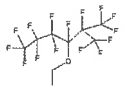
REACH

3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl)-hexane

EC number: 435-790-1 | CAS number: 297730-93-9

Substance identity

Identification



Display Name:	-
EC Number:	435-790-1
EC Name:	-
CAS Number:	297730-93-9
Molecular formula:	C9H5F15O
IUPAC Name:	3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl)hexane

Type of Substance

Composition: mono-constituent substance

Origin:

Substance Identifiers

Trade name

- HFE-7500 ENGINEERED FLUID

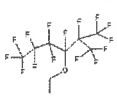
Compositions

Boundary Composition(s)

435-790-1

State Form: liquid

Constituent 1



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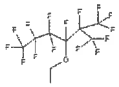
Legal Entity Composition(s)

435-790-1

State Form: liquid

Constituent 1



Reference substance name:	-
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Composition(s) generated upon use

Other types of composition(s)

REACH

3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl)-hexane

EC number: 435-790-1 · CAS number: 297730-93-9

Classification & Labelling & PBT assessment

PBT assessment

Administrative data

PBT assessment: overall result

Reference	
Name:	435-790-1
Type of composition:	boundary composition of the substance
State / form:	liquid
Reference substance:	435-790-1

PBT status:	the substance is not PBT / vPvB
Justification:	See attached justification

ECHA
EUROPEAN CHEMICALS AGENCY

REACH

3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl)-hexane

EC number: 435-790-1 | CAS number: 297730-93-9

Environmental fate & pathways

Endpoint summary

Administrative data

Description of key information

Additional information

CAS# 297730-93-9 is a segregated ether with a completely fluorinated region and a hydrocarbon region. The substance is a liquid at room temperature with a vapor pressure of 0.847 kPa at 20°C. The water solubility of CAS# 297730-93-9 is 21.3 µg/L at 23 °C. The measured Henry's Law constant (HLC) is 4.7 x 10^7 Pa m³/mol (464 atm m³/mol). Releases of CAS# 297730-93-9 are expected to be to the atmosphere based upon its intended uses. Fugitive emissions may occur at transfer points. During routine use, there is no anticipated release to water or wastewater in the EU. Therefore, this compound will remain in the atmosphere when released from industrial applications. The molecule contains no hydrolysable groups and is not biodegradable. Degradation in the environment is initiated by indirect photolysis of the hydrocarbon region, with formation of segregated C7-perfluoroalkyl ester intermediates. Initial phototransformation has a half-life of approximately 1.5 years. The segregated esters are subject to direct and indirect photolysis. No information on direct phototransformation rate is currently available. Based on the available data, the esters appear to be longer lived in the atmosphere than the parent compound. The ultimate degradation products are hydrofluoric acid (HF, CAS# 7664-39-3), trifluoroacetic acid (TFA, CAS# 76-05-1) and perfluorobutyric acid (PFBA, CAS# 375-22-4). Perfluoropropionic acid (PFPA, CAS# 422-64-0) may also occur in limited (<1% of PFBA yield) amounts. These acids are miscible in water and are completely ionized in rainwater. They are expected to undergo wet deposition with no further significant transformation. Please note that a published environmental risk assessment on TFA is available in the literature (1).

As CAS# 297730-93-9 is a highly fluorinated chemical, global warming and ozone depletion potentials may be of interest. USEPA states flatly that hydrofluorocarbons do not deplete ozone because they lack chlorine or bromine. Fluorine radicals do not contribute to ozone depletion because of fast quenching of F* by water or hydrogen donors, slow reaction of FO* radicals with oxygen, and obligate reformation of F* in the pathway (2). F* radicals are rapidly and irreversibly removed from the atmosphere after quenching as HF. Therefore, neither CAS# 297730-93-9 nor any of its acidic photodegradation products contribute to ozone depletion. Global warming potential depends on three factors: absorption of infrared radiation, area of the spectrum the absorption occurs and lifetime of the material in the atmosphere. CAS# 297730-93-9 has an estimated GWP of 100 over a 100-year integrated time horizon (calculation based on reported GWP relative to CFC-11)(3). Although the integrated absorption cross section of CAS# 297730-93-9 is large, the short atmospheric lifetime makes the global warming potential of the compound negligible.

In closed-bottle (OECD301D) assays, no biodegradation of CAS# 297730-93-9 was observed. In an OECD 308 biodegradation simulation study in sediments done under aerobic and anaerobic condition, CAS# 297730-93-9 was determined to degrade very slowly (half life of 91 to 224 years in aerobic sediments and between 189 and 415 years in anaerobic sediments). Trace levels of PFBA formation was observed in both anaerobic and aerobic conditions. HFC-227 was also consistently detected at trace levels in the bioactive cultures of the anaerobic study. In the aerobic study, HFC-227 was occasionally detected but without a clear trend with time and later timepoints were also affected by an increase in limit of quantitation due to the oxygen replenishment procedure. However, CAS# 297730-93-9 is not expected to partition to moist soils or surface waters. Upon accidental, direct release of CAS# 297730-93-9 to the aquatic compartment, the chemical is expected to volatilize rapidly. Given its extremely short half-life due to volatilization, it will not exist in aquatic environments or organisms for a sufficient time to allow partitioning into lipid tissues or testing of bioconcentration meaningfully. Accordingly, CAS#

297730-93-9 is expected to have little potential to bioaccumulate. Biodegradation and bioaccumulation can therefore be discussed in the context of the degradation products, predominantly acids resulting from photolysis in the atmosphere.

Partitioning of HF, TFA and PFBA in the environment is driven by the fact that these acids are completely ionized at environmental pH values, are miscible in water, and are not likely to bind with organic matter based on low Koc values and low log Kow values. HF, TFA and PFBA will be associated with the aqueous phase of any environment where they are released, and will be highly mobile in soils. HF, TFA and PFBA that have deposited in aquatic compartments are expected to remain in the aquatic compartment.

A review of available information indicates that perfluorocarboxylic acids under aerobic conditions are not readily or inherently biodegradable. In addition, it has been shown from studies with many other longer chain perfluorinated moieties that fluorochemicals are oxidatively recalcitrant and resistant to most conventional waste treatment technologies (4). TFA (see below) is similarly not biodegraded. Therefore, PFBA is not expected to biodegrade in surface waters, sediments or soils. PFBA is a strong acid which is expected to be entirely deprotonated at environmental pH, with an estimated logD less than -0.34 at pH > 5.5 as predicted by QSAR software (Advanced Chemistry Development, Inc. (ACD/Labs) Toronto, Ontario, Canada. Version 12). A bioconcentration study of PFPA in carp has been completed. The BCF at steady state was found to be 1.2 and < 4.8 at the two exposure concentrations. Based on the available evidence, PFBA is not expected to bioaccumulate in aquatic organisms.

A review of available literature indicates that TFA is not readily biodegradable and would be considered very persistent in the environment (1). TFA is very water soluble (> 10 g/mL(1)). As a water soluble anion, it is not expected to bioconcentrate in aquatic organisms. A calculated log Kow value of -2.1 (1) has been proposed. BCF data was available only for terrestrial plants. At concentrations at or below the no effect level of 1 mg/L, literature bioconcentration factors ranged from 5.4 to 27 (1).

References

1) Boutonnet (Ed.), 1999. Environmental Risk Assessment of Trifluoroacetic Acid. Human and Ecological Risk Assessment: Vol. 5, No. 1, pp. 59-124.

2) A.J. Colussi, M.A. Crela. 1994. Rate of the reaction between oxygen monofluoride and ozone. Implications for the atmospheric role of fluorine. Chem. Phys. Lett. Vol. 229, pp. 134-138.

3) Goto, M., Inoue, Y., Kawasaki, M., Guschin, A. G., Molina, L. T., Molina, M. J., Wallington, T. J., Hurley, M. D. 2002. Atmospheric Chemistry of HFE-7500 [n-C3F7CF(OC2H5)CF(CF3)2]: Reaction with OH Radicals and Cl Atoms and Atmospheric Fate of n-C3F7CF(OCHO·)CF(CF3)2 and n-C3F7CF(OCH2CH2O·)CF(CF3)2 Radicals. Environ. Sci. Technol. Vol. 36, No. 11, pp. 2395-2402.

4) C. D. Vecitis, H. Park, J. Cheng, B. T. Mader, M. R. Hoffman. 2009. Treatment technologies for aqueous perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA). Front. Environ. Sci. Engin. China. Vol. 3, No. 2, pp. 129-151.

REACH

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EC number: 435-790-1 | CAS number: 297730-93-9

Ecotoxicological information

Ecotoxicological Summary

Administrative data

Hazard for aquatic organisms

Freshwater

Hazard assessment conclusion:	PNEC aqua (freshwater)
PNEC value:	0.008 mg/L
Assessment factor:	1 000
Extrapolation method:	assessment factor

Marine water

Hazard assessment conclusion:	PNEC aqua (marine water)
PNEC value:	0.001 mg/L
Assessment factor:	10 000
Extrapolation method:	assessment factor

STP

Hazard assessment conclusion:	PNEC STP
PNEC value:	1 mg/L
Assessment factor:	10
Extrapolation method:	assessment factor

Sediment (freshwater)

Hazard assessment conclusion:	PNEC sediment (freshwater)
PNEC value:	0.006 mg/kg sediment dw
Extrapolation method:	sensitivity distribution

Sediment (marine water)

Hazard assessment conclusion:	PNEC sediment (marine water)
PNEC value:	0.001 mg/kg sediment dw
Extrapolation method:	sensitivity distribution

Hazard for air

Air

Hazard assessment conclusion:	PNEC air
PNEC value:	0 mg/m³

Hazard for terrestrial organisms

Soil

Hazard assessment conclusion:	PNEC soil
PNEC value:	0.01 mg/kg soil dw
Assessment factor:	100
Extrapolation method:	assessment factor

Hazard for predators

Secondary poisoning

Hazard assessment conclusion:	no potential for bioaccumulation

Additional information

CAS# 297730-93-9:

Using available aquatic toxicity data, the PNECs were calculated to be 0.01 mg/L for Freshwater and 0.001 mg/L for Marine Water. For the Freshwater and Marine water PNECs, only one test result was available; a 96-hour acute toxicity study with Oryzias latipes. A conservative assessment factor was applied to the results of this study of 1000 for Freshwater and 10000 for Marine Water. For the STP PNEC, a NOEC was available for activated sludge respiration inhibition. An assessment factor of 10 was applied to the NOEC to derive a PNEC for STP of 10 mg/L. No test results were available for Sediment or Marine Sediment organisms; therefore the EPM method with the Freshwater and Marine PNECs was used to derive sediment PNECs. Koc was determined in a laboratory study to be 75800 L/kg. The log Kow is 6.0, indicating a further adjustment factor of 10. The PNECs for Sediment and Marine Sediment were calculated to be 7.6 mg/kg dw and 0.76 mg/kg dw, respectively. For Grassland and Agricultural soil, no testing results were available. The EPM method with the Freshwater PNEC was used to derive soil PNECs. Using the laboratory-derived Koc, the PNEC for Grassland and Agricultural soil was determined to be 0.89 mg/kg after adjustment. CAS# 297730-93-9 was found to be not readily biodegradable and the log Kow > 3.0. However, based on the log octanol-air partition coefficient (log Koa) of 1.72 and the lack of exposure to aquatic systems based on the low water solubility and high vapor pressure, bioaccumulation in the food chain is not expected. Therefore, the PNEC oral is not applicable. There is no intermittent release of CAS# 297730-93-9.

Trifluoroacetic acid (CAS# 76-05-1):

Using available aquatic toxicity data(1, 2) PNECs were calculated to be 0.0064 mg/L for freshwater and 0.00064 mg/L for marine water. Acute results were available for three taxonomic groups. For the calculation of the Freshwater PNEC a 72-hour ErC50 value of 6.4 mg/L was obtained from a study with Pseudokirchneriella subcapitata. Chronic studies were not conducted. Therefore, an AF of 1000 was applied to the algae ErC50, which is the lowest of the acute EC/LC50 values. One study was avaliable on toxicity to marine organisms. The marine diatom Phaeodactylum tricornutum 72-hr ErC50 was reported as > 97.5 mg TFA/L. The freshwater alga P. subcapitata was found to be more sensitive, therefore an additional factor of 10 was applied to the Freshwater PNEC to derive the Marine Water PNEC. For the STP PNEC, a NOEC of 10 mg/L was available for respiration inhibition in an aerobic soil microcosm study(3). An assessment factor of 10 was applied to the NOEC to derive a PNEC of 1.0 mg/L for STP. No test results for FW Sediment were available. PNEC was extrapolated using the equilibrium partitioning method (EPM) with the freshwater PNEC. PNECsed = (0.783 + (0.0217 x Koc)) x PNECfreshwater, where the Koc was 0.023 and the freshwater PNEC was 0.0064 mg/L. PNEC converted to dry weight: (PNEC mg/kg ww) x 4.6 = PNEC of 0.023 mg/kg dry wt. No test results for Marine Sediment were available. PNEC was extrapolated using the equilibrium partitioning method (EPM) with the marine PNEC. PNECmarinesed = (0.783 + (0.0217 x Koc)) x PNECmarinewater, where the Koc was 0.023 and the marine PNEC was 0.00064 mg/L. PNEC converted to dry weight: (PNEC mg/kg ww) x 4.6 = PNEC of 0.0023 mg/kg dry wt. No experimental data available for air. As this study is not a standard information requirement in REACH and there is no indication from the CSA on the need to investigate further the atmospheric compartment, no PNEC air was derived. Multiple studies of long-term toxicity to plants were available, but plants were the only trophic level evaluated (1). Therefore an application factor of 100 was applied to the most sensitive long-term study result (0.83 mg/kg dry weight in soil), to derive a PNECsoil of 0.0083 mg/kg. TFA is expected to remain in the soil water and not sorb to soil. Plants exposed hydroponically showed more sensitivity than those where soil was dosed. PNEC was also determined using the equilibrium partitioning method (EPM) and the freshwater PNEC: PNECsoil = (0.174 + (0.0104 x Koc)) x PNECwater, where the Koc was 0.023 and the freshwater PNEC was 0.0064 mg/L. This value was then converted to dry weight: (PNEC mg/kg ww) x 1.13 = PNEC of 0.0013 mg/kg dry weight. The PNEC derived using the equilibrium method was lower than that derived using application factors. Because this value was the lesser of the two and because TFA is expected to remain in the soil water, the PNEC derived with the EPM method, 0.0013 mg/kg dw, will be the definitive value. TFA is not readily biodegradable.

However, Bioconcentration was evaluated using TFA uptake data from several aquatic studies and terrestrial plant studies (1). BCF values ranged from 1.0 - 43. It is thought that uptake into terrestrial plants is in part due to translocation of dissolved TFA in the tissue water(1). None of these studies demonstrated that TFA would be considered bioaccumulative. In addition, the log Kow was reported to be -2.1. Therefore, bioaccumulation of TFA in terrestrial or aquatic organisms is not expected and secondary poisoning does not need to be considered further in this assessment.

(1)Boutonnet (Ed.), 1999. Environmental Risk Assessment of Trifluoroacetic Acid. Human and Ecological Risk Assessment: Vol. 5, No. 1, pp. 59-124.

(2) Mark L. Hanson, Keith R. Solomon. Haloacetic acids in the aquatic environment.Part I: macrophyte toxicity. Environmental Pollution 130 (2004) 371-383

(3) Benesch, J.A. et al., 2002. Investigation of effects of trifluoroacetate on vernal pool ecosystems. Environmental Toxicology and Chemistry, Vol. 21, No. 3, pp. 640-647.

Perfluorobutyric acid (CAS# 375-22-4):

Using available aquatic toxicity data, the freshwater PNEC was found to be 2.6 mg/L and the marine PNEC 0.26 mg/L. Acute results from testing perfluorobutyric acid were available for 12 species in at least three taxonomic groups and chronic for three species in two taxonomic groups. As per R.10, Table R.10-4 footnote (d): one can reduce the AF to 10 in cases where it is possible to determine with high probability that the most sensitive species has been examined, i.e. that a further long-term result (e.g. EC10 or NOEC) from a different taxonomic group would not be lower than the data already available. This is also appropriate because perfluorobutyric acid does not bioaccumulate (BCF reported as < 3 - 6 at the 0.02 mg/L exposure and < 28 at the 0.2 mg/L exposure in a BCF test with carp). P. subcapitata has an ErC50 nearly one order of magnitude lower than and a NOEC more than one order of magnitude lower than all other organisms tested, including the green alga C. vulgaris. This extreme sensitivity of P. subcapitata has been seen with other small chain pefluorinated acids (i.e. trifluoroacetic acid). An AF of 10 will be taken in this case due to the evidence from the large data set for this substance and the evidence for testing with trifluoroacetic acid. For the calculation of the Freshwater PNEC a 72-hour ErC10 value of 26 mg/L was obtained from a study with Pseudokirchneriella subcapitata. An AF of 10 was applied to this algae ErC10. There is no additional data available on marine taxonomic groups. An additional factor of 10 was applied to the Freshwater PNEC to derive the Marine Water PNEC. For the STP PNEC, a NOEC of 1000 mg/L was available for activated sludge respiration inhibition. An assessment factor of 10 was applied to the NOEC to derive a PNEC of 100 mg/L for STP. No test results for freshwater sediment were available. PNEC was extrapolated using the equilibrium partitioning method (EPM) with the freshwater PNEC. PNECsed = (0.783 + (0.0217 x Koc)) x PNECfreshwater, where the Koc was 1.0 L/kg and the freshwater PNEC was 2.6 mg/L. PNEC converted to dry weight: (PNEC mg/kg ww) x 4.6 = PNEC of 9.61 mg/kg dry wt. No test results for Marine Sediment were available. PNEC was extrapolated using the equilibrium partitioning method (EPM) with the marine PNEC. PNECmarinesed = (0.783 + (0.0217 x Koc)) x PNECmarinewater, where the Koc was 1.0 L/kg and the marine PNEC was 0.26 mg/L. PNEC converted to dry weight: (PNEC mg/kg ww) x 4.6 = PNEC of 0.961 mg/kg dry wt. No experimental data available on air. As this study is not a standard information requirement in REACH and there is no indication from the CSA on the need to investigate further the atmospheric compartment, no PNEC was derived. No test results for Soil were available. PNEC was extrapolated using the equilibrium partitioning method (EPM) including the freshwater PNEC, PNECsoil = (0.174 + (0.0104 x Koc)) x PNECwater, where the Koc was 1.0 L/kg and the freshwater PNEC was 2.6 mg/L. PNEC converted to dry weight: (PNEC mg/kg ww) x 1.13 = PNEC of 0.541 mg/kg dry weight. Although PFBA is not readily biodegradable, the bioconcentration factor was found to be < 28 in a laboratory study with fish. This substance is not considered bioaccumulative. Therefore, the PNEC oral is not applicable and was not derived.

Hydrogen fluoride (CAS# 7664-39-3):

Using available aquatic toxicity data (1) PNECs were calculated to be 0.4 mg/L for freshwater and 0.04 mg/L for marine water. Acute and chronic results were available for three taxonomic groups. For the calculation of the Freshwater PNEC a 21-day LC05 (equivalent to NOEC) of 4.0 mg/L was obtained from a study with Oncorhynchus mykiss. Therefore, an AF of 10 was applied to the fish NOEC, which is the lowest of the three long-term NOECs. Although there are acute data available for marine species, there are no chronic data and there is acute data available for only one additional taxa (mollusk). Therefore, the PNEC derived from the most sensitive chronic study conducted in freshwater is divided by 10 to derive the marine PNEC. For the STP PNEC, a NOEC of 510 mg/L was available for activated sludge respiration inhibition. An assessment factor of 10 was applied to the NOEC to derive a PNEC of 51 mg/L for STP. No test results for FW Sediment were available. PNEC was extrapolated using the equilibrium partitioning method (EPM) with the freshwater PNEC. PNECsed = (0.783 + (0.0217 x Koc)) x PNECfreshwater, where the Koc was 0.063 and the freshwater PNEC was 0.4 mg/L. PNEC converted to dry weight: (PNEC mg/kg ww) x 4.6 = PNEC of 1.44 mg/kg dry wt. No test results for Marine Sediment were available. PNEC was extrapolated using the equilibrium partitioning method (EPM) with the marine PNEC. PNECmarinesed = (0.783 + (0.0217 x Koc)) x PNECmarinewater, where the Koc was 0.063 and the marine PNEC was 0.04 mg/L. PNEC converted to dry weight: (PNEC mg/kg ww) x 4.6 = PNEC of 0.144 mg/kg dry wt. A large data set of fumigation studies with vegetation was evaluated. Data from studies with a 7-month exposure period were used to derive the PNECair. The lowest value calculated as protective of vegetation was 0.2 ug/m³. Because of the large data set and the long exposure period, no application factor was applied to this protective value to derive the PNEC of 0.2 ug/m³. A great number of soil studies were available. Data from the most sensitive endpoints from long-term studies from three trophic levels were evaluated. An application factor of 10 was applied to the most sensitive NOEC of 106 mg/kg for soil microbe NO3 mineralization. PNEC converted to dry weight: (PNEC mg/kg ww) x 1.13 = PNEC of 12 mg/kg dry weight. HF is an inorganic acid and thus not considered PBT by the REACh criteria. Because this substance is an inorganic acid, and because the Kow value indicates low bioconcentration potential, secondary poisoning is not relevant. Log Kow = -1.4.

(1) European Chemicals Bureau European Union Risk Assessment: Hydrogen Fluoride, 2001.

Conclusion on classification

CAS# 297730-93-9:

CLP: Aquatic acute: Not classified - conclusive although not sufficient for classification.

M-factor acute: N/A

Aquatic Chronic 4

M-factor chronic: N/A

Ozone Depletion: CAS# 297730-93-9 is not listed in the Montreal Protocol on Substances that Deplete the Ozone Layer. It does not contain reactive halogens (chlorine or bromine) that could play a role in ozone depletion. It is not hazardous to the ozone layer. Conclusive although not sufficient for classification.

Trifluoroacetic acid degradation product (CAS# 76-05-1):

CLP: Aquatic acute: Not classified - conclusive although not sufficient for classification.

M-factor acute: N/A

Aquatic Chronic 3

M-factor chronic: N/A

Ozone Depletion: Trifluoroacetic acid is not listed in the Montreal Protocol on Substances that Deplete the Ozone Layer. It does not contain reactive halogens (chlorine or bromine) that could play a role in ozone depletion. TFA is not hazardous to the ozone layer. Conclusive although not sufficient for classification.

Perfluorobutyric acid degradation product (CAS# 375-22-4):

CLP: Aquatic acute: Not classified - conclusive although not sufficient for classification.

M-factor: N/A

Aquatic chronic: Not classified - conclusive although not sufficient for classification.

M-factor: N/A

Ozone depletion: Perfluorobutyric acid is not listed in the Montreal Protocol on Substances that Deplete the Ozone Layer. It does not contain reactive halogens (chlorine or bromine) that could play a role in ozone depletion. HF is not hazardous to the ozone layer. Conclusive although not sufficient for classification.

Hydrogen fluoride degradation product (CAS# 7664-39-3):

CLP: Aquatic acute: Not classified - conclusive although not sufficient for classification.

M factor acute: N/A

Aquatic chronic: Not classified - conclusive although not sufficient for classification.

Ozone Depletion: HF is not listed in the Montreal Protocol on Substances that Deplete the Ozone Layer. It does not contain reactive halogens (chlorine or bromine) that could play a role in ozone depletion. HF is not hazardous to the ozone layer. Conclusive although not sufficient for classification.

REACH

3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl)-hexane

EC number: 435-790-1 | CAS number: 297730-93-9

Toxicological information

Toxicological Summary

Administrative data

Workers - Hazard via inhalation route

Systemic effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

DNEL related information

Local effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

DNEL related information

Workers - Hazard via dermal route

Systemic effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

DNEL related information

Local effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

Workers - Hazard for the eyes

Local effects

Hazard assessment conclusion: no hazard identified

Additional information - workers

General Population - Hazard via inhalation route

Systemic effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

DNEL related information

Local effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

DNEL related information

General Population - Hazard via dermal route

Systemic effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

DNEL related information

Local effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

General Population - Hazard via oral route

Systemic effects

Long term exposure

Hazard assessment conclusion: no hazard identified

Acute/short term exposure

Hazard assessment conclusion: no hazard identified

DNEL related information

General Population - Hazard for the eyes

Local effects

Hazard assessment conclusion:	no hazard identified

Additional information - General Population