1 SECTION 1: IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE COMPANY/FIRM

1.1 Product identifier

- Substance name	HYDROGEN FLUORIDE
- Synonyms	HYDROFLUORIC ACID
- Formula	HF
- CAS Number	7664-39-3
- CE Number	7664-39-3
- Index number	009-002-00-6
- Registration number	01-2119458860-33-0030

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

Uses of the Substance/Mixture

Common uses	industrial uses, catalyst
Uses identified in the chemical safety report	generic list of applications
Formulation or repackaging	formulation and (re)packaging of substances and mixtures
Use at industrial sites	industrial uses, catalyst use in construction, use as an intermediate, use as a catalyst in alkylation reactions, mining, enrichment, purification of minerals and metals, passivation of metal surfaces, industrial cleaning of drums and pipes, semiconductor in the electronics and solar industry
Professional use	laboratory use
Consumer	none foreseen

Uses advised against:
The relevant uses are listed above. Other uses are not recommended unless an assessment has been carried out prior to the commencement of such use, demonstrating that the risks associated with such use are controlled.

See Annex for the full list of uses for which an exposure scenario is provided.

1.3 Information on the supplier of the safety data sheet

Company

FLUORSID ALKEEMIA SPA
VIA DELLA CHIMICA, 5
30175, PORTO MARGHERA
VENEZIA, ITALY
Tel.: +39 041 5096998
Fax: +39 041 5096840

E-mail address of the competent technician

msds@alkeemia.com

1.4 Emergency telephone number

Poison control centres: Telephone consultation active 24/24 hours Telephone consultation active 24/24 hours: Ospedale Niguarda Milan Tel: 02 66101029, CAV Pavia: Tel. 0382/24444, CAV Bergamo: Tel: 800 883300, CAV Foggia: Tel 0881-732326, CAV Florence: Tel 055-7947819, CAV Policlinico Umberto I Rome: Tel 06-490663, CAV Policlinico "A.Gemelli": Tel 06-3054343, CAV Cardarelli Naples: Tel: 081-5453333/7472870

2 SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Acute Toxicity 2	H300
Acute Toxicity 2	H330
Acute Toxicity 2	H310
Skin corrosion 1A	H314

Section 16 contains the full text of all H hazard statements.

2.2 Label elements

Regulation (EC) No. 1272/2008

Hazardous products that must be listed on the label

- INDEX No. 009-002-00-6 hydrogen fluoride

Pictogram

Warning
-Hazard

Hazard indications

H300	Fatal if swallowed
H310	Fatal in contact with skin
H330	Fatal if inhaled
H314	Causes severe skin burns and eye damage

Cautionary advice

Prevention

P260	Do not breathe dust/fumes/gas/mist/vapours/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection

Reaction

P301 + P310	IF SWALLOWED: Contact a POISON CENTRE / a doctor immediately
P330	Rinse mouth
P303 + P361 + P353	IN CASE OF CONTACT WITH THE SKIN (or hair): remove all contaminated clothing immediately. Rinse the skin/take a shower
P304 + P340	IF INHALED: Take the victim into the fresh air and keep him or her at rest in a position conducive to breathing.
P305 + P351 + P338	IN CASE OF CONTACT WITH THE EYES: rinse thoroughly for several minutes. Remove any contact lenses if it is easy to do so. Continue to rinse. Contact a POISON CENTRE / a doctor immediately
P361 + P364	Remove all contaminated clothing immediately and wash before wearing again

Storage

P403 + P233	Store in a well ventilated place. Keep container tightly closed.

Disposal

P501	Dispose of contents/container in accordance with Legislative Decree 152/06 as amended.

2.3 Other hazards that do not require classification

- Risk of bone or dental fluorosis

Results of PBT and vPvB assessment

- Not applicable (inorganic substance)

3 SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substance

Information on Components and Impurities.

Chemical Name	Identification number	Concentration [%]
Hydrogen fluoride	INDEX No.: 009-002-00-6 CAS No.: 7664-39-3 EINECS No.: 231-634-8 Registration number: 01-2119458860-33-0030	>= 99 - <= 100

3.1 Mixture

- Not applicable, the product is not a substance.

4 SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

General information

- Exposures to hydrofluoric acid are typical. Serious life-threatening effects may occur immediately or within 24 hours after exposure.
- Before providing first aid or medical treatment, always decontaminate the victims of exposure.
- First-aiders should wear personal protective equipment when assisting and decontaminating victims.
- First-aiders should wear gloves before touching exposed areas or applying calcium gluconate gel to victims.
- In case of splashes on eyes and face, treat the eyes first.
- In case of exposure to hydrofluoric acid, always consult a doctor.

If inhaled

- Take the injured or exposed person out into the fresh air.
  Consult a doctor immediately.
- Administer oxygen via mask at a rate of 12 litres per minute.
- Spray a 2.5% calcium gluconate solution for at least 15-20 minutes or until the exposed person is seen by a doctor.
- If calcium gluconate is not available, administer oxygen as described above until the victim is seen by a doctor.
- If breathing assistance is needed, use indirect methods such as resuscitation masks or self-expanding balloons. Do not perform mouth-to-mouth breathing.
- In case of exposure to hydrofluoric acid vapour, signs of exposure on skin and eyes are likely. Follow decontamination and first aid procedures for skin and eye exposure.
- If necessary, maintain support for vital functions.

In case of contact with the skin

- In case of skin exposure to hydrofluoric acid, go to the nearest water source or emergency shower. Turn on the water.
- During rinsing, remove all clothing, shoes and accessories.
- Finally, while keeping your eyes closed and facing the water jet, remove your goggles or respirator.
- Wear hydrofluoric acid resistant gloves when touching contaminated skin.
- Wash exposed parts for a maximum of 5 minutes if first aid treatment is immediately available. Otherwise, continue rinsing until emergency treatment becomes available.
- Apply 2.5% calcium gluconate gel immediately and massage on the affected area. Continue to massage and apply the gel for at least 15 minutes after pain relief.
- In case of contact with fingers or nails, even in the absence of pain, dip them in a 2.5% calcium gluconate bath for 15-20 minutes.
- Consult a doctor as soon as possible. During transport to a medical facility or while waiting for the victim to be examined by a doctor, it is extremely important to continue to massage the calcium gluconate gel.
- If necessary, maintain support for vital functions.

In case of contact with the eyes

- Decontamination: Go to the nearest clean water source and turn on the water. Ask a trained person to remove contact lenses if present (contact lenses should be prohibited), place eyes under the water jet and keep the eyelids open during rinsing.
- After rinsing, flush the eyes with a 1% calcium gluconate solution through a nasal cannula applied to the nasal bridge. Dispense 1000 cc of calcium gluconate solution in a continuous stream for at least 15 minutes, or if necessary until medical assistance is available.

- During transport to a medical facility or while waiting for the victim to be examined by a doctor, it is extremely important to continue to irrigate with calcium gluconate.
- Try to get a specialist medical examination and treatment as soon as possible.
- If necessary, maintain support for vital functions.

If swallowed

- If hydrofluoric acid is swallowed, the victim must immediately be transported to a medical facility. - DO NOT induce vomiting.
- If the injured or exposed person is able, rinse the mouth with calcium solution without swallowing.
- If necessary, maintain support for vital functions.

4.2 Main symptoms and effects, both acute and delayed

In case of contact with the skin

Symptoms

- Causes severe burns.
- Metabolic imbalances
- Potentially fatal cardiac arrhythmia

Effects

- HF penetrates very quickly into any epithelial tissue or organ with which it comes into contact and does not remain on the surface.
- Initially, the exposed parts will suffer possible local damage; the effects of exposure to HA may be more extensive and affect deeper tissues and may cause the following significant complications:
- In case of lower concentrations, symptoms may be delayed and may appear even 48 hours after exposure.
- It is completely absorbed into the body where it causes acute and severe toxic systemic effects, mainly due to rapid development of hypomagnesaemia and serum hypocalcaemia and enzyme blockage.

In case of contact with the eyes

Symptoms

- Causes severe burns.
- Blindness

Effects

- HF penetrates very quickly into any tissue with which it comes into contact and does not remain on the surface.
- Initially, the substances will burn locally and then penetrate deeper tissue causing the following significant complications:
- In case of lower concentrations, symptoms may be delayed and may appear even 48 hours after exposure.
- It is completely absorbed into the body where it causes acute and severe toxic systemic effects, mainly due to rapid development of hypomagnesaemia and serum hypocalcaemia and enzyme blockage.

If inhaled

Symptoms

- Causes severe burns.
- metabolic imbalances
- pulmonary oedema
- Potentially fatal cardiac arrhythmia

Effects

- Initially, the substances will burn locally and then penetrate deeper tissue causing the following significant complications:
- In case of lower concentrations, symptoms may be delayed and may appear even 48 hours after exposure.
- It is completely absorbed into the body where it causes acute and severe toxic systemic effects, mainly due to rapid development of hypomagnesaemia and serum hypocalcaemia and enzyme blockage.

If swallowed

Effects

- In case of lower concentrations, symptoms may be delayed and may appear even 48 hours after exposure.
- It is completely absorbed into the body where it causes acute and severe toxic systemic effects, mainly due to rapid development of hypomagnesaemia and serum hypocalcaemia and enzyme blockage.

4.2 Indication of any immediate medical attention and special treatment needed

- Consult a doctor immediately in case of exposure

5 SECTION 5: FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

- Use extinguishing systems compatible with the local situation and with the surrounding environment.

Unsuitable extinguishing media

- Water may be ineffective.

5.2 Special hazards arising from the substance or mixture The product is not flammable

- Not combustible.
- Dangerous decomposition products in case of fire.
- Releases hydrogen in reaction with metals.
- Reacts violently with water.

5.3 Recommendations for firefighters

Special protective equipment for firefighters

- Wear self-contained breathing apparatus and protective clothing.
- Wear specific PPE for HF
- Special activities for the protection of firefighters
- Use water jets in case of fire.
- Keep the product and empty containers away from heat and ignition sources.
- Cool containers/tanks with water spray.
- Avoid any possible contact with water.
- Approach the danger, keeping upwind

Further information

- Eliminate gas/vapour/mist with water jets.
- Cool containers/tanks with water spray.
- Avoid any possible contact with water.
  Approach the danger, keeping upwind

6 SECTION 6: MEASURES IN CASE OF ACCIDENTAL RELEASE

6.1 Personal precautions, protective equipment and emergency procedures

Advice for personnel not assigned to emergency situations

- Remove personnel to safe areas immediately.
- Keep people away from the leak, upwind.

Advice for personnel assigned to emergency situations

- Wear self-contained breathing apparatus and protective clothing.
- Eliminate gas/vapour/mist with water jets.
- Avoid watering the place where the leak occurred.
- Air the premises.
- Avoid additional spills or leaks, if this can be done without danger. - Keep away from incompatible products
- Vapours are heavier than air and can cause suffocation by reducing the oxygen available for breathing.

6.2 Environmental precautions

- It must not be abandoned in the environment.
- In case of pollution of rivers, lakes or sewers, inform the competent authorities in accordance with local laws.
- Do not dump the product in sewers.

6.3 Methods and materials for containment and reclamation

- Do not dump the product in sewers.
- During the dilution process, always add the product to the water, never add water to the product.
- Neutralize with limewater or soda and rinse with plenty of water.
- Store in suitable closed containers for disposal.
- Contact with water develops heat and presents a risk of projections

6.4 References to other sections

- Refer to the protective measures listed in sections 7 and 8.

7 SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

- Use only in a well-ventilated place.
- Use in a closed system
- Use only clean and dry tools.
- Store away from water.
- Preferably, transfer by pump or gravity.
- Avoid inhaling, swallowing and contact with skin and eyes.
- Keep away from incompatible products

Hygiene measures

- Ensure that eye washers and emergency showers are close to the workstation. - Remove contaminated clothing and shoes immediately.
- Wash contaminated clothing before reuse.
- Avoid contact with skin
- Wash hands before breaks and at the end of the working day.
- Handle in accordance with good industrial hygiene and safety practices.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/storage methods

- Keep the container tightly closed.
- Keep in a cool, well-ventilated place.
- Keep away from heat.
- Store in an area with a containment basin.
- Electrical equipment must be adequately protected in accordance with the appropriate standards.
- Keep in properly labelled containers.
- Close carefully and store in a cool, dry, well-ventilated place.
- Keep away from incompatible products

Packaging material

Suitable materials
- Carbon steel

Unsuitable materials
- glass

7.3 Particular end uses

- For further information, please contact your supplier

8 SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

8.1 Control parameters

Components with occupational exposure limits in the workplace

Components	Type of value	Value	Base
hydrogen fluoride	TWA	1.8 ppm 1.5 mg/m3	Indicative limit values for occupational exposure to chemical agents
	STEL	3 ppm 2.5 mg/m3	Indicative limit values for occupational exposure to chemical agents

hydrogen fluoride	TWA	1.8 ppm 1.5 mg/m3	Commission Directive 2000/39/EC establishing a first list of indicative limit values
hydrogen fluoride	STEL	3 ppm 2.5 mg/m3	Commission Directive 2000/39/EC establishing a first list of indicative limit values
hydrogen fluoride	TWA 0.5 ppm Danger of skin absorption Type of nomenclature: Fluoride		USA. ACGIH threshold limit values (TLV)
hydrogen fluoride	C 2 ppm Danger of skin absorption Type of nomenclature: Fluoride		USA. ACGIH threshold limit values (TLV)

Biological Exposure Indicators (BEI):

Components	Type of value	Value	Base
hydrogen fluoride	MAK	2 mg/l Fluoride Urine Before the shift (16 hours after termination of exposure)	ACGIH - Biological Exposure Indicators (BEI)
	MAK	3 mg/l Fluoride Urine At end of shift (as soon as possible after termination of exposure)	ACGIH - Biological Exposure Indicators (BEI)

Derived no effect level (DNEL) / Derived minimal effect level (DMEL)

Product name	Population	Exposure route	Potential health consequences	Exposure time	Value	Remarks
hydrogen fluoride	Workers	Inhalation	Systemic effects, Local effects	Acute	2.5 mg/m3	Registration dossier
	Workers	Inhalation	Systemic effects	Long-term	1.5 mg/m3	Registration dossier
	Workers	Inhalation	Local effects	Long-term	1.5 mg/m3	Registration dossier
	General population	Inhalation	Systemic effects	Acute	0.03 mg/m3	Registration dossier
	General population	Oral	Systemic effects	Acute	0.01 mg/kg	Registration dossier
	General population	Inhalation	Local effects	Acute	1.25 mg/m3	Registration dossier
	General population	Inhalation	Systemic effects	Long-term	0.03 mg/m3	Registration dossier
	General population	Oral	Systemic effects	Long-term	0.01 mg/kg	Registration dossier

	General population	Inhalation	Local effects	Long-term	1.25 mg/m3	Registration dossier

Predicted no effect concentration (PNEC)

Product name	Compartment	Value	Remarks
hydrogen fluoride	Fresh water	0.9 mg/l	CSR
	Sea water	0.9 mg/l	CSR
	Soil	11 mg/kg	CSR
	Sewage treatment plant	51 mg/l	CSR
	Sediments	0.766	CSR

- Minimize exposure to mists/vapours/aerosols. Before accessing the storage tanks and starting any kind of intervention in a confined space, check the atmosphere and verify the oxygen content.
- Monitoring procedures: refer to Legislative Decree 81/2008 as amended or to good industrial hygiene practices.

8.2 Exposure controls

8.3 Control measures

Suitable technical controls

- Provide adequate ventilation near machinery.
- Apply the necessary technical measures to avoid exceeding the occupational exposure limit values.
- Use only with sufficient ventilation and in closed systems.

Personal protection measures

Respiratory protection

- In case of dust or aerosol formation, use breathing apparatus with an approved filter.
- Breathing apparatus with full face mask
- Self-contained air breathing apparatus with face mask in case of significant or unknown fumes
- In case of decomposition (see section 10), face mask with combined filter type B-P3 (UNI EN 14387:2004)
- Self-contained breathing apparatus in the following cases: confined environment/ insufficient oxygen/ significant fumes/ where the face mask with filter does not offer adequate protection

Hand protection

- Gloves resistant to chemical agents and perfectly sealed, refer to UNI EN 374. Gloves must be inspected periodically and replaced in case of wear, perforation or contamination.
-
- Keep in mind the information given by the manufacturer regarding permeability, penetration times, and conditions at the workplace (mechanical stress, contact duration).
-

Suitable materials

- Fluoroelastomer, with a chemical protection index of at least 5 (permeation time > 240 minutes), thickness of at least 0.35 mm.

Eye protection

- Wear safety goggles suitable for chemical hazards. (EN 166)
- If there is a risk of splashing, wear: Protective visor

Skin and body protection

- Full protective clothing resistant to chemicals
- Boots
- Do not use leather shoes.
- Refer to UNI EN standard 14605:2005.

Hygiene measures

- Ensure that eye washers and emergency showers are close to the workstation.

- Remove contaminated clothing and shoes immediately.
- Wash contaminated clothing before reuse.
- Avoid contact with: Skin
- Wash hands before breaks and at the end of the working day.
- Handle in accordance with good industrial hygiene and safety practices.

Environmental exposure controls

- Dispose of the washing water according to national and local regulations.

9 SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Physical state: highly hygroscopic
	Physical state: gaseous
	Physical state: colourless
Smell	acrid
Odour detection threshold	No data available
Molecular Weight	20 g/mol
pH	< 1.0 (10%)
	pKa: 3.2
Melting point/freezing point	Melting point: -83.36 °C
Initial boiling point and boiling range	Boiling point: 19.51 °C
Flash point	Not applicable
Evaporation rate (butylacetate = 1)	No data available
Flammability (solids, gas)	The product is not flammable
Flammability/Explosion limit	Explosion index: with certain materials (see section 10)
Auto-ignition temperature	Not applicable
Vapour pressure	1,222.60 hPa (25°C)
Vapour density	2.4 (20°C)
Density	Apparent density: not applicable
Relative density:	0.8 (25 °C)
Relative density:	0.97 (20°C)
Relative density:	1.002 (0 °C)
Solubility	Water solubility: completely soluble
	Solubility in other solvents: Not applicable
Partition coefficient: n octanol/water	Not applicable
Decomposition temperature	No data available
Viscosity	Dynamic viscosity: 0.256 hPa (0°C)
Explosive properties	No data available
Oxidizing properties	Not applicable

9.2 9.2 other information 9.3

Surface tension	10.2 mN/m (0°C)
Critical temperature	188 °C
Critical pressure	64,850 hPa

10 SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

- Reacts violently with water.
- Risk of explosion.
- Risk of violent reaction.

10.2 Chemical stability

- Stable under recommended storage conditions.

10.3 Possibility of dangerous reactions

- Corrosive in contact with metals. Releases hydrogen in reaction with metals.
- Reacts violently with water, alkalis and amines.

10.4 Conditions to be avoided

- Exposure to moisture.

10.5 Incompatible materials / substances

- Glass
- Alkali
- Amines

10.6 Hazardous decomposition products

- Hydrogen

11 SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	scientifically unjustified study
Acute inhalation toxicity	LC50 - 1 h (gas): 2,240 - 2,340 ppm - Rat, male dry air Damp air
Acute skin toxicity	NOEC : 2 %(m) - On rabbit Substance to be tested: solution Exposure time 1 min NOEC : 0.01 %(m) - On rabbit Substance to be tested: solution Exposure time 30 min Derelanko MJ, Gad SC, Gavigan F & Dunn BJ (1985) The EU RAR for HF detects that skin contact with liquid or gaseous HF can cause not only serious skin lesions but also systemic (cardiac) effects that can be fatal.
Acute toxicity (for other routes of administration)	No data available
Skin corrosion/irritation	The substance is classified as corrosive. Standard OECD 404 study performed with 5% hydrofluoric acid, Martins (1990): corrosive effects
Severe eye injuries/severe eye irritation	The substance is classified as corrosive. However, some studies are already available: Thyssen (1981) detects no ocular effects with 0.13% hydrofluoric acid and only moderate irritation with 1.06% hydrofluoric acid.
Respiratory or skin sensitisation	Local effects of HF exposure are corrosion/irritation. There is no evidence of respiratory sensitisation (asthma) due to occupational exposure.
Carcinogenicity	No studies with HF are available. High quality NTP studies are available in rat and mouse for sodium fluoride. The EU RAR has reviewed all available data for HF and NaF and the conclusion is that fluoride is not carcinogenic in animals. Rat Oral NOAEL: 175ppm Substance to be tested: Sodium fluoride drinking water Mouse

	Oral
	NOAEL: 175ppm
	Substance to be tested: Sodium fluoride
	drinking water
	no carcinogenic effects have been observed
Toxic for reproduction and development	
Toxic for reproduction/fertility	By analogy
	Two-generation study - Male and female rat
	Oral
	Fertility NOAEL Parent: 10 mg/kg
	Fertility NOAEL F1: 10 mg/kg
	Substance to be tested, Sodium fluoride, drinking water. The product is not considered to have any effect on fertility.
Developmental toxicity/Teratogenicity	No studies with HF are available. However, a number of studies with the substance NaF read-across are available, including high quality studies conducted by USP NTP and FDA. There is no evidence for the toxicity of fluoride development.
	Oral
	Teratogenicity NOAEL: 14mg/kg
	Substance to be tested, Sodium fluoride, drinking water. The product is not considered toxic for development.
STOT	
Specific target organ toxicity (STOT) - single exposure	The substance or mixture is not classified as toxic to target organs as a result of single exposure according to CLP criteria
Specific target organ toxicity (STOT) - repeated exposure	The substance or mixture is not classified as toxic to target organs as a result of repeated exposure according to CLP criteria.
	Target organs: Bones, Teeth, Kidney
	Studies are available for sodium fluoride, therefore read-across is proposed. The primary effects of repeated exposure to water-soluble fluoride compounds in the oral cavity are to the skeletal system and teeth. The primary effects for repeated inhalation exposure are local respiratory irritation and effects on teeth while effects on the skeletal system are secondary to fluoride incorporation.
	Oral - Mouse, male and female LOAEL: 50 ppm
	Substance to be tested: Sodium fluoride Target organs: Skeleton
	Inhalation 90 days - Rat, male and female NOAEC: 0.72 mg/m3
Experience on human exposure	Evidence from epidemiological studies in humans indicates that prolonged exposure to fluoride causes dental and skeletal effects
Aspiration toxicity	Not applicable

12 SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Aquatic compartment

Acute toxicity to fish	LC50 - 96 h: 51 mg/l - Fish, Onchoryhnchus
	Fresh water
	mykiss Janssen (1989
Acute toxicity to daphnia and other aquatic invertebrates	Numerous studies with sodium fluoride are available, carried out using unrecognised methods.
	EC50 values for daphnia range from 10.5 to 352 mg/L; benthic insect larvae were more sensitive, with EC50 values of 26-48 mg/L. Most representative studies:
	Daphnia magna EC50 - 48 h: 10.5mg/l EC50 - 48 h: 97 mg/l EC50 - 24 h: 352 mg/l Static test Substance to be tested: Sodium fluoride Fresh water

Trichoptera aquatic larvae
EC50 - 96 h: 26-48 mg/l
Static test
Substance to be tested: Sodium fluoride
Marine species
salt water

Toxicity to aquatic plants

Numerous short-term studies are summarised and reviewed in the EU RAR and the Dutch ICD. EC50 values for freshwater algae are reported between 43 and 122 mg/L (as fluoride ion, F-). For marine algae EC50 is 81 mg/L in a single study with Skeletonema costatum. In long-term studies, NOEC values of 50 -249 mg/L and 50 -200 mg/L are reported for marine algae and soft water algae respectively.

EC50 - 96 h: 43 mg/l -

EC50 - 96 h: 122 mg/l - Algae

EC50 - 96 h: 81 mg/l - Algae

NOEC - 7 Days: 50 mg/l

NOEC - 8 Days: 249 mg/l

NOEC – 14 Days: 50-200 mg/l

Toxicity to micro-organisms

No data available

Chronic toxicity to fish

A 21-day study on Oncoryhychus mykiss with sodium fluoride was examined in the EU RAR and with ICD fluoride (RIVM). NOEC of 4 mg / is not considered relevant

NOEC: 4 mg/l - 21 Days - Oncorhynchus mykiss (Rainbow trout)

Static test

Substance to be tested: Sodium fluoride

Fresh water

Chronic toxicity to daphnia and other aquatic invertebrates

The EU RAR summarises the effects on reproduction of sodium fluoride on Daphnia magna in two studies. The two studies report NOEC values of 3.7 and 14.1 mg/L, with an arithmetic mean of 8.9 mg/L.

NOEC: 8.9 mg/l - 21 Days - Daphnia magna Static test

Substance to be tested: Sodium fluoride

Fresh water

12.2 persistence and degradability

abiotic degradation

Photodegradation

HF is highly reactive and, once released into the environment, is unlikely to remain in its original form for a significant period of time. HF dissociates rapidly in the presence of water vapour or in water to form hydrogen and fluoride ions and will be further transformed in air, water, sediment and soil into a variety of other fluorine-containing compounds.

Air

neutralisation by natural alkalinity

Physical and photochemical elimination

No data available

Biodegradation

The methods for determining biological degradability are not applicable to non-organic substances.

12.3 Bioaccumulation potential

Partition coefficient: n-octanol/water

Does not bio-accumulate

12.4 Mobility in the soil

Absorption potential (Koc, organic carbon absorption)

Mobility in the soil: fluoride adsorbs strongly in the soil, is essentially immobile and does not reach the aquifer

Distribution by known environmental compartment

HF is unstable and hydrolyses rapidly in the environment to form other fluorine-containing compounds. The behaviour of fluorine in water depends on pH and mineral content. Fluoride deposits in sediments as insoluble complexes and is

essentially immobile in the soil due to its incorporation into insoluble complexes. Adsorption to the solid phase of the soil is stronger with slightly acidic pH values (5.5-6.5).

12.5 Results of PBT and vPvB assessment

Not applicable (inorganic substance)

12.6 Other adverse effects

No data available

13 SECTION 13: CONSIDERATIONS ON DISPOSAL

13.1 Waste treatment methods

Destruction/Elimination

- In accordance with local and national regulations.
- Ask the manufacturer/supplier for information on recovery/recycling.
  Absorb the product in a potassium hydrate solution.
- Possible elimination from water by precipitation.
- Filter the product and send the solid residue to an authorised landfill for industrial waste.
- Dispose of the filtered liquid in waste water treatment plants

Recommendations on cleaning and disposal of packaging

- Clean the container with water.
- Empty and clean packaging can be reused, recycled or disposed of in accordance with local/national regulations.
- As far as possible, use a "shuttle" packaging reserved for this product

14 SECTION 14: TRANSPORT INFORMATION

ADR

14.1 UN Number	UN 1052
14.2 UN proper shipping name	ANHYDROUS HYDROGEN FLUORIDE
14.3 Transport hazard classes	**8**
Subsidiary hazard class	6.1
Label(s):	8 (6.1)
14.4 Packaging group	
Packaging group	I
Classification code	CT1
14.5 Environmental hazards	NO
14.6 Special precautions for users	
Hazard identification number	886
Tunnel restriction code	(C/D)

See Section 8 for personal protective equipment

ADN

14.1 UN Number	UN 1052
14.2 UN proper shipping name	ANHYDROUS HYDROGEN FLUORIDE
14.3 Transport hazard classes	**8**
Subsidiary hazard class	6.1
Label(s):	8 (6.1)
14.4 Packaging group	
Packaging group	I
Classification code	CT1
14.5 Environmental hazards	NO

14.6 Special precautions for users

Hazard identification number	886
Tunnel restriction code	-

See Section 8 for personal protective equipment

RID

14.1 UN Number	UN 1052
14.2 UN proper shipping name	ANHYDROUS HYDROGEN FLUORIDE
14.3 Transport hazard classes	**8**
Subsidiary hazard class	6.1
Label(s):	8 (6.1)
14.4 Packaging group	
Packaging group	I
Classification code	CT1
14.5 Environmental hazards	NO
14.6 Special precautions for users	
Hazard identification number	886
Tunnel restriction code	-

See Section 8 for personal protective equipment

IMDG

14.1 UN Number	UN 1052
14.2 UN proper shipping name	HYDROGEN FLUORIDE, ANHYDROUS
IMDG Code segregation group	Acids (SGG1)
14.3 Transport hazard classes	**8**
Subsidiary hazard class	6.1
Label(s):	8 (6.1)
14.4 Packaging group	
Packaging group	I
Classification code	CT1
14.5 Marine pollutant environmental hazards	NO
14.6 Special precautions for users	
EMS no	F-C, S-U
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code **No data available**	No data available

See Section 8 for personal protective equipment

IATA

14.1 UN Number	UN 1052
14.2 UN proper shipping name	Not authorised for transport
14.3 Transport hazard classes	Not authorised for transport
14.5 Environmental hazards	NO
14.6 Special precautions for users	
Packing instructions (cargo aircraft)	Not authorised for transport
Packing instructions (passenger aircraft)	Not authorised for transport

See Section 8 for personal protective equipment

Note: The above regulatory requirements are those in force on the date of completion of the form. However, taking into account the possible evolution of the regulations concerning the transport of dangerous products, it is advisable to check their validity with your commercial agency.

15 SECTION 15: REGULATORY INFORMATION

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

Other legislation

- Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), as amended. Title VIII Restrictions: the product is subject to Restrictions
- Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), as amended. Title VII Authorisation: Product not subject to authorisation.
- Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, as amended.
- Council Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work, and subsequent amendments (Legislative Decree 81/08).

  Title IX, Chapter I: Hazardous chemical agent

  Title IX, Chapter II: Non-carcinogenic/mutagenic agent
- Category Seveso (Dir. 2012/18/EU) Legislative Decree 105/2015): Annex 1, part 1: category H2 - Acute toxicity
- European Waste Catalogue
- Waste codes must be assigned by the user according to the application that has been made of this product.

Inventory Information	Situation
United States TSCA Inventory	Listed in this inventory
Mexico INSQ (INSQ)	Listed in this inventory
Canadian Domestic Substances List (DSL)	Listed in this inventory
New Zealand. Inventory of Chemical Substances	Listed in this inventory
Australia Inventory of Chemical Substances (AICS)	Listed in this inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	Listed in this inventory
Korea. Korean Existing Chemicals Inventory (KECI)	Listed in this inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	Listed in this inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	Listed in this inventory
EU. European Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	If purchased from an Alkeemia European legal entity, this product complies with the registration provisions of REACH Regulation (EC) No 1907/2006 as all its components are excluded, exempt, pre-registered and/or registered. If purchased from a non-European legal entity, please contact your local representative for further information.

15.2 Chemical safety assessment

- A Chemical Safety Assessment has been carried out for this substance.
- See Exposure scenario

16 SECTION 16: OTHER INFORMATION

References to hazard statements in full text under paragraphs 2 and 3.

- H300 Fatal if swallowed.
- H310 Fatal in contact with skin.
- H314 Causes severe skin burns and eye damage.
- H330 Fatal if inhaled.

Explanation or legend of abbreviations and acronyms used in the safety data sheet

- C Maximum limit
- STEL Limit Values - Short Term
- TWA Limit Values - 8 Hours

Information on training

Provide appropriate training for workers potentially exposed to this substance based on the contents of this safety data sheet.

Main bibliographical sources

CSR (Chemical safety report)
ECHA.

Revisions

This document is the first issue by FLUORSID ALKEEMIA SpA.

Further information

NB: In this document the digital separator of the thousands is "," (comma), the decimal separator is "." (period).

The information contained in this Safety Data Sheet has been compiled to the best of our knowledge on the date of publication of this document. This information is provided for guidance only in order to assist the user in carrying out the handling, use, treatment, storage, transport, disposal and use of the product in satisfactory conditions of safety, and should therefore not be construed as a guarantee, or considered as quality specifications. It completes the technical instructions, but does not replace them. This information relates only to the precisely designated product and, unless specifically stated otherwise, is not applicable when the product is used together with other substances, or used in other manufacturing processes. In no event does this information exempt the user from making sure that he is in compliance with the entire legislation governing his activity.

Annex

List of scenarios

1. **ES1 : Industrial use, Use as an intermediate**
2. **ES2 : Industrial use, Catalyst in alkylation reactions**
3. **ES3 : Professional use, Laboratory use**
4. **ES4 : Industrial use, Mining, enrichment, purification of minerals and metals,**
5. **ES5 : Industrial use, Passivation of metal surfaces**
6. **ES6 : Industrial use, Constructions**
7. **7 ES7 : Formulation and (re)packaging of substances and mixtures**
8. **8 ES8 : Industrial use, Cleaning of drums and pipes**
9. **9 ES9 : Industrial use, Semiconductor in the electronics and solar industry**

17 ES1 : INDUSTRIAL USE, USE AS AN INTERMEDIATE

1.1 Description of the situation

Main user groups	**SU 3**	Industrial uses: uses of substances as such or in preparations at industrial sites
Sector of end use	**SU8**	Large-scale production of basic chemicals (including petroleum products)
	SU9	Manufacture of fine chemicals
Environmental release category	**ERC6a**	Industrial use resulting in the production of another substance (use of intermediates)
Process category	**PROC1**	Use in a closed process, exposure unlikely
	PROC2	Use in a closed, continuous process with occasional controlled exposure
	PROC3	Use in a closed batch process (synthesis or formulation)
	PROC4	Use in batch and other processes (synthesis), where opportunities for exposure occur
	PROC8b	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities
	PROC9	Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)
Product category	**PC19**	Intermediate substances

1.2. Conditions of use with effects on exposure

1.2.1 Contributing scenario that controls environmental exposure for: ERC6a Industrial use resulting in the production of another substance (use of intermediates)

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).

Quantity

Daily local emission into waste water	14.6 kg

Environmental factors

flow rate	20,000 m3/d
Dilution factor (River)	10

Other determined operating conditions involving environmental exposure

Number of days of emission per year:	300
Emission or Release Factor: Air:	0.05 %

Technical conditions and precautionary measures/organisational measures

Air	Use in a closed gas extractor system (Efficiency (of a precautionary

	measure): 99%)
Water	Chemical precipitation

Conditions and measures concerning the waste water treatment plant

Type of waste water treatment plant	none
Effluent flow rate of a waste water treatment plant	2,000 m3/d

1.2.2 Contributing scenario that controls worker exposure for: PROC2 Use in a closed, continuous process with occasional controlled exposure, PROC3 Use in a closed batch process (synthesis or formulation), PROC4 Use in batch and other processes (synthesis), where opportunities for exposure occur, PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing) Anhydrous form

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).
Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process
Technical conditions and precautions	with local extraction ventilation system
Organisational measures to avoid/limit spills, dispersion and exposure	It is assumed that good basic occupational hygiene standards are applied.
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, safety shoes Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

1.2.3 Contributing scenario that controls worker exposure for: PROC1 Use in a closed process, exposure unlikely Anhydrous form

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).
Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process
Technical conditions and precautions	with local extraction ventilation system
Organisational measures to avoid/limit spills, dispersion and exposure	It is assumed that good basic occupational hygiene standards are applied.
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, safety shoes Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

1.2.4 Contributing scenario that controls worker exposure for: PROC1 Use in a closed process, exposure unlikely, PROC2 Use in a closed, continuous process with occasional controlled exposure, PROC3 Use in a closed batch process (synthesis or formulation), PROC4 Use in batch and other processes (synthesis), where opportunities for exposure occur, PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing) 40-85%, aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to **85%**
Physical Form (at the time of use)	40-85%, aqueous solution

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, safety shoes Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

1.2.5 Contributing scenario that controls worker exposure for: PROC1 Use in a closed process, exposure unlikely, PROC2 Use in a closed, continuous process with occasional controlled exposure, PROC3 Use in a closed batch process (synthesis or formulation), PROC4 Use in batch and other processes (synthesis), where opportunities for exposure occur, PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing) <40%, Aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to 85%
Physical Form (at the time of use)	< 40%, aqueous solution

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, safety shoes Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

1.3. Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC6a	local PEC	Fresh water	0.73 mg/l	0.811
		Fresh water sediment	0.622 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.0811
		Marine sediment	0.0622 mg/kg (dry material)	0.0812
		Farming land	0.0017 mg/kg (pp)	0.00015
		Meadow	0.0017 mg/kg (pp)	0.00015
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR
PROC2	Anhydrous form	Worker - inhalatory, long-term - systemic	0.208 mg/m^3	0.139
PROC3, PROC4	Anhydrous form	Worker - inhalatory, long-term - systemic	0.417 mg/m^3	0.278
PROC8b	Anhydrous form	Worker - inhalatory, long-term - systemic	0.188 mg/m^3	0.125
PROC9	Anhydrous form	Worker - inhalatory, long-term - systemic	0.833 mg/m^3	0.555
PROC8b	Anhydrous form	Worker - inhalatory, short-term - local	0.184 mg/m^3	0.0736
PROC9	Anhydrous form	Worker - inhalatory, short-term - local	0.818 mg/m^3	0.327
PROC1	Anhydrous form	Worker - inhalatory, long-term - systemic	0.008 mg/m^3	0.005
PROC1, PROC2	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.001 mg/m^3	0.0007
PROC3, PROC8b, PROC9	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.01 mg/m^3	0.007
PROC4	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.05 mg/m^3	0.033
PROC8b, PROC9	40-85%, aqueous solution	Worker - inhalatory, short-term - local	0.02 mg/m^3	0.008
PROC1, PROC2	<40%, Aqueous solution	Worker - inhalatory, long-term - systemic	0.001 mg/m^3	0.0007
PROC3, PROC8b, PROC9	<40%, Aqueous solution	Worker - inhalatory, long-term - systemic	0.01 mg/m^3	0.007
PROC4	<40%, Aqueous solution	Worker - inhalatory, long-term - systemic	0.05 mg/m^3	0.033
PROC8b, PROC9	<40%, Aqueous solution	Worker - inhalatory, short-term - local	0.02 mg/m^3	0.008

RCR = Risk characterisation report

ERC6a	Exposure Assessment Method: EUSES v2.1
PROC2	Exposure Assessment Method: MEASE
PROC3, PROC4	Exposure Assessment Method: MEASE
PROC8b	Exposure Assessment Method: MEASE
PROC9	Exposure Assessment Method: MEASE
PROC8b	Exposure Assessment Method: MEASE
PROC9	Exposure Assessment Method: MEASE
PROC1	Exposure Assessment Method: MEASE
PROC1, PROC2	Exposure Assessment Method: MEASE
PROC3,	Exposure Assessment Method: MEASE
PROC8b, PROC9	Exposure Assessment Method: MEASE
PROC4	Exposure Assessment Method: MEASE

PROC8b, PROC9	Exposure Assessment Method: MEASE
PROC1, PROC2	Exposure Assessment Method: MEASE
PROC3,	Exposure Assessment Method: MEASE
PROC8b, PROC9	Exposure Assessment Method: MEASE
PROC4	Exposure Assessment Method: MEASE
PROC8b, PROC9	Exposure Assessment Method: MEASE

1.4. Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

1.4.1 Environment

If a downstream user has operating conditions/RMM that do not comply with the specifications in the exposure scenario, he will be able to assess whether he is operating **within** the limits set in the exposure scenario through the scale assessment in the **EUSES.**

The main parameters to consider are:

- local quantity used (tonnage)
- emission factor before on-site treatment
- **presence of the waste water treatment plant** on site and efficiency
- dilution factor

The required removal **efficiency** for waste water can be achieved **by adopting** on-site/off-site technologies, alone or in combination.

Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

1.4.2 Health

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

18 ES2 : INDUSTRIAL USE, CATALYST IN ALKYLATION REACTIONS

2.1. Description of the situation

Main user groups	**SU 3**	Industrial uses: uses of substances as such or in preparations at industrial sites
Sector of end use	**SU8**	Large-scale production of basic chemicals (including petroleum products)
	SU9	Manufacture of fine chemicals
Environmental release category	**ERC6b**	Industrial use of reactive technological aids
Process category	**PROC1**	Use in a closed process, exposure unlikely
	PROC2	Use in a closed, continuous process with occasional controlled exposure
	PROC8b	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities
	PROC9	Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)
Product category	**PC20**	Products such as pH regulators, flocculants, precipitators, neutralising agents

2.2. Conditions of use with effects on exposure

2.2.1 Contributing scenario that controls environmental exposure for: ERC6b Industrial use of reactive technological aids

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).

Quantity

Daily local emission into waste water	14.6 kg
waste water	

Environmental factors

flow rate	20,000 m3/d
Dilution factor (River)	10

Other determined operating conditions involving environmental exposure

Number of days of emission per year	20
Emission or Release Factor: Air	0.001 %

Technical conditions and precautionary measures/organisational measures

Air	Use in a closed gas extractor system (Efficiency (of a precautionary measure): 99%)
Water	Chemical precipitation

Conditions and measures concerning the waste water treatment plant

Type of waste water treatment plant	none
Effluent flow rate of a waste water treatment plant	2,000 m3/d

2.2.2 Contributing scenario that controls worker exposure for: PROC1 Use in a closed process, exposure unlikely

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process
Technical conditions and precautions	without local extraction ventilation system
Organisational measures to avoid/limit spills, dispersion and exposure	It is assumed that good basic occupational hygiene standards are applied.
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, safety shoes Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

2.2.3 Contributing scenario that controls worker exposure for: PROC2 Use in a closed, continuous process with occasional controlled exposure, PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).
Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process
Technical conditions and precautions	with local extraction ventilation system
Organisational measures to avoid/limit spills, dispersion and exposure	It is assumed that good basic occupational hygiene standards are applied.
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, safety shoes Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

2.3. Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC6b	local PEC	Fresh water	0.73 mg/l	0.81
		Fresh water sediment	0.622 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.081
		Marine sediment	0.0622 mg/kg (dry material)	0.0812
		Farming land	< 0.0000001 mg/kg (pp)	< 0.000001
		Meadow	< 0.0000001 mg/kg (pp)	< 0.000001
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR
PROC1		Worker - inhalatory, long-term - systemic	0.008 mg/m^3	0.0056
PROC2		Worker - inhalatory, long-term - systemic	0.102 mg/m^3	0.068
PROC8b		Worker - inhalatory, long-term - systemic	0.092 mg/m^3	0.061
PROC9		Worker - inhalatory, long-term - systemic	0.409 mg/m^3	0.273
PROC8b		Worker - inhalatory, long-term - systemic	0.184 mg/m^3	0.074
PROC9		Worker - inhalatory, long-term - systemic	0.818 mg/m^3	0.327

RCR = Risk characterisation report

ERC6b	Exposure Assessment Method: EUSES v2.1
PROC1	Exposure Assessment Method: MEASE
PROC2	Exposure Assessment Method: MEASE
PROC8b	Exposure Assessment Method: MEASE
PROC9	Exposure Assessment Method: MEASE
PROC8b	Exposure Assessment Method: MEASE
PROC9	Exposure Assessment Method: MEASE

2.4. Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

19 ES3 : PROFESSIONAL USE, LABORATORY USE

3.1. Description of the situation

Sector of end use	**SU22**	Public domain (administration,teaching, entertainment, services, crafts)
Environmental release category	**ERC8a**	Wide dispersive indoor use of technological aids in open systems
	ERC8b	Wide dispersive indoor use of reactive substances in open systems
Process category	**PROC15**	Use as laboratory reagents
Product category	**PC21**	Laboratory chemicals

3.2. Conditions of use with effects on exposure

3.2.1 Contributing scenario that controls environmental exposure for: ERC8a Wide dispersive indoor use of technological aids in open systems, ERC8b Wide dispersive indoor use of reactive substances in open systems

Product characteristics	
Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Quantity	
Maximum annual quantity used	1 t
Daily quantity per site	3.33 kg
Daily local emission into waste water	14.6 kg
Environmental factors	
flow rate	20,000 m3/d
Dilution factor (River)	10
Other determined operating conditions involving environmental exposure	
Number of days of emission per year	300
Technical conditions and precautionary measures/organisational measures	
Air	Use in a closed gas extractor system
Water	Chemical precipitation
Conditions and measures concerning the waste water treatment plant	
Type of waste water treatment plant	On-site waste water treatment plant
Effluent flow rate of a waste water treatment plant	2,000 m3/d

3.2.2 Contributing scenario that controls worker exposure for: PROC15 Use as laboratory reagents Anhydrous form

Product characteristics	
Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form
Frequency and duration of use	
Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).
Human factors not influenced by risk management	
Respiratory volume	10 m3
Other operating conditions affecting the exposure of workers	
outdoors / indoors	indoors
Remarks	Use in a closed process
Technical conditions and precautions	with local extraction ventilation system, Working in a fume extraction hood.
Organisational measures to avoid/limit spills, dispersion and exposure	It is assumed that good basic occupational hygiene standards are applied.
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, Safety shoes Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling

3.2.3 Contributing scenario that controls worker exposure for: PROC15 Use as laboratory reagents 40-85%, aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	40-85%, aqueous solution

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process
Technical conditions and precautions	with local extraction ventilation system, Working in a fume extraction hood.
Organisational measures to avoid/limit spills, dispersion and exposure	It is assumed that good basic occupational hygiene standards are applied.
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, Safety shoes Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling

3.3. Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC8a, ERC8b	local PEC	Fresh water	0.73 mg/l	0.811
		Fresh water sediment	0.622 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.0811
		Marine sediment	0.0622 mg/kg (dry material)	0.0812
		Farming land	< 0.0000001 mg/kg (pp)	< 0.000001
		Meadow	< 0.0000001 mg/kg (pp)	< 0.000001
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR
PROC15	Anhydrous form	Worker - inhalatory, long-term - systemic	0.102 mg/m^3	0.068
PROC15	Anhydrous form	Worker - inhalatory, long-term - systemic	0.204 mg/m^3	0.08
PROC15	40-85%, aqueous solution	Worker - inhalatory, long-term - local	0.01 mg/m^3	0.007
PROC15	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.02 mg/m^3	0.008

RCR = Risk characterisation report

ERC8a, ERC8b	Exposure Assessment Method: EUSES v2.1
PROC15	Exposure Assessment Method: MEASE
PROC15	Exposure Assessment Method: MEASE
PROC15	Exposure Assessment Method: MEASE
PROC15	Exposure Assessment Method: MEASE

3.4. Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

20 ES4 : INDUSTRIAL USE, MINING, ENRICHMENT PURIFICATION OF MINERALS AND METALS,

4.1. Description of the situation

Main user groups	**SU 3**	Industrial uses: uses of substances as such or in preparations at industrial sites
Sector of end use	**SU14**	Metallurgical activities, including alloys
	SU15	Manufacture of fabricated metal products, except machinery and equipment
	SU2a	Mining activities (except offshore industries)
Environmental release category	**ERC4**	Industrial use of technological aids, which do not form part of articles
	ERC6b	Industrial use of reactive technological aids
Process category	**PROC1**	Use in a closed process, exposure unlikely
	PROC2	Use in a closed, continuous process with occasional controlled exposure
	PROC3	Use in a closed batch process (synthesis or formulation)
	PROC4	Use in batch and other processes (synthesis), where opportunities for exposure occur
	PROC7	Industrial spray application
	PROC13	Treatment of articles by immersion and casting
	PROC8b	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities
	PROC9	Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)
	PROC19	Manual mixing with direct contact, using only personal protective equipment
Product category	**PC14**	Products for the treatment of metallic surfaces, including galvanic and electroplating products
	PC15	Products for the treatment of non-metallic surfaces
	PC35	Washing and cleaning products (including solvent-based products)
	PC40	Extraction agents

4.2. Conditions of use with effects on exposure

4.2.1 Contributing scenario that controls environmental exposure for: ERC4 Industrial use of technological aids, which do not form part of articles, ERC6b Industrial use of reactive technological aids

Product characteristics	
Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to 85%
Quantity	
Daily local emission into	14.6 kg
waste water	
Environmental factors	
flow rate	20,000 m3/d
Dilution factor (River)	10
Other determined operating conditions involving environmental exposure	
Number of days of emission per year	100
Emission or Release Factor: Air	0.001 %

Technical conditions and precautionary measures/organisational measures

Air	Use in a closed gas extractor system (Efficiency of a precautionary measure: 99%)
Water	Chemical precipitation

Conditions and measures concerning the waste water treatment plant

Type of waste water treatment plant	On-site waste water treatment plant
Effluent flow rate of a waste water treatment plant	2,000 m3/d

4.2.2 Contributing scenario that controls worker exposure for: PROC1 Use in a closed process, exposure unlikely 40-85%, aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to 85%
Physical Form (at the time of use)	40-85%, aqueous solution

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

without local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable work clothing, Safety shoes
Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment
Do not eat, drink or smoke during work, Wash thoroughly after handling

4.2.3 Contributing scenario that controls worker exposure for: PROC1 Use in a closed process, exposure unlikely <40% Aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to 40%
Physical Form (at the time of use)	<40%, Aqueous solution

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

without local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable work clothing, Safety shoes
Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment
Do not eat, drink or smoke during work, Wash thoroughly after handling

4.2.4 Contributing scenario that controls worker exposure for: PROC2 Use in a closed, continuous process with occasional controlled exposure, PROC3 Use in a closed batch process (synthesis or formulation), PROC4 Use in batch and other processes (synthesis), where opportunities for exposure occur, PROC7 Industrial spray application, PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing), PROC13 Treatment of articles by immersion and casting, PROC19 Manual mixing with direct contact, using only personal protective equipment 40-85%, aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to **85%**
Physical Form (at the time of use)	40-85%, aqueous solution
Technical conditions and precautions	with local extraction ventilation system
Organisational measures to avoid/limit spills, dispersion and exposure	It is assumed that good basic occupational hygiene standards are applied.
Conditions and measures concerning personal protection, hygiene and health assessment	Wear suitable work clothing, Safety shoes. Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling

4.2.5 Contributing scenario that controls worker exposure for: PROC2 Use in a closed, continuous process with occasional controlled exposure, PROC3 Use in a closed batch process (synthesis or formulation), PROC4 Use in batch and other processes (synthesis), where opportunities for exposure occur, PROC7 Industrial spray application, PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing), PROC13, Treatment of articles by immersion and casting, PROC19. Manual mixing with direct contact, using only personal protective equipment < 40% Aqueous solution

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to 40%
Physical Form (at the time of use)	<40%, Aqueous solution
Frequency and duration of use	
Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).
Human factors not influenced by risk management	
Respiratory volume	10 m3
Other operating conditions affecting the exposure of workers	
outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

with local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable work clothing, Safety shoes
Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment, Do not eat, drink or smoke during work, Wash thoroughly after handling.

4.3. Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC4, ERC6b	local PEC	Fresh water	0.73 mg/l	0.811
		Fresh water sediment	0.622 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.0811

		Marine sediment	0.0622 mg/kg (dry material)	0.0812
		Farming land	0.000003 mg/kg (pp)	< 0.000001
		Meadow	0.000003 mg/kg (pp)	< 0.000001
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR
PROC1	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.008 mg/m^3	0.0056
PROC1	<40%, Aqueous solution	Worker - inhalatory, long-term - systemic	0.008 mg/m^3	0.0056
PROC2	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.001 mg/m^3	0.0007
PROC3, PROC8b, PROC9, PROC13	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.01 mg/m^3	0.007
PROC4, PROC19	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.05 mg/m^3	0.033
PROC7	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.025 mg/m^3	0.017
PROC7	40-85%, aqueous solution	Worker - inhalatory, short-term - local	0.05 mg/m^3	0.02
PROC8b, PROC9, PROC13	40-85%, aqueous solution	Worker - inhalatory, short-term - local	0.02 mg/m^3	0.008
PROC19	40-85%, aqueous solution	Worker - inhalatory, short-term - local	0.1 mg/m^3	0.04
PROC3, PROC8b, PROC9, PROC13	<40%, Aqueous solution	Worker - inhalatory, long-term - systemic	0.01 mg/m^3	0.007
PROC4, PROC19	<40%, Aqueous solution	Worker - inhalatory, long-term - systemic	0.05 mg/m^3	0.033
PROC7	<40%, Aqueous solution	Worker - inhalatory, long-term - systemic	0.025 mg/m^3	0.017
PROC7	<40%, Aqueous solution	Worker - inhalatory, short-term - local	0.05 mg/m^3	0.02
PROC8b, PROC9, PROC13	<40%, Aqueous solution	Worker - inhalatory, short-term - local	0.02 mg/m^3	0.008
PROC19	<40%, Aqueous solution	Worker - inhalatory, short-term - local	0.1 mg/m^3	0.04

RCR = Risk characterisation report

ERC4, ERC6b	Exposure Assessment Method: EUSES v2.1
PROC1	Exposure Assessment Method: MEASE
PROC1	Exposure Assessment Method: MEASE
PROC2	Exposure Assessment Method: MEASE
PROC3,	Exposure Assessment Method: MEASE
PROC8b,	Exposure Assessment Method: MEASE
PROC9, PROC13	Exposure Assessment Method: MEASE
PROC4, PROC19	Exposure Assessment Method: MEASE
PROC7	Exposure Assessment Method: MEASE
PROC7	Exposure Assessment Method: MEASE
PROC8b,	Exposure Assessment Method: MEASE
PROC9, PROC13	Exposure Assessment Method: MEASE
PROC19	Exposure Assessment Method: MEASE
PROC3,	Exposure Assessment Method: MEASE
PROC8b,	Exposure Assessment Method: MEASE

PROC9, PROC13	Exposure Assessment Method: MEASE
PROC4, PROC19	Exposure Assessment Method: MEASE
PROC7	Exposure Assessment Method: MEASE
PROC7	Exposure Assessment Method: MEASE
PROC8b,	Exposure Assessment Method: MEASE
PROC9, PROC13	Exposure Assessment Method: MEASE
PROC19	Exposure Assessment Method: MEASE

4.4. Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

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21 ES5 : INDUSTRIAL USE, PASSIVATION OF METAL SURFACES

5.1. Description of the situation

Main user groups	**SU 3**	Industrial uses: uses of substances as such or in preparations at industrial sites
Environmental release category	**ERC5**	Industrial use resulting in inclusion in or application to a matrix
Process category	**PROC1**	Use in a closed process, exposure unlikely
	PROC8b	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities
	PROC9	Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)
Product category	**PC14**	Products for the treatment of metallic surfaces, including galvanic and electroplating products

5.2. Conditions of use with effects on exposure

5.2.1 Contributing scenario that controls environmental exposure for: ERC5 Industrial use resulting in inclusion in or application to a matrix

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).

Quantity

Daily local emission into waste water	14.6 kg

Environmental factors

flow rate	20,000 m3/d
Dilution factor (River)	10

Other determined operating conditions involving environmental exposure

Number of days of emission per year	20
Emission or Release Factor: Air	0.05 %

Technical conditions and precautionary measures/organisational measures

Air	Use in a closed gas extractor system (Efficiency of a precautionary measure: 99%)
Water	Chemical precipitation

Conditions and measures concerning the waste water treatment plant

Type of waste water treatment plant	On-site waste water treatment plant
Effluent flow rate of a waste water treatment plant	2,000 m3/d

5.2.2 Contributing scenario that controls worker exposure for: PROC1 Use in a closed process, exposure unlikely

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

without local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

5.2.3 Contributing scenario that controls worker exposure for: PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

without local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

5.3. Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC5	local PEC	Fresh water	0.73 mg/l	0.811
		Fresh water sediment	0.641 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.0811
		Marine sediment	0.0641 mg/kg (dry material)	0.0812
		Farming land	0.00045 mg/kg (pp)	0.00004
		Meadow	0.00045 mg/kg (pp)	0.00004
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR
PROC1		Worker - inhalatory, long-term - systemic	0.008 mg/m^3	0.005
PROC8b		Worker - inhalatory, long-term - systemic	0.092 mg/m^3	0.061
PROC9		Worker - inhalatory, long-term - systemic	0.409 mg/m^3	0.273
PROC8b		Worker - inhalatory, short-term - local	0.0184 mg/m^3	0.007
PROC9		Worker - inhalatory, short-term - local	0.818 mg/m^3	0.327

RCR = Risk characterisation report

ERC5	Exposure Assessment Method: EUSES v2.1
PROC1	Exposure Assessment Method: MEASE
PROC8b	Exposure Assessment Method: MEASE
PROC9	Exposure Assessment Method: MEASE
PROC8b	Exposure Assessment Method: MEASE
PROC9	Exposure Assessment Method: MEASE

5.4. Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

22 ES6 : INDUSTRIAL USE, CONSTRUCTIONS

6.1. Description of the situation

Main user groups	**SU 3**	Industrial uses: uses of substances as such or in preparations at industrial sites
Sector of end use	**SU 10**	Formulation [mixing] of preparations and/or repackaging (except alloys)
	SU19	Constructions
Environmental release category	**ERC2**	Formulation of preparations
Process category	**PROC3**	Use in a closed batch process (synthesis or formulation)
	PROC8a	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in non-dedicated facilities
	PROC8b	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities
	PROC9	Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)

6.2. Conditions of use with effects on exposure

6.2.1 Contributing scenario that controls environmental exposure for: ERC2 Formulation of preparations

Product characteristics

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to 40%

Quantity

Daily local emission into waste water	14.6 kg

Environmental factors

flow rate	20,000 m3/d
Dilution factor (River)	10

Other determined operating conditions involving environmental exposure

Number of days of emission per year	20
Emission or Release Factor: Air	0.0025 %

Technical conditions and precautionary measures/organisational measures

Air	Use in a closed gas extractor system (Efficiency (of a precautionary measure): 99 %
Water	Chemical precipitation

Conditions and measures concerning the waste water treatment plant

Type of waste water treatment plant	On-site waste water treatment plant
Effluent flow rate of a waste water treatment plant	2,000 m3/d

6.2.2 Contributing scenario that controls worker exposure for: PROC3 Use in a closed batch process (synthesis or formulation), PROC8a Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in non-dedicated facilities, PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing) <40% Aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	<40%, Aqueous solution

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

with local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable work clothing, Safety shoes
Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment, Do not eat, drink or smoke during work, Wash thoroughly after handling.

6.3. Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC2	local PEC	Fresh water	0.73 mg/l	0.811
		Fresh water sediment	0.622 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.0811
		Marine sediment	0.0622 mg/kg (dry material)	0.0812
		Farming land	0.000009 mg/kg (pp)	< 0.000001
		Meadow	0.000009 mg/kg (pp)	< 0.000001
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR
PROC3, PROC8b, PROC9		Worker - inhalatory, long-term - systemic	0.01 mg/m^3	0.007
PROC8a		Worker - inhalatory, long-term - systemic	0.05 mg/m^3	0.033
PROC8a		Worker - inhalatory, short-term - local	0.1 mg/m^3	0.04
PROC8b, PROC9		Worker - inhalatory, short-term - local	0.02 mg/m^3	0.008

RCR = Risk characterisation report

ERC2	Exposure Assessment Method: EUSES v2.1
PROC3, PROC8b, PROC9	Exposure Assessment , Method: MEASE
PROC8a	Exposure Assessment Method: MEASE
PROC8a	Exposure Assessment Method: MEASE
PROC8b, PROC9	Exposure Assessment Method: MEASE

6.4. Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

23 ES7 : FORMULATION AND (RE)PACKAGING OF SUBSTANCES AND MIXTURES

6.5. Description of the situation

Sector of end use	**SU 10**	Formulation [mixing] of preparations and/or repackaging (except alloys)
Environmental release category	**ERC2**	Formulation of preparations
Process category	**PROC3**	Use in a closed batch process (synthesis or formulation)

PROC5	Mixing or blending in batch processes for the formulation of preparations and articles (contact in different stages and/or significant contact)
PROC8b	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities
PROC9	Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)
PROC13	Treatment of articles by immersion and casting
PROC19	Manual mixing with direct contact, using only personal protective equipment

6.6. Conditions of use with effects on exposure

6.6.1 Contributing scenario that controls environmental exposure for: ERC2 Formulation of preparations

Product characteristics

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to 85%

Quantity

Daily local emission into waste water	14.6 kg

Environmental factors

flow rate	20,000 m3/d
Dilution factor (River)	10

Other determined operating conditions involving environmental exposure

Number of days of emission per year	100
Emission or Release Factor: Air	0.025 %

Technical conditions and precautionary measures/organisational measures

Air	Use in a closed gas extractor system Efficiency (of a precautionary measure): 99 %
Water	Chemical precipitation

Conditions and measures concerning the waste water treatment plant

Type of waste water treatment plant	On-site waste water treatment plant
Effluent flow rate of a waste water treatment plant	2,000 m3/d

6.6.2 Contributing scenario that controls worker exposure for: PROC3 Use in a closed batch process (synthesis or formulation), PROC5 Mixing or blending in batch processes for the formulation of preparations and articles (contact in different stages and/or significant contact) PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing), PROC13 Treatment of articles by immersion and casting, PROC19 Manual mixing with direct contact, using only personal protective equipment Anhydrous form

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

with local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable work clothing, Safety shoes. Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

6.6.3 Contributing scenario that controls worker exposure for: PROC3 Use in a closed batch process (synthesis or formulation), PROC5 Mixing or blending in batch processes for the formulation of preparations and articles (contact in different stages and/or significant contact) PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing), PROC13 Treatment of articles by immersion and casting, PROC19 Manual mixing with direct contact, using only personal protective equipment 40-85%, aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Covers the percentage of the substance in the product up to 85%
Physical Form (at the time of use)	40-85%, aqueous solution

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

with local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable work clothing, Safety shoes. Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

6.7. Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC2	local PEC	Fresh water	0.73 mg/l	0.811
		Fresh water sediment	0.622 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.0811
		Marine sediment	0.0622 mg/kg (dry material)	0.0812
		Farming land	0.0001 mg/kg (pp)	0.00001
		Meadow	0.0001 mg/kg (pp)	0.00001
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR

PROC3	Anhydrous form	Worker - inhalatory, long-term - systemic	0.204 mg/m^3	0.136
PROC5	Anhydrous form	Worker - inhalatory, long-term - systemic	0.511 mg/m^3	0.341
PROC8b	Anhydrous form	Worker - inhalatory, long-term - systemic	0.092 mg/m^3	0.061
PROC9	Anhydrous form	Worker - inhalatory, long-term - systemic	0.409 mg/m^3	0.273
PROC5	Anhydrous form	Worker - inhalatory, short-term - local	1.02 mg/m^3	0.408
PROC8b	Anhydrous form	Worker - inhalatory, short-term - local	0.184 mg/m^3	0.073
PROC9	Anhydrous form	Worker - inhalatory, short-term - local	0.818 mg/m^3	0.327
PROC3, PROC5	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.05 mg/m^3	0.033
PROC8b, PROC9, PROC13, PROC19	40-85%, aqueous solution	Worker - inhalatory, long-term - systemic	0.01 mg/m^3	0.007
PROC5	40-85%, aqueous solution	Worker - inhalatory, short-term - local	0.1 mg/m^3	0.04
PROC8b, PROC9, PROC13, PROC19	40-85%, aqueous solution	Worker - inhalatory, short-term - local	0.02 mg/m^3	0.008

RCR = Risk characterisation report

ERC2	Exposure Assessment Method: EUSES v2.1
PROC3	Exposure Assessment Method: MEASE
PROC5	Exposure Assessment Method: MEASE
PROC8b	Exposure Assessment Method: MEASE
PROC9	Exposure Assessment Method: MEASE
PROC5	Exposure Assessment Method: MEASE
PROC8b	Exposure Assessment Method: MEASE
PROC9	Exposure Assessment Method: MEASE
PROC3, PROC5	Exposure Assessment Method: MEASE
PROC8b, PROC9, PROC13, PROC19	Exposure Assessment , Method: MEASE
PROC5	Exposure Assessment Method: MEASE
PROC8b, PROC9, PROC13, PROC19	Exposure Assessment , Method: MEASE

6.8. Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

24 ES8 : INDUSTRIAL USE, CLEANING OF DRUMS AND PIPES

8.1 Description of the situation

Main user groups	**SU 3**	Industrial uses: uses of substances as such or in preparations at industrial sites
Environmental release category	**ERC7**	Industrial use of substances in closed systems
Process category	**PROC3**	Use in a closed batch process (synthesis or formulation)
	PROC8b	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities

	PROC9	Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)
	PROC13	Treatment of articles by immersion and casting
Product category	**PC35**	Washing and cleaning products (including solvent-based products)

8.2 Conditions of use with effects on exposure

8.2.1 Contributing scenario that controls environmental exposure for: ERC7 Industrial use of substances in closed systems

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).

Quantity

Daily local emission into waste water	0 kg
Concentration after maximum dilution for use	7.3 mg/l

Environmental factors

flow rate	20,000 m3/d
Dilution factor (River)	10

Other determined operating conditions involving environmental exposure

Number of days of emission per year	100
Emission or Release Factor: Air	0.5 %

Technical conditions and precautionary measures/organisational measures

Air	Use in a closed gas extractor system Efficiency (of a precautionary measure): 99%)
Water	Chemical precipitation

Conditions and measures concerning the waste water treatment plant

Type of waste water treatment plant	none

8.2.2 Contributing scenario that controls worker exposure for: PROC3 Use in a closed batch process (synthesis or formulation), PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing), PROC13 Treatment of articles by immersion and casting <40% Aqueous solution

Product characteristics

Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	<40%, Aqueous solution

Frequency and duration of use

Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

Technical conditions and precautions

with local extraction ventilation system

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable work clothing, Safety shoes. Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

8.3 Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC7	local PEC	Fresh water	0.73 mg/l	0.811
		Fresh water sediment	0.622 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.0811
		Marine sediment	0.0622 mg/kg (dry material)	0.0812
		Farming land	0.000003 mg/kg (pp)	< 0.00001
		Meadow	0.000003 mg/kg (pp)	< 0.00001
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR
PROC3, PROC8b, PROC9, PROC13		Worker - inhalatory, long-term - systemic	0.01 mg/m^3	0.007
PROC8b, PROC9, PROC13		Worker - inhalatory, short-term - local	0.02 mg/m^3	0.008

RCR = Risk characterisation report

ERC7	Exposure Assessment Method: EUSES v2.1
PROC3, PROC8b, PROC9, PROC13	Exposure Assessment , Method: MEASE
PROC8b, PROC9, PROC13	Exposure Assessment , Method: MEASE

8.4 Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented. Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.

25 ES9 : INDUSTRIAL USE, SEMICONDUCTOR IN THE ELECTRONICS AND SOLAR INDUSTRY

9.1 Description of the situation

Main user groups	**SU 3**	Industrial uses: uses of substances as such or in preparations at industrial sites
Environmental release category	**ERC6b**	Industrial use of reactive technological aids
Process category	**PROC1**	Use in a closed process, exposure unlikely
	PROC2	Use in a closed, continuous process with occasional controlled exposure
	PROC3	Use in a closed batch process (synthesis or formulation)
	PROC4	Use in batch and other processes (synthesis), where opportunities for exposure occur
	PROC8b	Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities
	PROC9	Transfer of a substance or preparation into small containers (dedicated filling line, including weighing)
Product category	**PC15**	Products for the treatment of non-metallic surfaces

9.2 Conditions of use with effects on exposure

9.2.1 Contributing scenario that controls environmental exposure for: ERC6b Industrial use of reactive technological aids

Product characteristics	Includes percentages of substance in the product up to 100%
Concentration of the substance in the Mixture/Article	(unless otherwise stated).
Quantity	
Daily local emission into waste water	0 kg
Concentration after maximum dilution for use	7.3 mg/l
Environmental factors	
flow rate	20,000 m3/d
Dilution factor (River)	10
Other determined operating conditions involving environmental exposure	
Number of days of emission per year	100
Emission or Release Factor: Air	0.001 %
Technical conditions and precautionary measures/organisational measures	
Air	Use in a closed gas extractor system Efficiency (of a precautionary measure) 99%
Water	Chemical precipitation
Conditions and measures concerning the waste water treatment plant	
Type of waste water treatment plant	none

9.2.2 Contributing scenario that controls worker exposure for: PROC2 Use in a closed, continuous process with occasional controlled exposure, PROC3 Use in a closed batch process (synthesis or formulation), PROC4 Use in batch and other processes (synthesis), where opportunities for exposure occur, PROC8b Transfer of a substance or preparation (filling/emptying) from/to vessels/large containers in dedicated facilities, PROC9 Transfer of a substance or preparation into small containers (dedicated filling line, including weighing) 40-85%, aqueous solution

Product characteristics	
Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	40-85%, aqueous solution
Frequency and duration of use	
Frequency of use	220 days/year
Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).
Human factors not influenced by risk management	
Respiratory volume	10 m3
Other operating conditions affecting the exposure of workers	
outdoors / indoors	indoors
Remarks	Use in a closed process

Organisational measures to avoid/limit spills, dispersion and exposure

It is assumed that good basic occupational hygiene standards are applied.

Conditions and measures concerning personal protection, hygiene and health assessment

Wear suitable work clothing, Safety shoes. Wear suitable gloves tested with EN374, Protective visor, respiratory protective equipment Do not eat, drink or smoke during work, Wash thoroughly after handling.

9.2.3 Contributing scenario that controls worker exposure for: PROC1 Use in a closed process, exposure unlikely

Product characteristics	
Concentration of the substance in the Mixture/Article	Includes percentages of substance in the product up to 100% (unless otherwise stated).
Physical Form (at the time of use)	gaseous, Anhydrous form
Frequency and duration of use	
Frequency of use	220 days/year

Remarks	Includes daily exposures of up to 8 hours (unless indicated otherwise).

Human factors not influenced by risk management

Respiratory volume	10 m3

Other operating conditions affecting the exposure of workers

outdoors / indoors	indoors
Remarks	Use in a closed process

9.3 Exposure assessment and reference to its origin

Environment

Emission factor	Type of value	Compartment	Environmental exposure	RCR
ERC6b	local PEC	Fresh water	0.73 mg/l	0.811
		Fresh water sediment	0.641 mg/kg (dry material)	0.812
		Sea water	0.073 mg/l	0.0811
		Marine sediment	0.0641 mg/kg (dry material)	0.0812
		Farming land	0.0000009 mg/kg (pp)	< 0.00001
		Meadow	0.0000009 mg/kg (pp)	< 0.00001
		STP	7.3 mg/l	0.143

Human health

Contributing scenario	Specific conditions	Type of value	Exposure level	RCR
PROC2		Worker - inhalatory, long-term - systemic	0.102 mg/m^3	0.068
PROC3, PROC4		Worker - inhalatory, long-term - systemic	0.204 mg/m^3	0.136
PROC8b		Worker - inhalatory, long-term - systemic	0.092 mg/m^3	0.061
PROC9		Worker - inhalatory, long-term - systemic	0.409 mg/m^3	0.273
PROC8b		Worker - inhalatory, short-term - local	0.818 mg/m^3	0.327
PROC9		Worker - inhalatory, short-term - local	0.02 mg/m^3	0.008
PROC1		Worker - inhalatory, long-term - systemic	0.008 mg/m^3	0.005

RCR = Risk characterisation report

ERC6b Exposure Assessment Method: EUSES v2.1
PROC2 Exposure Assessment Method: MEASE
PROC3, PROC4 Exposure Assessment Method: MEASE
PROC8b Exposure Assessment Method: MEASE
PROC9 Exposure Assessment Method: MEASE
PROC8b Exposure Assessment Method: MEASE
PROC9 Exposure Assessment Method: MEASE
PROC1 Exposure Assessment Method: MEASE

9.4 Guide for downstream users to assess whether they are working within the limits set by the Exposure Scenario

Expected exposures should not exceed the DN(M)EL when the risk management measures/operating conditions outlined in Section 2 are implemented.
Where other risk management measures/operational conditions are adopted, users should ensure risk management to at least equivalent levels.