 ppm |
| NPK-P (OEL C) | 2000 mg/m³ |
| | 558 ppm |
| Remark | I - dráždí sliznice (oči, dýchací cesty) resp. kůži. |
| Regulatory reference | Nařízení vlády č. 361/2007 Sb. (Předpis 330/2023 Sb.) |
| **Finland - Occupational Exposure Limits** | |
| Local name | 2,2-Dimetyylibutaani |
| HTP (OEL TWA) | 1800 mg/m³ |
| | 500 ppm |
| HTP (OEL STEL) | 2300 mg/m³ |
| | 630 ppm |
| Regulatory reference | HTP-ARVOT 2020 (Sosiaali- ja terveysministeriö) |
| **Germany - Occupational Exposure Limits (TRGS 900)** | |
| Local name | 2,2-Dimethylbutan |
| AGW (OEL TWA) | 1800 mg/m³ |
| | 500 ppm |
| Peak exposure limitation factor | 2(II) |
| Remark | DFG - Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe der DFG (MAK-Kommission) |
| Regulatory reference | TRGS900 |
| **Poland - Occupational Exposure Limits** | |
| Local name | Heksanu izomery acykliczne nasycone, z wyjątkiem heksanu: 2,2-Dimetylobutan |

| **2,2-dimethylbutane (75-83-2)** | |
|---|---|
| NDS (OEL TWA) | 400 mg/m³ |
| NDSCh (OEL STEL) | 1200 mg/m³ (Hexane saturated acyclic isomers) |
| Regulatory reference | Dz. U. 2018 poz. 1286 wraz z późn. zm. |
| **Portugal - Occupational Exposure Limits** | |
| OEL STEL | 1000 ppm |
| **Slovenia - Occupational Exposure Limits** | |
| Local name | 2,2-dimetilbutan |
| OEL TWA | 1800 mg/m³ |
| | 500 ppm |
| OEL STEL | 3600 mg/m³ |
| | 1000 ppm |
| Regulatory reference | Uradni list RS, št. 29/2024 z dne 4. 4. 2024 - Pravilnik o varovanju delavcev pred tveganji zaradi izpostavljenosti kemičnim snovem pri delu |
| **Sweden - Occupational Exposure Limits** | |
| Local name | 2,2-Dimetylbutan |
| NGV (OEL TWA) | 700 mg/m³ (Hexane isomers) |
| | 200 ppm (Hexane isomers) |
| KGV (OEL STEL) | 1100 mg/m³ (Hexane isomers) |
| | 300 ppm (Hexane isomers) |
| Remark | V (Vägledande korttidsgränsvärde ska användas som ett rekommenderat högsta värde som inte bör överskridas) |
| Regulatory reference | Hygieniska gränsvärden (AFS 2018:1) |
| **USA - ACGIH - Occupational Exposure Limits** | |
| Local name | 2,2-Dimethyl butane |
| ACGIH OEL TWA | 200 ppm |
| Remark (ACGIH) | TLV® Basis: URT irr; lung dam. Notations: A3 (Confirmed Animal Carcinogen with Unknown Relevance to Humans) |
| Regulatory reference | ACGIH 2024 |

#### 8.1.2. Recommended monitoring procedures

No additional information available

#### 8.1.3. Air contaminants formed

No additional information available

#### 8.1.4. DNEL and PNEC

| Piperylene (102110-15-6) | |
|---|---|
| **DNEL/DMEL (Workers)** | |
| Acute - systemic effects, dermal | No hazard identified |
| Acute - systemic effects, inhalation | No hazard identified |
| Acute - local effects, dermal | No hazard identified |
| Acute - local effects, inhalation | 160.23 mg/m³ |
| Long-term - systemic effects, dermal | 0.95 mg/kg bodyweight/day |
| Long-term - local effects, dermal | No hazard identified |
| Long-term - systemic effects, inhalation | 2.31 mg/m³ |
| Long-term - local effects, inhalation | 2.31 mg/m³ |
| **PNEC (Water)** | |
| PNEC aqua (freshwater) | 0.001 mg/l |
| PNEC aqua (marine water) | 0.001 mg/l |
| **PNEC (Sediment)** | |
| PNEC sediment (freshwater) | No hazard identified |
| PNEC sediment (marine water) | No hazard identified |
| **PNEC (Soil)** | |
| PNEC soil | No hazard identified |
| **PNEC (Oral)** | |
| PNEC oral (secondary poisoning) | No bioaccumulation potential |
| **PNEC (STP)** | |
| PNEC sewage treatment plant | No hazard identified |

#### 8.1.5. Control banding

No additional information available

### 8.2. Exposure controls

#### 8.2.1. Appropriate engineering controls

**Appropriate engineering controls:**

All equipment used when handling the product must be grounded. Ensure good ventilation of the work station. Mechanical ventilation is recommended. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

#### 8.2.2. Personal protection equipment

##### 8.2.2.1. Eye and face protection

**Eye protection:**

Full face piece respirator. Chemical goggles or safety glasses. ISO 16321-1

#### 8.2.2.2. Skin protection

**Skin and body protection:**
Use chemically protective clothing. Long sleeved protective clothing

**Hand protection:**
Impermeable protective gloves. ISO 374-1. Please follow the instructions related to the permeability and the penetration time provided by the manufacturer. Do not reuse gloves

| Hand protection | | | | | |
|---|---|---|---|---|---|
| **Type** | **Material** | **Permeation** | **Thickness (mm)** | **Penetration** | **Standard** |
| Disposable gloves, E.g. KCL Type: 730 or 890 or equivalent | Nitrile, or, Viton | < 480 minutes. | 0,4 / 0,7 | Not known | EN 374 |

#### 8.2.2.3. Respiratory protection

**Respiratory protection:**
Approved organic vapour respirator. An approved organic vapour respirator/supplied air or self-contained breathing apparatus must be used when vapour concentration exceeds applicable exposure limits. Consult a national health and safety authority for further guidance

| Respiratory protection | | | |
|---|---|---|---|
| **Device** | **Filter type** | **Condition** | **Standard** |
| Full face mask, with cartridge/filter | Ax | Concentrations exceed max allowed workplace atmospheric concentrations. | EN 14387 |

#### 8.2.2.4. Thermal hazards

No additional information available

#### 8.2.3. Environmental exposure controls

**Environmental exposure controls:**
Avoid release to the environment.

**Other information:**
Do not eat, drink or smoke during use.

## SECTION 9: Physical and chemical properties

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

| | | |
|---|---|---|
| Physical state | : | Liquid |
| Colour | : | Colourless. |
| Odour | : | Hydrocarbon-like. |
| Odour threshold | : | Not available |
| Melting point | : | Not available |
| Freezing point | : | -141 – -87.5 °C Information refers to cis-1,3-pentadiene and trans-1,3-pentadiene |
| Boiling point | : | 42 – 44 °C Information refers to cis-1,3-pentadiene and trans-1,3-pentadiene |

| | | |
|---|---|---|
| Flammability | : | Not applicable<br>Highly flammable liquid and vapour. |
| Lower explosion limit | : | 2 vol % |
| Upper explosion limit | : | 8.3 vol % |
| Flash point | : | -29 – -28 °C (closed cup)<br>Information refers to cis-1,3-pentadiene and trans-1,3-pentadiene |
| Auto-ignition temperature | : | Not available |
| Decomposition temperature | : | Not available |
| pH | : | Not applicable |
| Viscosity, kinematic | : | Not available |
| Solubility | : | Water: 690 mg/l<br>Ethanol: Miscible<br>Ether: Miscible<br>Acetone: Miscible |
| Partition coefficient n-octanol/water (Log Kow) | : | Not available |
| Partition coefficient n-octanol/water (Log Pow) | : | 2.44 |
| Vapour pressure | : | 405 mm Hg (25°C) |
| Vapour pressure at 50°C | : | Not available |
| Density | : | 0.676 g/m³ (20°C) |
| Relative density | : | Not available |
| Relative vapour density at 20°C | : | 2.35 |
| Particle characteristics | : | Not applicable |

### 9.2. Other information

#### 9.2.1. Information with regard to physical hazard classes

No additional information available

#### 9.2.2. Other safety characteristics

No additional information available

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

Highly flammable liquid and vapour. May form flammable/explosive vapour-air mixture. Attacks some forms of plastics, rubber, and coatings.

### 10.2. Chemical stability

Static-accumulating. Stable at room temperature.

### 10.3. Possibility of hazardous reactions

Explosive when mixed with oxidizing substances. May polymerize on exposure to temperature rise.

### 10.4. Conditions to avoid

Minimize exposure to air. No flames, no sparks. Eliminate all sources of ignition. Direct sunlight. Extremely high or low temperatures. Open flame.

### 10.5. Incompatible materials

Strong oxidizing agents. Halogens. Strong acids and oxidants. Certain plastics, rubbers and coatings. Reducing agents. Strong bases.

### 10.6. Hazardous decomposition products

Thermal decomposition may produce : Carbon oxides (CO, CO2). May release flammable gases. Lead oxide.

## SECTION 11: Toxicological information

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

Acute toxicity (oral) : Harmful if swallowed.
Acute toxicity (dermal) : Not classified (Based on available data, the classification criteria are not met)
Acute toxicity (inhalation) : Harmful if inhaled.

| **Cyclopentene (142-29-0)** | |
|---|---|
| LD50 oral rat | 2140 µl/kg (Source: NLM_CIP) |
| LD50 dermal rabbit | 1231 mg/kg (Source: ECHA_API) |
| LC50 Inhalation - Rat | > 22.9 mg/l/4h |
| ATE CLP (oral) | 500 mg/kg bodyweight |
| ATE CLP (dermal) | 1100 mg/kg bodyweight |

| **2-Methyl-2-butene (513-35-9)** | |
|---|---|
| LD50 oral rat | 700 – 2600 mg/kg (Source: OECD_SIDS) |
| LD50 dermal rat | > 2000 mg/kg (Source: OECD_SIDS) |
| LC50 Inhalation - Rat [ppm] | > 61000 ppm/4h |
| ATE CLP (oral) | 700 mg/kg bodyweight |

| **Cyclopentane (287-92-3)** | |
|---|---|
| LD50 oral rat | 11400 mg/kg (Source: NLM_CIP) |
| LC50 Inhalation - Rat | > 25.3 mg/l/4h |
| ATE CLP (oral) | 11400 mg/kg bodyweight |

| **Cyclopentadiene (542-92-7)** | |
|---|---|
| LD50 oral rat | 113 mg/kg (Source: NLM_CIP) |
| LD50 dermal rabbit | 430 mg/kg |
| LC50 Inhalation - Rat | 39 mg/l (Exposure time: 1 h Source: JAPAN_GHS) |
| ATE CLP (oral) | 113 mg/kg bodyweight |
| ATE CLP (dermal) | 430 mg/kg bodyweight |
| ATE CLP (vapours) | 39 mg/l/4h |
| ATE CLP (dust,mist) | 39 mg/l/4h |

| **Dicyclopentadiene (77-73-6)** | |
|---|---|
| LD50 oral rat | 346.5 mg/kg (Source: JAPAN_GHS) |
| LD50 dermal rabbit | 4380 mg/kg (Source: JAPAN_GHS) |
| LC50 Inhalation - Rat | 1910 mg/m³ (Exposure time: 6 h Source: ECHA_API) |

| **n-Pentane (109-66-0)** | |
|---|---|
| LD50 oral rat | > 2000 mg/kg (Source: EU_RAR) |
| LD50 dermal rabbit | 3000 mg/kg (Source: OECD_SIDS) |
| LC50 Inhalation - Rat | 364 g/m³ (Exposure time: 4 h Source: NLM_CIP) |
| LC50 Inhalation - Rat (Vapours) | 364 mg/l Source: ChemIDplus |
| ATE CLP (dermal) | 3000 mg/kg bodyweight |
| ATE CLP (vapours) | 364 mg/l/4h |
| ATE CLP (dust,mist) | 364 mg/l/4h |

| **1,3-Butadiene, 2-methyl- (78-79-5)** | |
|---|---|
| LD50 oral rat | 2043 mg/kg |
| LD50 dermal rat | > 1 ml/kg (Source: NLM_CIP) |
| LC50 Inhalation - Rat | 180 mg/l/4h |

| **2,2-dimethylbutane (75-83-2)** | |
|---|---|
| LD50 dermal rabbit | > 5 ml/kg (Source: ECHA_API) |

Skin corrosion/irritation : Causes skin irritation.
pH: Not applicable

Serious eye damage/irritation : Causes serious eye irritation.
pH: Not applicable

Respiratory or skin sensitisation : Not classified (Based on available data, the classification criteria are not met)

Germ cell mutagenicity : Suspected of causing genetic defects.

Carcinogenicity : May cause cancer (if inhaled, If swallowed).

| **1,3-Butadiene, 2-methyl- (78-79-5)** | |
|---|---|
| IARC group | 2B - Possibly carcinogenic to humans |

Reproductive toxicity : Suspected of damaging fertility or the unborn child (if inhaled, If swallowed).

STOT-single exposure : May cause respiratory irritation.

| **2-Methyl-2-butene (513-35-9)** | |
|---|---|
| STOT-single exposure | May cause drowsiness or dizziness. |

| **Cyclopentadiene (542-92-7)** | |
|---|---|
| STOT-single exposure | May cause respiratory irritation. |

| **Dicyclopentadiene (77-73-6)** | |
|---|---|
| STOT-single exposure | May cause respiratory irritation. |

| **n-Pentane (109-66-0)** | |
|---|---|
| STOT-single exposure | May cause drowsiness or dizziness. |

| **.beta.-Amylene-trans (646-04-8)** | |
|---|---|
| STOT-single exposure | May cause respiratory irritation. |

| **cis-2-Pentene (627-20-3)** | |
|---|---|
| STOT-single exposure | May cause respiratory irritation. |

| **2,2-dimethylbutane (75-83-2)** | |
|---|---|
| STOT-single exposure | May cause drowsiness or dizziness. |

STOT-repeated exposure : Causes damage to organs (Auditory system, nervous system, visual system) through prolonged or repeated exposure.

| **n-Pentane (109-66-0)** | |
|---|---|
| NOAEC (inhalation, rat, vapour, 90 days) | 30 mg/l air Animal: rat, Guideline: OECD Guideline 413 (Subchronic Inhalation Toxicity: 90-Day Study), Guideline: other:, Guideline: EPA OTS 798.2450 (90-Day Inhalation Toxicity), Guideline: other:, Guideline: other: |

Aspiration hazard : May be fatal if swallowed and enters airways.

### 11.2. Information on other hazards

#### 11.2.1. Endocrine disrupting properties

Adverse health effects caused by endocrine disrupting properties : No additional information available

#### 11.2.2. Other information

Other information : Likely routes of exposure: ingestion, inhalation, skin and eye

## SECTION 12: Ecological information

### 12.1. Toxicity

Ecology - general : Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.

Hazardous to the aquatic environment, short–term (acute) : Very toxic to aquatic life.

Hazardous to the aquatic environment, long–term (chronic) : Very toxic to aquatic life with long lasting effects.

| **2-Methyl-2-butene (513-35-9)** | |
|---|---|
| LC50 - Fish [1] | 4.99 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [semi-static] Source: ECHA) |
| EC50 - Crustacea [1] | 3 mg/l (Exposure time: 48 h - Species: Daphnia magna) |

| **Cyclopentane (287-92-3)** | |
|---|---|
| EC50 - Crustacea [1] | 10.5 mg/l (Exposure time: 48 h - Species: Daphnia magna) |

| **Dicyclopentadiene (77-73-6)** | |
|---|---|
| LC50 - Fish [1] | 11.5 – 17.6 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static] Source: EPA) |
| LC50 - Fish [2] | 23 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus Source: IUCLID) |
| EC50 - Crustacea [1] | 11 mg/l (Exposure time: 48 h - Species: Daphnia magna) |
| EC50 96h - Algae [1] | > 100 mg/l (Species: Pseudokirchneriella subcapitata) |

| **n-Pentane (109-66-0)** | |
|---|---|
| LC50 - Fish [1] | 9.87 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss) |
| LC50 - Fish [2] | 11.59 mg/l (Exposure time: 96 h - Species: Pimephales promelas) |
| EC50 - Crustacea [1] | 9.74 mg/l (Exposure time: 48 h - Species: Daphnia magna) |
| ErC50 algae | 10.7 mg/l Source: EHCA |

| **1,3-Butadiene, 2-methyl- (78-79-5)** | |
|---|---|
| LC50 - Fish [1] | 32.5 – 50.15 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static] Source: EPA) |
| LC50 - Fish [2] | 58.75 – 95.32 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static] Source: EPA) |
| EC50 - Crustacea [1] | 140 mg/l (Exposure time: 48 h - Species: Daphnia magna) |
| EC50 96h - Algae [1] | > 1000 mg/l (Species: Scenedesmus quadricauda) |

### 12.2. Persistence and degradability

| **Piperylene (102110-15-6)** | |
|---|---|
| Persistence and degradability | Not persistent. Readily biodegradable. |

### 12.3. Bioaccumulative potential

| **Piperylene (102110-15-6)** | |
|---|---|
| Partition coefficient n-octanol/water (Log Pow) | 2.44 |
| Bioaccumulative potential | not bioaccumulable. Based on the n-octanol/water partition coefficient accumulation in organisms is not expected. |

| **2-Methyl-2-butene (513-35-9)** | |
|---|---|
| BCF - Fish [1] | (low potential to bioaccumulate) |

| **Cyclopentane (287-92-3)** | |
|---|---|
| Partition coefficient n-octanol/water (Log Pow) | 3 (at 25 °C (at pH 7) |

| **Dicyclopentadiene (77-73-6)** | |
|---|---|
| BCF - Fish [1] | (53 dimensionless (edible fraction) |
| Partition coefficient n-octanol/water (Log Pow) | 2.78 (at 25 °C (at pH 7) |

| **n-Pentane (109-66-0)** | |
|---|---|
| Partition coefficient n-octanol/water (Log Pow) | 3.45 (at 25 °C (at pH 7) |

| **1,3-Butadiene, 2-methyl- (78-79-5)** | |
|---|---|
| BCF - Fish [1] | (no bioaccumulation expected) |

| 1,3-Butadiene, 2-methyl- (78-79-5) | |
|---|---|
| Partition coefficient n-octanol/water (Log Pow) | 3.2 – 4.5 (at 20 °C) |

| 2,2-dimethylbutane (75-83-2) | |
|---|---|
| Partition coefficient n-octanol/water (Log Pow) | 3.8 |

### 12.4. Mobility in soil

| Piperylene (102110-15-6) | |
|---|---|
| Ecology - soil | Product is volatile. Mobility in soil. |

### 12.5. Results of PBT and vPvB assessment

| Piperylene (102110-15-6) |
|---|
| This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII |
| This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII |

| Component | |
|---|---|
| Hydrocarbons, C5-rich, dicyclopentadiene-containing (102110-15-6) | This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII<br>This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII |

### 12.6. Endocrine disrupting properties

No additional information available

### 12.7. Other adverse effects

Additional information : Avoid release to the environment.

## SECTION 13: Disposal considerations

### 13.1. Waste treatment methods

Waste treatment methods : Can be incinerated according to local regulations. Dispose of contents/container in accordance with licensed collector's sorting instructions.

Product/Packaging disposal recommendations : Dispose of in a safe manner in accordance with local/national regulations.

Additional information : Do not re-use empty containers. Flammable vapours may accumulate in the container. Handle empty containers with care because residual vapours are flammable.

Ecological waste information : Avoid release to the environment. Hazardous waste due to toxicity.

## SECTION 14: Transport information

In accordance with ADR / IMDG / IATA / ADN / RID

| ADR | IMDG | IATA | ADN | RID |
|---|---|---|---|---|
| **14.1. UN number or ID number** | | | | |
| UN 3295 | UN 3295 | UN 3295 | UN 3295 | UN 3295 |

| ADR | IMDG | IATA | ADN | RID |
|---|---|---|---|---|
| **14.2. UN proper shipping name** | | | | |
| HYDROCARBONS, LIQUID, N.O.S. | HYDROCARBONS, LIQUID, N.O.S. | Hydrocarbons, liquid, n.o.s. | HYDROCARBONS, LIQUID, N.O.S. | HYDROCARBONS, LIQUID, N.O.S. |
| **14.3. Transport hazard class(es)** | | | | |
| 3 | 3 | 3 | 3 | 3 |
|  |  |  |  |  |
| **14.4. Packing group** | | | | |
| II | II | II | II | II |
| **14.5. Environmental hazards** | | | | |
| Dangerous for the environment: Yes | Dangerous for the environment: Yes<br>Marine pollutant: Yes | Dangerous for the environment: Yes | Dangerous for the environment: Yes | Dangerous for the environment: Yes |
| No supplementary information available | | | | |

### 14.6. Special precautions for user

**Overland transport**

Classification code (ADR) : F1
Special provisions (ADR) : 640C
Limited quantities (ADR) : 1l
Excepted quantities (ADR) : E2
Packing instructions (ADR) : P001
Mixed packing provisions (ADR) : MP19
Portable tank and bulk container instructions (ADR) : T7
Portable tank and bulk container special provisions (ADR) : TP1, TP8, TP28
Tank code (ADR) : L1.5BN
Vehicle for tank carriage : FL
Transport category (ADR) : 2
Special provisions for carriage - Operation (ADR) : S2, S20
Hazard identification number (Kemler No.) : 33
Orange plates : 

Tunnel restriction code (ADR) : D/E

**Transport by sea**

Limited quantities (IMDG) : 1 L
Excepted quantities (IMDG) : E2
Packing instructions (IMDG) : P001

| | | |
|---|---|---|
| IBC packing instructions (IMDG) | : | IBC02 |
| Tank instructions (IMDG) | : | T7 |
| Tank special provisions (IMDG) | : | TP1, TP8, TP28 |
| EmS-No. (Fire) | : | F-E |
| EmS-No. (Spillage) | : | S-D |
| Stowage category (IMDG) | : | B |
| Properties and observations (IMDG) | : | Immiscible with water. |
| MFAG-No | : | 128 |

**Air transport**

| | | |
|---|---|---|
| PCA Excepted quantities (IATA) | : | E2 |
| PCA Limited quantities (IATA) | : | Y341 |
| PCA limited quantity max net quantity (IATA) | : | 1L |
| PCA packing instructions (IATA) | : | 353 |
| PCA max net quantity (IATA) | : | 5L |
| CAO packing instructions (IATA) | : | 364 |
| CAO max net quantity (IATA) | : | 60L |
| Special provisions (IATA) | : | A3, A324 |
| ERG code (IATA) | : | 3H |

**Inland waterway transport**

| | | |
|---|---|---|
| Classification code (ADN) | : | F1 |
| Special provisions (ADN) | : | 640C |
| Limited quantities (ADN) | : | 1 L |
| Excepted quantities (ADN) | : | E2 |
| Carriage permitted (ADN) | : | T |
| Equipment required (ADN) | : | PP, EX, A |
| Ventilation (ADN) | : | VE01 |
| Number of blue cones/lights (ADN) | : | 1 |

**Rail transport**

| | | |
|---|---|---|
| Classification code (RID) | : | F1 |
| Special provisions (RID) | : | 640C |
| Limited quantities (RID) | : | 1L |
| Excepted quantities (RID) | : | E2 |
| Packing instructions (RID) | : | P001 |
| Mixed packing provisions (RID) | : | MP19 |
| Portable tank and bulk container instructions (RID) | : | T7 |
| Portable tank and bulk container special provisions (RID) | : | TP1, TP8, TP28 |
| Tank codes for RID tanks (RID) | : | L1.5BN |
| Transport category (RID) | : | 2 |
| Colis express (express parcels) (RID) | : | CE7 |
| Hazard identification number (RID) | : | 33 |

### 14.7. Maritime transport in bulk according to IMO instruments

| | | |
|---|---|---|
| IBC code | : | Applicable. |
| IBC product name | : | 1,3-Pentadiene (greater than 50%), cyclopentene and isomers, mixtures |
| Ship type | : | Type 2 |

Pollution category : Y

## SECTION 15: Regulatory information

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

#### 15.1.1. EU-Regulations

**REACH Annex XVII (Restriction List)**

Not listed on REACH Annex XVII

**REACH Annex XIV (Authorisation List)**

Not listed on REACH Annex XIV (Authorisation List)

**REACH Candidate List (SVHC)**

Not listed on the REACH Candidate List

**PIC Regulation (Prior Informed Consent)**

Not listed on the PIC list (Regulation EU 649/2012)

**POP Regulation (Persistent Organic Pollutants)**

Not listed on the POP list (Regulation EU 2019/1021)

**Ozone Regulation (1005/2009)**

Not listed on the Ozone Depletion list (Regulation EU 1005/2009)

**Explosives Precursors Regulation (2019/1148)**

Contains no substance(s) listed on the Explosives Precursors list (Regulation EU 2019/1148 on the marketing and use of explosives precursors)

**Drug Precursors Regulation (273/2004)**

Contains no substance(s) listed on the Drug Precursors list (Regulation EC 273/2004 on the manufacture and the placing on market of certain substances used in the illicit manufacture of narcotic drugs and psychotropic substances)

#### 15.1.2. National regulations

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Listed on KECL/KECI (Korean Existing Chemicals Inventory)
Listed on the TCSI (Taiwan Chemical Substance Inventory)
Listed on the NCI (Vietnam - National Chemical Inventory)

### France

| **Occupational diseases** | |
|---|---|
| Code | Description |
| RG 84 | Conditions caused by liquid organic solvents for professional use: saturated or unsaturated aliphatic or cyclic liquid hydrocarbons and mixtures thereof; liquid halogenated hydrocarbons; nitrated derivatives of aliphatic hydrocarbons; alcohols; glycols, glycol ethers; ketones; aldehydes; aliphatic and cyclic ethers, including tetrahydrofuran; esters; dimethylformamide and dimethylacetamine; acetonitrile and propionitrile; pyridine; dimethylsulfone and dimethylsulfoxide |

### Germany

Water hazard class (WGK) : WGK 3, Highly hazardous to water (Classification is carried out on the basis of the Ordinance on facilities for handling substances that are hazardous to water (Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen (AwSV)) of 18 April 2017 (BGBl 2017, Teil I, Nr. 22, Seite 905).).

| | | |
|---|---|---|
| Chemicals Prohibition Ordinance (ChemVerbotsV) | : | This product is subject to ChemVerbotsV Annex 2 Entry 1. The following requirements must be observed: authorization requirement (according to § 6 paragraph 1 sentence 1), basic requirements for carrying out the delivery (according to § 8 paragraph 1, 3 and 4), identification and documentation (according to § 9 paragraph 1 to 3) and exclusion of the shipping route (according to § 10). |
| Hazardous Incident Ordinance (12. BImSchV) | : | Is not subject to the Hazardous Incident Ordinance (12. BImSchV) |

**Netherlands**

| | | |
|---|---|---|
| SZW-lijst van kankerverwekkende stoffen | : | Hydrocarbons, C5-rich, dicyclopentadiene-containing is listed |
| SZW-lijst van mutagene stoffen | : | Hydrocarbons, C5-rich, dicyclopentadiene-containing is listed |
| SZW-lijst van reprotoxische stoffen – Borstvoeding | : | The substance is not listed |
| SZW-lijst van reprotoxische stoffen – Vruchtbaarheid | : | The substance is not listed |
| SZW-lijst van reprotoxische stoffen – Ontwikkeling | : | The substance is not listed |

**Denmark**

| | | |
|---|---|---|
| Classification remarks | : | Emergency management guidelines for the storage of flammable liquids must be followed |
| Danish National Regulations | : | Young people under 18 years are not allowed to use the product<br>Pregnant/breastfeeding women working with the product must not be in direct contact with it |

### 15.2. Chemical safety assessment

A chemical safety assessment has been carried out.

## SECTION 16: Other information

| Indication of changes | | | |
|---|---|---|---|
| **Section** | **Changed item** | **Change** | **Comments** |
| 2.1 | Classification of the substance or mixture | Modified | |
| 2.2 | Label elements | Modified | |
| 4 | First aid measures | Modified | |
| 8.2.1. | Appropriate engineering controls | Modified | |
| 8.2.2. | Personal protective equipment | Modified | |
| 11 | Toxicological information | Modified | |
| 14 | Transport information | Modified | |

| Abbreviations and acronyms: | |
|---|---|
| ACGIH | ACGIH (American Conference of Governement Industrial Hygienists) |
| CLP | CLP - Classification, Labelling and Packaging |
| EC | EC - European Community |
| EEC | EEC - European Economic Community |

| Abbreviations and acronyms: | |
|---|---|
| GHS | GHS - Globally Harmonised System |
| PVC | PVC (Polyvinyl chloride). |
| REACH | REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals |
| SDS | SDS - Safety Data Sheet |

Sources of Key data : Data arise from reference works and literature.

Other information : None.

| Full text of H- and EUH-statements: | |
|---|---|
| Acute Tox. 3 (Dermal) | Acute toxicity (dermal), Category 3 |
| Acute Tox. 3 (Oral) | Acute toxicity (oral), Category 3 |
| Acute Tox. 4 (Dermal) | Acute toxicity (dermal), Category 4 |
| Acute Tox. 4 (Inhalation) | Acute toxicity (inhal.), Category 4 |
| Acute Tox. 4 (Oral) | Acute toxicity (oral), Category 4 |
| Aquatic Acute 1 | Hazardous to the aquatic environment – Acute Hazard, Category 1 |
| Aquatic Chronic 1 | Hazardous to the aquatic environment – Chronic Hazard, Category 1 |
| Aquatic Chronic 2 | Hazardous to the aquatic environment – Chronic Hazard, Category 2 |
| Aquatic Chronic 3 | Hazardous to the aquatic environment – Chronic Hazard, Category 3 |
| Asp. Tox. 1 | Aspiration hazard, Category 1 |
| Carc. 1B | Carcinogenicity, Category 1B |
| Carc. 2 | Carcinogenicity, Category 2 |
| Eye Irrit. 2 | Serious eye damage/eye irritation, Category 2 |
| Flam. Liq. 1 | Flammable liquids, Category 1 |
| Flam. Liq. 2 | Flammable liquids, Category 2 |
| Flam. Liq. 3 | Flammable liquids, Category 3 |
| H224 | Extremely flammable liquid and vapour. |
| H225 | Highly flammable liquid and vapour. |
| H226 | Flammable liquid and vapour. |
| H301 | Toxic if swallowed. |
| H302 | Harmful if swallowed. |
| H304 | May be fatal if swallowed and enters airways. |
| H311 | Toxic in contact with skin. |
| H312 | Harmful in contact with skin. |

| Full text of H- and EUH-statements: | |
|---|---|
| H315 | Causes skin irritation. |
| H319 | Causes serious eye irritation. |
| H332 | Harmful if inhaled. |
| H335 | May cause respiratory irritation. |
| H336 | May cause drowsiness or dizziness. |
| H341 | Suspected of causing genetic defects. |
| H350 | May cause cancer. |
| H351 | Suspected of causing cancer. |
| H361 | Suspected of damaging fertility or the unborn child. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |
| H411 | Toxic to aquatic life with long lasting effects. |
| H412 | Harmful to aquatic life with long lasting effects. |
| Muta. 2 | Germ cell mutagenicity, Category 2 |
| Repr. 2 | Reproductive toxicity, Category 2 |
| Skin Irrit. 2 | Skin corrosion/irritation, Category 2 |
| STOT RE 1 | Specific target organ toxicity – Repeated exposure, Category 1 |
| STOT SE 3 | Specific target organ toxicity – Single exposure, Category 3, Respiratory tract irritation |

| Full text of use descriptors | |
|---|---|
| ERC6a | Use of intermediate |
| ERC6c | Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article) |
| ESVOC SPERC 4.21a.v1 | Polymer processing: Industrial (SU 10) |
| PROC1 | Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions |
| PROC14 | Tabletting, compression, extrusion, pelettisation, granulation |
| PROC2 | Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions |
| PROC21 | Low energy manipulation and handling of substances bound in/on materials or articles |
| PROC28 | Manual maintenance (cleaning and repair) of machinery |
| PROC3 | Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |

| Full text of use descriptors | |
|---|---|
| PROC4 | Chemical production where opportunity for exposure arises |
| PROC5 | Mixing or blending in batch processes |
| PROC6 | Calendering operations |
| PROC8a | Transfer of substance or mixture (charging and discharging) at non-dedicated facilities |
| PROC8b | Transfer of substance or mixture (charging and discharging) at dedicated facilities |
| SU10 | Formulation [mixing] of preparations and/or re-packaging (excluding alloys) |
| SU3 | Industrial uses: Uses of substances as such or in preparations at industrial sites |

Safety Data Sheet (SDS), EU - Braskem

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product. It warns that the handling of any chemical substance requires the previous knowledge of its hazards for the user. It is up to the user of the product company providing this SDS to and promote the training of its employees about possible risks come upon of the product. The information contained herein is not absolute, but only general information on the use of the chemical and indication of safety and security measures.

## Annex to the safety data sheet

| Product exposure scenario(s) | |
|---|---|
| **ES Type** | **ES title** |
| Worker | Polymer production |

## 1. Exposure scenario ES16

### Polymer production

| | |
|---|---|
| ES Ref.: ES16<br>ES Type: Worker | |

| | |
|---|---|
| Use descriptors | PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC14, PROC21, PROC28<br>ERC6c |
| Processes, tasks, activities covered | Manufacture of polymers from monomers in continuous and batch processes. Including production, re-cycling and recovery, degassing, discharging, reactor maintenance and immediate polymer product formation (i.e. compounding, pelletisation, product off-gassing)<br>Use at industrial sites (IS) |

## 2. Operational conditions and risk management measures

### 2.2 Contributing scenario controlling environmental exposure (ERC6c)

| | |
|---|---|
| Polymer production | |
| ERC6c | Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article) |

**Product characteristics**

| | |
|---|---|
| Physical form of product | Liquid |
| Concentration of substance in product | 100 % |
| Vapour pressure | 405 mm Hg |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure |

**Operational conditions**

No additional information.

**Risk Management Measures**

No additional information.

### 2.1.1 Contributing scenario controlling worker exposure (PROC1) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| General exposures (closed systems). Continuous process. no sampling; indoor | |
| PROC1 | Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions |

**Product characteristics**

| | |
|---|---|
| Physical form of product | Liquid |
| Concentration of substance in product | ≤ 100 % |
| Vapour pressure | 405 mm Hg |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure |

**Operational conditions**

| | | |
|---|---|---|
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Operating temperature | ≤ 20 °C |
| | Indoor | |

**Risk Management Measures**

| | | |
|---|---|---|
| Technical conditions and measures to control dispersion from source towards the worker | General ventilation | Good general ventilation (3-5 air changes per hour) |
| | Local exhaust ventilation | No specific measures identified |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for |

| | | |
|---|---|---|
| | | exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.2 Contributing scenario controlling worker exposure (PROC8b) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Bulk transfers. Transport. with sample collection; Indoor with LEV. | |
| PROC8b | Transfer of substance or mixture (charging and discharging) at dedicated facilities |

| | | |
|---|---|---|
| **Product characteristics** | | |
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 100 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | Local exhaust ventilation. Effectiveness inhalation: | ≥ 95 %<br>Handle in an enclosing hood with exhaust ventilation. Use high-performance fume cupboard |
| | General ventilation | Enhanced general ventilation (5-10 air changes per hour) |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking |

| | | |
|---|---|---|
| | | containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Protection effectiveness: | ≥ 95 % |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.3 Contributing scenario controlling worker exposure (PROC2) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| polymerization (Bulk and batch). Continuous process. with sample collection; Outdoor, 4 Hours. | |
| PROC2 | Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions |

| | | |
|---|---|---|
| **Product characteristics** | | |
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 100 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 4 h/day |
| Other given operational conditions affecting workers exposure | Outdoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | General ventilation | Basic. Up to 3 ACH |
| | Local exhaust ventilation | No |
| | Use in closed, continuous process with occasional controlled exposure | |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear |

| | | |
|---|---|---|
| | | transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Protection effectiveness: | ≥ 90 % |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | Yes. APF ≥ 10 |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.4 Contributing scenario controlling worker exposure (PROC3) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| polymerization (Bulk and batch). Batch process. with sample collection; Outdoor, 1 hour. | |
| PROC3 | Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |

| | | |
|---|---|---|
| **Product characteristics** | | |
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 100 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 1 h/day |
| Other given operational conditions affecting workers exposure | Outdoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | General ventilation | Basic. Up to 3 ACH |
| | Local exhaust ventilation | No |
| | Closed systems. Batch process. With occasional controlled exposure | |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain |

| | | |
|---|---|---|
| | | down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Protection effectiveness: | ≥ 90 % |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | Yes. APF ≥ 10 |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.5 Contributing scenario controlling worker exposure (PROC3) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| polymerization (Bulk and batch). Batch process. with sample collection. elevated temperature; Indoor with LEV. | |
| PROC3 | Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |

| | | |
|---|---|---|
| **Product characteristics** | | |
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 100 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 40 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | General ventilation | Enhanced general ventilation (5-10 air changes per hour) |
| | Local exhaust ventilation. Effectiveness inhalation: | ≥ 90 %<br>Yes. Specifically designed fixed capturing hood, on tool extraction or enclosing hoods. |
| | Closed systems. Batch process. With occasional controlled exposure | |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. |

| | | |
|---|---|---|
| | | Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Protection effectiveness: | ≥ 90 % |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.6 Contributing scenario controlling worker exposure (PROC3) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Finishing operations. Batch process. with sample collection; Outdoor, 1 hour. | |
| PROC3 | Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |

| **Product characteristics** | | |
|---|---|---|
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 100 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 1 h/day |
| Other given operational conditions affecting workers exposure | Outdoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | General ventilation | Basic. Up to 3 ACH |
| | Local exhaust ventilation | No |
| | Closed systems. Batch process. With occasional controlled exposure | |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the |

| | | |
|---|---|---|
| | | elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | Yes. APF ≥ 10 |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.7 Contributing scenario controlling worker exposure (PROC4) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Intermediate polymer storage. 5%, Local exhaust ventilation. | |
| PROC4 | Chemical production where opportunity for exposure arises |

| | | |
|---|---|---|
| **Product characteristics** | | |
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 5 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | Local exhaust ventilation. Effectiveness inhalation: | ≥ 90 %<br>Yes. Specifically designed fixed capturing hood, on tool extraction or enclosing hoods. |
| | Occupational Health and Safety Management System: | Advanced |
| | General ventilation | Good general ventilation (3-5 air changes per hour) |

| | | |
|---|---|---|
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.8 Contributing scenario controlling worker exposure (PROC3) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Additivation and stabilisation. 5%, Local exhaust ventilation. | |
| PROC3 | Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |

| | | |
|---|---|---|
| **Product characteristics** | | |
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 5 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| | Closed systems. Batch process. With occasional controlled exposure | |

| | | |
|---|---|---|
| Technical conditions and measures to control dispersion from source towards the worker | Local exhaust ventilation. Effectiveness inhalation: | ≥ 90 %<br>Yes. Specifically designed fixed capturing hood, on tool extraction or enclosing hoods. |
| | General ventilation | Good general ventilation (3-5 air changes per hour) |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.9 Contributing scenario controlling worker exposure (PROC5) (> 0.1% DCPD & < 0.1% benzene)

| Mixing in containers. Batch process; 5%, Local exhaust ventilation. | |
|---|---|
| PROC5 | Mixing or blending in batch processes |

| **Product characteristics** | | |
|---|---|---|
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 5 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| | Indoor | |

| | | |
|---|---|---|
| Other given operational conditions affecting workers exposure | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | General ventilation | Enhanced general ventilation (5-10 air changes per hour) |
| | Local exhaust ventilation. Effectiveness inhalation: | ≥ 90 %<br>Yes. Specifically designed fixed capturing hood, on tool extraction or enclosing hoods. |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.10 Contributing scenario controlling worker exposure (PROC6) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Pelletizing. Extrusion and masterbatching; 5%, Local exhaust ventilation. | |
| PROC6 | Calendering operations |

| | |
|---|---|
| **Product characteristics** | |
| Physical form of product | Liquid |
| Concentration of substance in product | ≤ 5 % |
| Vapour pressure | 405 mm Hg |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure |

| | | |
|---|---|---|
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | Local exhaust ventilation. Effectiveness inhalation: | ≥ 90 %<br>Yes. Specifically designed fixed capturing hood, on tool extraction or enclosing hoods. |
| | Occupational Health and Safety Management System: | Advanced |
| | General ventilation | Enhanced general ventilation (5-10 air changes per hour) |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.11 Contributing scenario controlling worker exposure (PROC14) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Pelletizing; 5%, Local exhaust ventilation. | |
| PROC14 | Tabletting, compression, extrusion, pelettisation, granulation |
| **Product characteristics** | |
| Physical form of product | Liquid |
| Concentration of substance in product | ≤ 5 % |

| | | |
|---|---|---|
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | Local exhaust ventilation. Effectiveness inhalation: | ≥ 90 %<br>Yes. Specifically designed fixed capturing hood, on tool extraction or enclosing hoods. |
| | Occupational Health and Safety Management System: | Advanced |
| | General ventilation | Enhanced general ventilation (5-10 air changes per hour) |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.12 Contributing scenario controlling worker exposure (PROC8b, PROC21) (> 0.1% DCPD & < 0.1% benzene)

| Pelletisation and pellet screening. (Open systems). Rework of articles; 5%, Local exhaust ventilation. | |
|---|---|
| PROC8b | Transfer of substance or mixture (charging and discharging) at dedicated facilities |
| PROC21 | Low energy manipulation and handling of substances bound in/on materials or articles |

# Piperylene

## Annex to the safety data sheet: Exposure scenario

CAS-No.: 102110-15-6 Product form: Substance Physical state: Liquid Substance type: UVCB

| | | |
|---|---|---|
| **Product characteristics** | | |
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 5 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | Occupational Health and Safety Management System: | Advanced |
| | General ventilation | Enhanced general ventilation (5-10 air changes per hour) |
| | Local exhaust ventilation. Effectiveness inhalation: | ≥ 95 %<br>Handle in an enclosing hood with exhaust ventilation. Use high-performance fume cupboard |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.13 Contributing scenario controlling worker exposure (PROC3) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Bulk transfers. Continuous process. with sample collection; 5%, Local exhaust ventilation. | |
| PROC3 | Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition |

| | | |
|---|---|---|
| **Product characteristics** | | |
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 5 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | Closed systems. Batch process. With occasional controlled exposure | |
| | Local exhaust ventilation. Effectiveness inhalation: | ≥ 90 %<br>Yes. Specifically designed fixed capturing hood, on tool extraction or enclosing hoods. |
| | Occupational Health and Safety Management System: | Advanced |
| | General ventilation | Good general ventilation (3-5 air changes per hour) |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic | |

| | | |
|---|---|---|
| | employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.14 Contributing scenario controlling worker exposure (PROC8b) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Transport.with sample collection; 5%, Local exhaust ventilation. | |
| PROC8b | Transfer of substance or mixture (charging and discharging) at dedicated facilities |

| **Product characteristics** | | |
|---|---|---|
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 5 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 8 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | Occupational Health and Safety Management System: | Advanced |
| | General ventilation | Good general ventilation (3-5 air changes per hour) |
| | Local exhaust ventilation. Effectiveness inhalation: | ≥ 95 %<br>Handle in an enclosing hood with exhaust ventilation. Use high-performance fume cupboard |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for | |

| | | |
|---|---|---|
| | indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.15 Contributing scenario controlling worker exposure (PROC8a, PROC28) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Equipment maintenance. Local exhaust ventilation. | |
| PROC8a | Transfer of substance or mixture (charging and discharging) at non-dedicated facilities |
| PROC28 | Manual maintenance (cleaning and repair) of machinery |

**Product characteristics**

| | |
|---|---|
| Physical form of product | Liquid |
| Concentration of substance in product | ≤ 100 % |
| Vapour pressure | 405 mm Hg |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure |

**Operational conditions**

| | | |
|---|---|---|
| Frequency and duration of use | Duration of activity | ≤ 4 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |

**Risk Management Measures**

| | | |
|---|---|---|
| Technical conditions and measures to control dispersion from source towards the worker | General ventilation | Good general ventilation (3-5 air changes per hour) |
| | Local exhaust ventilation. Effectiveness inhalation: | ≥ 90 %<br>Yes. Specifically designed fixed capturing hood, on tool extraction or enclosing hoods. LEV has been added to equate to the SOP. Drain down and flush system prior to equipment break-in or maintenance. |
| | Occupational Health and Safety Management System: | Advanced |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. |

| | | |
|---|---|---|
| | | Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 95 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | Yes. APF ≥ 10 |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

### 2.1.16 Contributing scenario controlling worker exposure (PROC1, PROC2) (> 0.1% DCPD & < 0.1% benzene)

| | |
|---|---|
| Storage. With occasional controlled exposure; 5%, 1 hour. | |
| PROC1 | Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions |
| PROC2 | Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions |

| **Product characteristics** | | |
|---|---|---|
| Physical form of product | Liquid | |
| Concentration of substance in product | ≤ 5 % | |
| Vapour pressure | 405 mm Hg | |
| | Liquid, vapour pressure 0.5 - 10 kPa at Standard Temperature and Pressure | |
| **Operational conditions** | | |
| Frequency and duration of use | Duration of activity | ≤ 1 h/day |
| Other given operational conditions affecting workers exposure | Indoor | |
| | Operating temperature | ≤ 20 °C |
| **Risk Management Measures** | | |
| Technical conditions and measures to control dispersion from source towards the worker | Local exhaust ventilation | No |
| | Occupational Health and Safety Management System: | Advanced |
| | Use in closed, continuous process with occasional controlled exposure | |
| | General ventilation | Good general ventilation (3-5 air changes per hour) |
| Organisational measures to prevent/limit releases, dispersion and exposure | General measures (carcinogens) | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. |

| | | |
|---|---|---|
| | | Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Eye / face protection | No |
| | Dermal Protection: | ≥ 90 %<br>Chemically resistant gloves conforming to EN374 with basic employee training |
| | General measures (skin irritants). Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. | |
| | Respiratory protection: | No |
| | General measures (eye irritants) | Use suitable eye protection. Avoid direct contact with released material |

## 3. Exposure estimation and reference to its source

### 3.1. Health

| Long-term - systemic effects | | | | | | |
|---|---|---|---|---|---|---|
| DNEL | Inhalation: 2.31 mg/m³<br>Dermal: 0.95 mg/kg bodyweight/day | | | | | |
| Contributing scenario | inhalation exposure | RCR | dermal exposure | RCR | Sum RCR | Assessment method |
| PROC1<br>(> 0.1% DCPD & < 0.1% benzene) | 0.038 mg/m³ | 0.016 | 0.0034 mg/kg bw/day | < 0.01 | < 0.026 | |
| PROC8b<br>(> 0.1% DCPD & < 0.1% benzene) | 0.412 mg/m³ | 0.178 | 0.686 mg/kg bw/day | 0.722 | 0.9 | |
| PROC2<br>(> 0.1% DCPD & < 0.1% benzene) | 0.231 mg/m³ | 0.1 | 0.137 mg/kg bw/day | 0.144 | 0.244 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 0.231 mg/m³ | 0.1 | 0.069 mg/kg bw/day | 0.073 | 0.173 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 1.65 mg/m³ | 0.714 | 0.069 mg/kg bw/day | 0.073 | 0.787 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 0.231 mg/m³ | 0.1 | 0.069 mg/kg bw/day | 0.073 | 0.173 | |
| PROC4<br>(> 0.1% DCPD & < 0.1% benzene) | 0.385 mg/m³ | 0.167 | 0.137 mg/kg bw/day | 0.144 | 0.311 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 0.231 mg/m³ | 0.1 | 0.014 mg/kg bw/day | 0.015 | 0.115 | |
| PROC5<br>(> 0.1% DCPD & < 0.1% benzene) | 0.165 mg/m³ | 0.071 | 0.274 mg/kg bw/day | 0.289 | 0.36 | |
| PROC6 | 0.165 mg/m³ | 0.071 | 0.549 mg/kg bw/day | 0.578 | 0.649 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| (> 0.1% DCPD & < 0.1% benzene) | | | | | | |
| PROC14<br>(> 0.1% DCPD & < 0.1% benzene) | 0.165 mg/m³ | 0.071 | 0.069 mg/kg bw/day | 0.073 | 0.144 | |
| PROC8b, PROC21<br>(> 0.1% DCPD & < 0.1% benzene) | 0.193 mg/m³ | 0.083 | 0.274 mg/kg bw/day | 0.289 | 0.372 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 0.231 mg/m³ | 0.1 | 0.014 mg/kg bw/day | 0.015 | 0.115 | |
| PROC8b<br>(> 0.1% DCPD & < 0.1% benzene) | 0.193 mg/m³ | 0.083 | 0.274 mg/kg bw/day | 0.289 | 0.372 | |
| PROC8a, PROC28<br>(> 0.1% DCPD & < 0.1% benzene) | 0.231 mg/m³ | 0.1 | 0.686 mg/kg bw/day | 0.722 | 0.822 | |
| PROC1, PROC2<br>(> 0.1% DCPD & < 0.1% benzene) | 0.154 mg/m³ | 0.067 | 0.027 mg/kg bw/day | 0.029 | 0.096 | |

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| Local - Inhalation | | | | | |
|---|---|---|---|---|---|
| DNEL | Acute: 160.23 mg/m³<br>Long-term: 2.31 mg/m³ | | | | |
| Contributing scenario | Acute | RCR | Long term | RCR | Assessment method |
| PROC1<br>(> 0.1% DCPD & < 0.1% benzene) | 0.154 mg/m³ | < 0.01 | 0.038 mg/m³ | 0.016 | |
| PROC8b<br>(> 0.1% DCPD & < 0.1% benzene) | 1.65 mg/m³ | 0.01 | 0.412 mg/m³ | 0.178 | |
| PROC2<br>(> 0.1% DCPD & < 0.1% benzene) | 0.154 mg/m³ | < 0.01 | 0.231 mg/m³ | 0.1 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 4.62 mg/m³ | 0.029 | 0.231 mg/m³ | 0.1 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 6.6 mg/m³ | 0.041 | 1.65 mg/m³ | 0.714 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 4.62 mg/m³ | 0.029 | 0.231 mg/m³ | 0.1 | |
| PROC4<br>(> 0.1% DCPD & < 0.1% benzene) | 1.542 mg/m³ | < 0.01 | 0.385 mg/m³ | 0.167 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 0.924 mg/m³ | < 0.01 | 0.231 mg/m³ | 0.1 | |
| PROC5<br>(> 0.1% DCPD & < 0.1% benzene) | 0.66 mg/m³ | < 0.01 | 0.165 mg/m³ | 0.071 | |
| PROC6 | 0.66 mg/m³ | < 0.01 | 0.165 mg/m³ | 0.071 | |

| | | | | | |
|---|---|---|---|---|---|
| (> 0.1% DCPD & < 0.1% benzene) | | | | | |
| PROC14<br>(> 0.1% DCPD & < 0.1% benzene) | 0.66 mg/m³ | < 0.01 | 0.165 mg/m³ | 0.071 | |
| PROC8b, PROC21<br>(> 0.1% DCPD & < 0.1% benzene) | 0.77 mg/m³ | < 0.01 | 0.193 mg/m³ | 0.083 | |
| PROC3<br>(> 0.1% DCPD & < 0.1% benzene) | 0.924 mg/m³ | < 0.01 | 0.231 mg/m³ | 0.1 | |
| PROC8b<br>(> 0.1% DCPD & < 0.1% benzene) | 0.77 mg/m³ | < 0.01 | 0.193 mg/m³ | 0.083 | |
| PROC8a, PROC28<br>(> 0.1% DCPD & < 0.1% benzene) | 1.54 mg/m³ | < 0.01 | 0.231 mg/m³ | 0.1 | |
| PROC1, PROC2<br>(> 0.1% DCPD & < 0.1% benzene) | 3.08 mg/m³ | 0.019 | 0.154 mg/m³ | 0.067 | |

### 3.2. Environment

| Information for contributing exposure scenario | |
|---|---|
| 2.2 | Exposure assessment and risk characterisation are not required |

## 4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

### 4.1. Health

| | |
|---|---|
| Guidance - Health | Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. |

### 4.2. Environment

| | |
|---|---|
| Guidance - Environment | Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. |