1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifiers

Commercial Product Name:	**Dinitrogen tetraoxide**
Substance name:	**Dinitrogen tetraoxide**
Chemical Formula:	N2O4
CAS-No.:	10544-72-6
Index-No.:	007-002-00-0
EC-No.:	234-126-4
REACH Registration Number:	01-2119957842-0001
Other means of identification:	Dinitrogen tetroxide, NTO

1.2 Use of the Substance/Mixture

Oxidising agent for chemical processes.

1.2 Identified uses

Additional information to identified uses see: www.skwp.de.

1.3 Details of the supplier of the safety data sheet

SKW Stickstoffwerke Piesteritz GmbH
Möllensdorfer Str. 13
06886 Lutherstadt Wittenberg, Deutschland

Telephone: +49 3491 68 0
Telefax: +49 3491 68 4300

E-mail address: SDB@skwp.de

1.4 Emergency telephone number

SKW: +49 3491 68 2202

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

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

Hazard class / Hazard category	Hazard statements
Press. Gas	H280
Ox. Gas 1	H270
Acute Tox. 1	H330
Skin Corr. 1B	H314
Eye Dam. 1	H318
Muta. 1B	H340
	EUH071

2.2 Label elements

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

Product identifier: Dinitrogen tetraoxide
Index-No.: 007-002-00-0
EINECS-No.: 234-126-4

Hazardous components which must be listed on the label:

- Nitrogen tetraoxide

Hazard pictograms:

GHS03 GHS04 GHS06 GHS05 GHS08

Signal word: Danger

Hazard statements:

H270	May cause or intensify fire; oxidizer.
H280	Contains gas under pressure; may explode if heated.
H330	Fatal if inhaled.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H340	May cause genetic defects if inhaled.
EUH071	Corrosive to the respiratory tract.

Precautionary statements:

P220	Keep/ Store away from clothing/ combustible materials.
P244	Keep reduction valves free from grease and oil.
P260	Do not breathe gas.
P264	Wash hands thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	Wear respiratory protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/ doctor.
P320	Specific treatment is urgent (see supplemental first aid instructions on this label).
P321	Specific treatment (see supplemental first aid instructions on this label).
P363	Wash contaminated clothing before reuse.
P370 + P376	In case of fire: Stop leak if safe to do so.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved incineration plant.

2.3 Other hazards

Thise substance does not meet the PBT-/vPvB criteria of REACH, annex XIII

Adverse physicochemical effects:
Contact with combustible material may cause fire.

Adverse human health effects and symptoms:
Fatal if inhaled. Causes severe skin burns and eye damage.

Potential environmental effects:
Slightly hazardous to water.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substance related information

Chemical identity:	Dinitrogen tetraoxide
Index-No.:	007-002-00-0
EC-No.:	234-126-4
REACH Registration Number:	01-2119957842-0001
CAS-No.:	10544-72-6
Purity:	> 98,5 %
Synonyms:	Dinitrogen tetroxide
Molecular formula:	N2O4

Additional advice:

Self classification. On basis of test data.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General Information: Move out of dangerous area. First aider needs to protect himself. Take off all contaminated clothing immediately. Call a physician immediately. Move victims to fresh air and do not leave them without supervision.

If inhaled: Keep patient warm and at rest. Call a physician immediately. Move victims to fresh air and do not leave them without supervision. Early administration of cortisone spray.

In case of skin contact: Wash off immediately with plenty of water. Immediate medical treatment is necessary as untreated wounds from corrosion of the skin heal slowly and with difficulty. Rinse with a multi-purpose solution containing an adsorbant for corrosive substances, which will stop the leak from spreading and reduce the risk of subsequent damage.

In case of eye contact: In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Rinse with a multi-purpose solution containing an adsorbant for corrosive substances, which will stop the leak from spreading and reduce the risk of subsequent damage.

4.2 Most important symptoms and effects, both acute and delayed

Causes severe skin burns and eye damage. Symptoms of poisoning may not appear for several hours. Keep under medical supervision for at least 48 hours.

4.3 Indication of any immediate medical attention and special treatment needed

Symptoms:
Shortness of breath. Aspiration may cause pulmonary oedema and pneumonitis. Drowsiness.

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media: Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2. Special hazards arising from the substance or mixture

May accelerate the burning of other combustible materials (wood, cotton, straw, ...). Toxic gases are released (NOx). On contact with ordinary metals (steel, galvanized, aluminum) corrosion may occur and generate highly flammable hydrogen gas. May explode in contact with a powerful reducing agent.

5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus. Chemical protection clothing.

Additional advice:

The product itself does not burn. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Do not direct water spray onto the leak. Cool containers/tanks with water spray. Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. In case of exposure to vapour, wear respiratory protection.

6.2 Environmental precautions

Suppress (knock down) gases/vapours/mists with a water spray jet. Retain and dispose of contaminated wash water. Do not let enter drains/ surface water/ ground water.

6.3 Methods and materials for containment and cleaning up

Put into suitable containers and take for recycling or disposal. Use respiratory protection during cleaning up.

6.4 Reference to other sections

none

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Fire prevention measures: The product is not flammable. Supports combustion in combination with readily combustible substances.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers: Acid resisting floor. Keep containers tightly closed in a cool, well-ventilated place. Keep away from heat. Provide (catchment area) containment bund without drain. Only use containers specifically approved for this substance. Heating causes high pressure and bursting hazard. Keep and store locked up, with access only for competent personnel.

7.3 Specific end use(s)

none

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Exposure limit(s):

Components	CAS-No.	Control parameters	Ceiling Limit Value		Update	Basis
Nitrogen dioxide	10102-44-0	0,2 ml/m3		AGW	2008	

DNEL - Workers:	
inhalative, Long term, Systemic effects	0,17 mg/m3

8.2 Exposure controls

Personal protective equipment:

Eye/face protection: Goggles. Ensure that the type of material and the quality of the body protective equipment correspond with the recommendations of the producer for your particular type of work.

Hand protection: Protective gloves for chemicals Ensure that the type of material and the quality of the body protective equipment correspond with the recommendations of the producer for your particular type of work. Follow EN 374.

Skin and body protection: Chemical protection clothing. Ensure that the type of material and the quality of the body protective equipment correspond with the recommendations of the producer for your particular type of work.

Hygiene measures: When using do not eat, drink or smoke.

Respiratory protection: In case of insufficient ventilation, wear suitable respiratory equipment. Self-contained breathing apparatus (EN 133). For a short time, respirator with filter, special gas filter ABEK.

General protective measures:

Avoid contact with eyes. Avoid contact with skin. Do not breathe gases / vapours.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Physical state	gas, liquid	
Colour	red brown	
Odour	sweet	
pH	< 1	
Melting point/range	-9,3 °C	Pressure: 1013 hPa
Boiling point/boiling range	21,15 °C	Pressure: 1013 hPa
Flash point		Not applicable, Inorganic gas
Vapour pressure (20 °C)	1000 hPa	
Vapour pressure (50 °C)	3400 hPa	
Vapour density (Air = 1.0)	4,052	Temperature: 20 °C
Water solubility		Degradation to HNO3

Auto-flammability	558 °C	Pressure: 1.013 hPa

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available.

10.2. Chemical stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

In some cases, very vigorous reaction with bases as well with several classes of organic substances such as alcohols and amines. With combustible substances. With fats and oils. Corrodes copper and brass.

10.4. Conditions to avoid

Because of the high vapour pressure the containers can burst with increased temperature.

10.5. Incompatible materials to avoid

alkalines, Strong reducing agents

10.6 Hazardous decomposition products

Nitrous gases.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute oral toxicity: Substance is a gas. This substance is rated caustic to the skin. No data available.

Acute inhalation toxicity:

Test substance:	Nitrogen dioxide
Dose LC50:	315 mg/l
Exposure time:	15 min
Species:	Rabbit

Test substance:	Nitrogen dioxide
Dose LC50:	28 mg/l
Exposure time:	60 min
Species:	Rat

Acute dermal toxicity: Substance is a gas. This substance is rated caustic to the skin. No data available.

Skin irritation: This substance is rated caustic to the skin.

Eye irritation: No data available.

Sensitisation: This substance is rated caustic to the skin. No data available.

Genotoxicity in vitro: No data available.

Mutagenicity: No data available.

Carcinogenicity: No data available.

Repeated dose toxicity:

Application Route:	Inhalation
Test substance:	Nitrogen dioxide
NOAEL:	2,15 mg/kg
Species:	Rat
Exposure time:	90 Days

Reproductive toxicity: No data available.

Teratogenicity: No data available.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish:

Median lethal pH value:	3 - 3,5
Species:	Lepomis macrochirus (Bluegill sunfish)
Exposure time:	96 h

Relative to HNO3.

Median lethal pH value: 3,7
Species: Oncorhynchus mykiss (rainbow trout)
Exposure time: 96 h
Relative to HNO3.

Toxicity to daphnia and other aquatic invertebrates:
Species: Ceriodaphnia dubia (Water flea)
Exposure time: 48 h
Median lethal pH value: 4,6

Toxicity to algae: No data available.

Toxicity to microorganisms: No data available.

Chronic toxicity to aquatic organisms: No data available

Toxicity to soil dwelling organisms: No data available.

Toxicity to terrestrial plants: No data available

General effects: Impairment of the pH value An increase in the nitrate concentrations has little effect only.

12.2 Elimination information (persistence and degradability)

Biological degradability: Not relevant to inorganic materials. On contact with water. Degradation to HNO3.

12.3 Bioaccumulative potential

Not relevant to inorganic materials.

12.4 Mobility in soil

No data available.

12.5 Results of PBT and vPvB assessment

Not relevant to inorganic materials.

12.6 Endocrine disrupting properties

No data available.

12.7 Other adverse effects

No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste from residues:

Return packages containing residues to the producer.

14. TRANSPORT INFORMATION

Land transport (ADR/RID/GGVSEB):

UN number:	**1067**
Proper technical name:	DINITROGEN TETROXIDE (NITROGEN DIOXIDE)
Class:	2
Hazard Identification Number:	265
Classification Code:	2TOC
Packing group	
Labels:	2.3 + 5.1 + 8
Tunnel restriction code:	(C/D)

Sea transport (IMDG-Code/GGVSee):

UN number:	**1067**
Proper technical name:	DINITROGEN TETROXIDE (NITROGEN DIOXIDE)
Class:	2.3
Packing group	
Labels:	2.3 + 5.1 + 8
Marine pollutant:	no
EmS:	F-C, S-W

15. REGULATORY INFORMATION

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

European Union:

Regulation:	1907/2006 (EU)
Regulation:	REGULATION (EC) No 1272/2008

National legislation (Germany):

Other regulations:
Occupational restrictions for pregnant and breast feeding women
TRG 280 "General requirements for pressurised gas containers, Working with pressurised gas containers"
TRGS 510 "Storage of hazardous substances in non-stationary containers"
Work restrictions for young people.

15.2 Chemical safety assessment:

A Chemical Safety Assessment has been carried out for this substance.

16. OTHER INFORMATION

Relevant R-, H- and EUH-phrases (Number and full text):

EUH071:	Corrosive to the respiratory tract.
H270:	May cause or intensify fire; oxidizer.
H280:	Contains gas under pressure; may explode if heated.
H314:	Causes severe skin burns and eye damage.
H318:	Causes serious eye damage.
H330:	Fatal if inhaled.
H340:	May cause genetic defects if inhaled.

Further information:

The data corresponds to our current knowledge and describes our product with regard to safety requirements. Therefore the data is not meant to warranty certain properties of the product. It is the responsibility of the receiver of our product to comply with current legislation and regulations.

17. Annex to extended Safety Data Sheet (eSDS):

Downstream user Exposure Scenario for Dinitrogen tetraoxide

Overview of uses and Exposure Scenarios

Table 1. Overview of exposure scenarios and contributing scenarios

Identifiers	Market Sector	Titles of exposure scenarios and the related contributing scenarios
ES1 - M1		Manufacture - Manufacture - Industrial Manufacture (ERC 1) - Industrial Manufacture: continuous synthesis of substance (PROC 1) - Industrial Manufacture: continuous synthesis of substance (PROC 2) - Industrial manufacture: bulk transfer and storage of substance (PROC 8b) - Industrial manufacture: laboratory analysis of substance (PROC 15)
ES2 - F1		Formulation - Formulation - Industrial use of substance to formulate chemical product mixtures Industrial distribution of substance (ERC 2) - Industrial use of substance to formulate chemical product mixtures (PROC 1) - Industrial use of substance to formulate chemical product mixtures (PROC 3) - Industrial distribution of substance (PROC 8a) - Industrial use of substance to formulate chemical product mixtures (PROC 8b) - Industrial use of substance to formulate chemical product mixtures (PROC 9) - Industrial use of substance to formulate chemical product mixtures (PROC 15)
ES3 - IW1		Use at industrial site - Industrial use of substance, as such or in a mixture, for surface/article treatment (e.g. electronics/semiconductors) - Industrial use of substance, as such or in a mixture, for surface/article treatment (e.g. electronics/semiconductors) (ERC 6b) - Industrial use of substance, as such or in a mixture, for surface/article treatment (e.g. electronics/semiconductors) (PROC 1) - Industrial use of substance, as such or in a mixture, for surface/article treatment (e.g. electronics/semiconductors) (PROC 3) - Industrial use of substance, as such or in a mixture, for surface/article treatment (e.g. electronics/semiconductors) (PROC 8b) - Industrial use of substance, as such or in a mixture, for surface/article treatment (e.g. electronics/semiconductors) (PROC 9) - Industrial use of substance, as such or in a mixture, for surface/article treatment (e.g. electronics/semiconductors) (PROC 15)
ES4 - IW2		Use at industrial site - Industrial use of the Substance as intermediate - Industrial use of the Substance as intermediate (ERC 6a) - Industrial use of the Substance as intermediate (PROC 1) - Industrial use of the Substance as intermediate (PROC 2) - Industrial use of the Substance as intermediate (PROC 3) - Industrial use of the Substance as intermediate (PROC 15)
ES5 - IW3		Use at industrial site - Industrial use as a laboratory/research chemical (a) - Industrial use as a laboratory/research chemical (ERC 4) - Industrial use of the Substance as intermediate (PROC 15)
ES6 - IW4		Use at industrial site - Industrial use as a laboratory/research chemical (b) - Industrial use as a laboratory/research chemical (ERC 6b) - Industrial use as a laboratory/research chemical (PROC 15)
ES7 - IW5		Use at industrial site - Industrial use of the substance as propellant - Industrial use of the substance as propellant (ERC 6b) - Industrial use of the substance as propellant (PROC 3) - Industrial use of the substance as propellant (PROC 8b) - Industrial use of the substance as propellant (PROC 9) - Industrial use of the substance as propellant (PROC 16)
ES8 - PW1		Use by professional worker - Professional use as a laboratory/research chemical (a)

Identifiers	Market Sector	Titles of exposure scenarios and the related contributing scenarios
		- Professional use as a laboratory/research chemical (ERC 8a) - Professional use as a laboratory/research chemical (PROC 3) - Professional use as a laboratory/research chemical (PROC 15)
ES9 - PW2		Use by professional worker - Professional use as a laboratory/research chemical (b) - Professional use as a laboratory/research chemical (ERC 8d) - Professional use as a laboratory/research chemical (PROC 3) - Professional use as a laboratory/research chemical (PROC 15)
Manufacture: M-#, Formulation: F-#, Industrial end use at site: IW-#, Professional end use: PW-#, Consumer end use: C-#, Service life (by workers in industrial site): SL-IW-#, Service life (by professional workers): SL-PW-#, Service life (by consumers): SL-C-#.)		

Environment

Scope and type of assessment

The scope of exposure assessment and type of risk characterization required for the environment are described in the following table based on the hazard conclusions presented in section 7.

Table 2. Type of risk characterization required for the environment

Protection target	Type of risk characterization	Hazard conclusion (see section 7)
Freshwater	Not needed	No hazard identified
Sediment (freshwater)	Qualitative testing proposal	No or insufficient data available at present
Marine water	Not needed	No hazard identified
Sediment (marine water)	Qualitative testing proposal	No or insufficient data available at present
Sewage treatment plant	Qualitative	No emission to STP expected
Air	Not needed	No hazard identified
Agricultural soil	Qualitative	No exposure of soil expected
Predator	Qualitative testing proposal	No or insufficient data available at present

Man via environment

Scope and type of assessment

The scope of exposure assessment and type of risk characterization required for man via the environment are described in the following table based on the hazard conclusions reported and justified in section 5.11.

Table 3. Type of risk characterization required for man via the environment

Route of exposure and type of effects	Type of risk characterization	Hazard conclusion (see section 5.11)
Inhalation: Systemic Long Term	Not needed	No hazard identified
Oral: Systemic Long Term	Not needed	No hazard identified

Workers

Scope and type of assessment

The scope of exposure assessment and type of risk characterization required for workers are described in the following table based on the hazard conclusions presented in section 5.11.

Table 4. Type of risk characterization required for workers

Route	Type of effect	Type of risk characterization	Hazard conclusion (see section 5.11)
Inhalation	Systemic Long Term	Quantitative	DNEL (Derived No Effect Level) = 0.17 mg/m³
	Systemic Acute	An acute toxicity DNEL has not been derived as there is no potential for high peak exposure.	Not applicable
	Local Long Term	Qualitative	High hazard (no threshold derived). The substance is considered to be corrosive; hence there will be local effects. However, it is not possible to determine a threshold from the available data.
	Local Acute	Qualitative	High hazard (no threshold derived). The substance is considered to be corrosive; hence there will be local effects. However, it is not possible to determine a threshold from the available data.
Dermal	Systemic Long Term	Not needed	No hazard identified
	Systemic Acute	Not needed	No hazard identified
	Local Long Term	Not needed	No hazard identified
	Local Long Acute	Not needed	No hazard identified
Eye	Local	Qualitative	High hazard (no threshold derived)

Consumers

Exposure assessment is not applicable as there are no consumer-related uses for the substance.

Environmental contributing scenario

Conditions of use

Not defined.

Releases

The local releases to the environment are reported in the following table.

Tabelle 5 Lokale Freisetzungen in die Umwelt

			ES-Identifikator								
Release	**Release factor estimation method**	**Explanation / Justification**	ES1 - M1	ES2 - F1	ES3 - IW1	ES4 - IW2	ES5 - IW3	ES6 - IW4	ES7 - IW5	ES8 - PW1	ES9 - PW2
Water	Measured release	**Initial release factor:** (%):		2	5	2				100	100
		Final release factor: (%):	0,003	2	5	2	0,07	0,07	0,019	100	100
		Local release rate: (kg/day):	0,808	60	500	250	0,035	0,035	0,24	5,5E-4	5,5E-4
Air	Measured release	**Initial release factor:** (%):		2,5	0,1	5				100	100

			ES-Identifikator								
Release	**Release factor estimation method**	**Explanation / Justification**	ES1 - M1	ES2 - F1	ES3 - IW1	ES4 - IW2	ES5 - IW3	ES6 - IW4	ES7 - IW5	ES8 - PW1	ES9 - PW2
		Final release factor: (%):	0,007	2,5	0,1	5	0,354	0,354	0,002	100	100
		Local release rate: (kg/day):	1,77	75	10	625	0,177	0,177	0,025		
Soil	ERC based	**Final release factor: (**%)	0.01	0,01	0,025	0,1	5	0,025	0,025	0	20

Please note that the values given in the table above are generated based on default values from CHESAR and are very much worst case. In reality there will be no release to the soil or water compartment based upon the physical state of the substance (gas) and the manufacturing processes. There may be minimal release to the air compartment, but due to the properties of the substance and the fact that the manufacturing process is a closed process this is expected to be minimal and certainly much lower than the figures provided in the above table. Monitoring data will be provided as soon as it becomes available.

Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterization ratios (RCR) are reported in the following table.

Table 6. Exposure concentrations and risks for the environment

Protection target	Exposure concentration	Risk characterization
Sediment (freshwater)	Direct or indirect exposure to the sediment (freshwater) compartment is unlikely as the substance is a gas.	The substance is not classified for the environment; hence RCR values have not been determined.
Sediment (marine water)	Direct or indirect exposure to the sediment (marine water) compartment is unlikely as the substance is a gas.	The substance is not classified for the environment; hence RCR values have not been determined.
Sewage treatment plant	Direct or indirect exposure to the sewage treatment plant is unlikely as the substance is a gas.	The substance is not classified for the environment; hence RCR values have not been determined.
Air		
Agricultural soil	Direct or indirect exposure to the agricultural soil compartment is unlikely as the substance is a gas.	The substance is not classified for the environment; hence RCR values have not been determined.
Predator (terrestrial)	Direct or indirect exposure to the terrestrial compartment is unlikely as the substance is a gas.	The substance is not classified for the environment; hence RCR values have not been determined.

Conclusion on risk characterization
In addition to the fact that the substance is not classified for the environment, direct or indirect exposure to the aquatic, including STP, sediment or soil compartments is unlikely as the substance is a gas.

Worker contributing scenario for all PROCs according to overview

Conditions of use (contributing scenario)

Not defined.

Exposure and risks for workers

The exposure concentrations and risk characterization ratios (RCR) are reported in the following table.

Table 7. Exposure concentrations and risks for worker

Route of exposure and type of effects	Exposure concentration	Risk characterization
Inhalation, systemic, long-term	Using the Ease Model for a gas with a high tendancy to become airborne and the following parameters: Determination of pattern of control: Full containment Determination of pattern of use: Full containment with a breached system, but assuming that this is done via dedicated sampling/filling lines with full containment The exposure is determined to be 0-0.1 ppm. **0.1 ppm (0.203 mg/m^3) will be used as a worst case.**	1.194
Inhalation, systemic, acute	An acute toxicity DNEL has not been derived as there is no potential for high peak exposure.	Not applicable
Inhalation, local, long-term	Qualitative	High hazard (no threshold derived). The substance is considered to be corrosive; hence there will be local effects. However, it is not possible to determine a threshold from the available data.
Inhalation, local, acute	Qualitative	High hazard (no threshold derived). The substance is considered to be corrosive; hence there will be local effects. However, it is not possible to determine a threshold from the available data.
Eye, local	Qualitative	High hazard (no threshold derived). The substance is considered to be corrosive.

Conclusion on risk characterization

The RCR value for long-term systemic inhalation exposure is 1.194, which indicates that risk management measures are required. However, this value is very much a ‘worst case’ as the substance is manufactured using closed systems, with no release expected during normal processes. Furthermore, the control parameters, exposure controls and individual protection measures detailed below should be used as a minimum. These measures will significantly reduce any potential for systemic exposure.

A RCR value has not been determine for the acute systemic inhalation exposure as there is no potential for high peak exposure.

The local exposure, including long-term inhalation, acute inhalation and eye exposure, is not considered to be of concern as the substance is manufactured using closed systems, with no release expected during normal processes. Furthermore, the control parameters, exposure controls and individual protection measures detailed below should be used as a minimum. These measures will significantly reduce any potential for local exposure.

Control parameters

Occupational exposure limits: No exposure limit value known. However, DNELs were derived for this substance and can be regarded as a Control Parameter (OEL).

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

Exposure controls

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

Hygiene measures : A washing facility or water for eye and skin cleaning purposes should be present. Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead. Tightly-fitting goggles CEN: EN136 face shield.

Skin protection:

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. > 8 h hours (breakthrough time) : Protective gloves should be worn under normal conditions of use, neoprene and viton, CEN: EN374.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator or respiratory mask with acid gas filter type E complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable level.