

Zinc sulphate monohydrate

Material number Z005

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SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifier**

Trade name: Zinc sulphate monohydrate

REACH registration No.: 01-2119474684-27-0000

CAS-Number: 7446-19-7

EC-number: 231-793-3

EU index number: 030-006-00-9

1.2 Relevant identified uses of the substance or mixture and uses advised againstGeneral use: Chemical basic material.
For industrial purposes only

Identified uses:

Industrial use:

- | | | |
|---|---|---------|
| 0 | Generic exposure scenario: Industrial use of primary or secondary zinc bearing material in manufacture of Zinc sulphate in several process steps, collection of the substance
SU 0,2a,3,8,9,10; PROC 2,3,5,8b,9,22,26; PC 19,20,21; ERC 1 | Page 12 |
| 1 | Generic exposure scenario: Industrial use of Zinc sulphate formulation into mixture by mixing thoroughly, dry or solvent, the starting materials with potentially pressing, pelletising, sintering possibly followed by packing
SU 2a,3,8,9,10; PROC 1,2,3,4,5,8b,9,13,14,15,22; ERC 1,2 | Page 17 |
| 2 | Generic exposure scenario: Industrial use of Zinc sulphate and Zinc sulphate-composition manufacture of other inorganic or organic zinc substances in a solvent-based matrix with potentially filtering and packaging
SU 0,3,8,9,10,14,15,17; PROC 1,2,3,4,8b,9,13,15,21,22,23,26; PC 7,14,19,20,21,24,29,39; AC 2,7,12-2; ERC 1,2,5,6a | Page 22 |
| 3 | Generic exposure scenario: Professional use and industrial use of Zinc sulphate, use as laboratory reagent, in organic materials, water, for analysis and Chemicals which are used in the chemicals industry for synthesis processes
SU 3,10,22,24; PROC 1,2,3,4,5,8a,8b,9,10,15; PC 19,21,28,39; ERC 1,2,4,6a,6b,8a,8b,8d,9a | Page 27 |
| 4 | Generic exposure scenario: Industrial use of Zinc sulphate and Zinc sulphate-formulation into mixture as a component for the manufacture of solid blends and matrices for downstream user
SU 1,3,4,5,8,9,10,11,12,13,14,20; PROC 1,2,3,4,5,8b,9,13,14,15,22; PC 1,8,9a,9b,9c,12,14,15,18,20,21,26,28,29,32,35,37,39; ERC 1,2,3,4,5,7,8a,8b,8d,10a,10b | Page 32 |
| 5 | Generic exposure scenario: Industrial use of Zinc sulphate and Zinc sulphate. component for the manufacture of dispersions, pastes, or other viscous or polymerised matrices
SU 3,4,5,6b,7,8,9,10,18,20; PROC 1,2,3,4,5,6,8b,9,10,13,14,15; PC 2,8,9a,9b,12,14,15,18,19,20,21,23,24,25,28,29,32,34,35,39,40; AC 1,2,7; ERC 1,2,3,4,5,6a,6b,6d,8a,8b,8d,9a,9b,10a,10b,11a | Page 38 |
| 6 | Generic exposure scenario: Industrial and professional use of solid substrates with < 25 % w/w Zinc sulphate.
SU 3,5,6b,9,10,22; PROC 4,5,6,8b,9,10,11,13,19; PC 1,8,9a,9b,9c,14,15,18,20,21,28,29,35,39; AC 0; ERC 8a,8d,10a,11a | Page 44 |



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Professional use:

- | | | |
|---|--|---------|
| 3 | Generic exposure scenario: Professional use and industrial use of Zinc sulphate, use as laboratory reagent, in organic materials, water, for analysis and Chemicals which are used in the chemicals industry for synthesis processes
SU 3,10,22,24; PROC 1,2,3,4,5,8a,8b,9,10,15; PC 19,21,28,39; ERC 1,2,4,6a,6b,8a,8b,8d,9a | Page 27 |
| 6 | Generic exposure scenario: Industrial and professional use of solid substrates with < 25 % w/w Zinc sulphate.
SU 3,5,6b,9,10,22; PROC 4,5,6,8b,9,10,11,13,19; PC 1,8,9a,9b,9c,14,15,18,20,21,28,29,35,39; AC 0; ERC 8a,8d,10a,11a | Page 44 |
| 7 | Generic exposure scenario: Industrial and professional use of dispersions, pastes and polymerised substrates with < 25 % w/w Zinc sulphate
SU 9,20,22; PROC 8b,9,10,11,13; PC 8,20,21,28,29,35,39; ERC 8a | Page 53 |

Consumer use:

- | | | |
|---|---|---------|
| 8 | Generic exposure scenario, consumers: combined for all exposure routes
SU 21 | Page 60 |
|---|---|---------|

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Summary of registered and identified uses and their respective exposure scenarios:

- IU 1, Manufacture of Zinc sulphate, wet: GESZnSO4 0
- IU 5, Component for production of inorganic zinc compounds: GESZnSO4 2
- IU 6, Electro-galvanising: GESZnSO4 2
- IU 7, Electroplating: GESZnSO4 2
- IU 8, Zinc production by electrowinning: GESZnSO4 2
- IU 9, Use as laboratory reagent: GESZnSO4 3
- IU 10, Ore dressing (mining metallurgy): GESZnSO4 0, GESZnSO4 1
- IU 11, Zinc production by pyrometallurgy: GESZnSO4 2
- IU 12, Component for production of organic zinc compounds: GESZnSO4 2
- IU 13, Component for production of inorganic pigments, i.e. Lithopones: GESZnSO4 1, GESZnSO4 4
- IU 14, Component for production of coatings/paints, inks, enamels, varnishes: GESZnSO4 1, GESZnSO4 4
- IU 15, Component for production of surface treatment preparations: GESZnSO4 1, GESZnSO4 4
- IU 16, Component for paper coating: GESZnSO4 1, GESZnSO4 5
- IU 17, Use of ZnSO4-containing paper coatings: GESZnSO4 6
- IU 18, Component for textile and leather coating/treatment: GESZnSO4 1, GESZnSO4 5
- IU 19, Use of ZnSO4-containing textile and leather coatings: GESZnSO4 6
- IU 20, Additive for the production of lubricants/grease/metal working fluids: GESZnSO4 1, GESZnSO4 5
- IU 21, Use of ZnSO4-containing lubricants/grease/metal working fluids: Generic consumer/environment
- IU 22, Use of ZnSO4-containing catalysts: GESZnSO4 1, GESZnSO4 5
- IU 23, Additive for the formulation of animal feedstuffs, nutrients: GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
- IU 24, Additive for the formulation of biocidal products: GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
- IU 25, Additive for the formulation of cleaning products: GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
- IU 26, Use of ZnSO4-containing cleaning products: GESZnSO4 6, GESZnSO4 7, Generic consumer/environment
- IU 27, Additive for the formulation of fertilizers: GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
- IU 28, Use of ZnSO4-containing fertilizer's formulations: Generic consumer/environment
- IU 29, Additive in the formulation of cosmetics: GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
- IU 30, Use of cosmetics: GESZnSO4 6, GESZnSO4 7, Generic consumer/environment
- IU 31, Additive in the formulation of pharma/veterinary products: GESZnSO4 1, GESZnSO4 4, GESZnSO4 5
- IU 32, Use of pharma/veterinary products: GESZnSO4 6, GESZnSO4 7, Generic consumer/environment

1.3 Details of the supplier of the safety data sheet

Company name: Grillo-Werke Aktiengesellschaft

Street/POB-No.: Weseler Str.1

Postal Code, city: 47169 Duisburg
Germany

WWW: www.grillo.de

E-mail: chemie@grillo.de

Telephone: +49 203 5557-1

Dept. responsible for information:

Telephone: +49 203 5557-297, Herr Dr. Ingo Biertümpel, Email: i.biertuempel@grillo.de

1.4 Emergency telephone number

InfraServ GmbH & Co. Höchst KG, Frankfurt, Germany
(in German and English)
Telephone: +49 69 3056418

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to EC regulation 1272/2008 (CLP)

Acute Tox. 4; H302 Harmful if swallowed.
Eye Dam. 1; H318 Causes serious eye damage.
Aquatic Acute 1; H400 Very toxic to aquatic life. M-factor = 1
Aquatic Chronic 1; H410 Very toxic to aquatic life with long lasting effects. M-factor = 1

2.2 Label elements

Labelling (CLP)



Signal word:

Danger

Hazard statements:

H302 Harmful if swallowed.
H318 Causes serious eye damage.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statements:

P273 Avoid release to the environment.
P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
P351 Rinse cautiously with water for several minutes.

2.3 Other hazards

No risks worthy of mention.

Results of PBT and vPvB assessment:

This substance does not meet the PBT/vPvB criteria of REACH, Annex XIII.

SECTION 3: Composition / information on ingredients

3.1 Substances

Chemical characterisation: Zn SO₄ * H₂O

CAS-Number: 7446-19-7

EC-number: 231-793-3

EU index number: 030-006-00-9

Customs tariff number: 2833 29 20

SECTION 4: First aid measures

4.1 Description of first aid measures

In case of inhalation: Move victim to fresh air. Care for immobility and protect against heat loss.
In case of irregular breathing or respiratory arrest provide artificial respiration.

Following skin contact: Change contaminated clothing. Remove residues with water.



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After eye contact: Immediately flush eyes with plenty of flowing water for 10 to 15 minutes holding eyelids apart. Subsequently consult an ophthalmologist.

After swallowing: Rinse mouth immediately and drink plenty of water.
Seek medical attention.

4.2 Most important symptoms and effects, both acute and delayed

In case of inhalation: May cause irritations.

Cough, sore throat, shortage of breath.

In case of ingestion: Abdominal pain, diarrhoea, nausea, vomiting.

After contact with skin: Irritation and redness may occur.

4.3 Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media:

Product is non-combustible. Extinguishing materials should therefore be selected according to surroundings.

5.2 Special hazards arising from the substance or mixture

May form dangerous gases and vapours in case of fire.

5.3 Advice for firefighters

Special protective equipment for firefighters:

Wear self-contained breathing apparatus.

Additional information:

Hazchem-Code: 2Z

Do not allow fire water to penetrate into surface or ground water.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid generation of dust. Do not breathe dust. Provide adequate ventilation. Wear personal protection equipment.

6.2 Environmental precautions

Do not allow to penetrate into soil, waterbodies or drains.

6.3 Methods and material for containment and cleaning up

Take up mechanically, placing in appropriate containers for disposal.

6.4 Reference to other sections

Refer additionally to section 8 and 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advices on safe handling: Provide adequate ventilation, and local exhaust as needed. Avoid generation of dust.
Avoid contact with the substance.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storerooms and containers:

Keep container tightly closed.

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7.3 Specific end use(s)

No information available.

SECTION 8: Exposure controls/personal protection**8.1 Control parameters**

Additional information: Contains no substances with occupational exposure limit values.

DNEL/DMEL: DNEL workers and consumers:
DNEL oral, Zn soluble: 0.83 mg Zn/kg bw/d
DNEL oral, Zn insoluble: 0.83 mg Zn/kg bw/d
DNEL dermal, Zn soluble: 8.3 mg Zn/kg bw/d
DNEL dermal, Zn insoluble: 83 mg Zn/kg bw/d

DNEL workers, inhalative, Zn soluble: 1 mg Zn/m³
DNEL workers, inhalative, Zn insoluble: 5 mg Zn/m³
DNEL consumers, inhalative, Zn soluble: 1.3 mg Zn/m³
DNEL consumers, inhalative, Zn insoluble: 2.5 mg Zn/m³

PNEC: PNEC water (freshwater): 20.6 µg Zn/L
PNEC water (marine water): 6.1 µg Zn/L
PNEC sediment (freshwater): 235.6 mg Zn/kg dw
PNEC sediment (marine water): 113 mg Zn/kg dw
PNEC soil: 106.8 mg Zn/kg dw
PNEC sewage treatment plant: 52 µg Zn/L

8.2 Exposure controls

Use local exhaust complete with an appropriate filter system. Air cyclones for dust collection.
use in contained systems

Personal protection equipment**Occupational exposure controls**

Respiratory protection: In case of dust formation: Particulates filter P2 according to EN 143.

Hand protection: Protective gloves according to EN 374.
Glove material: nitrile rubber-Layer thickness: 0.11 mm
Breakthrough time: >480 min.
Observe glove manufacturer's instructions concerning penetrability and breakthrough time.

Eye protection: Tightly sealed goggles according to EN 166.

Body protection: Wear suitable protective clothing.

General protection and hygiene measures:
When using do not eat, drink or smoke. Wash hands before breaks and after work.

SECTION 9: Physical and chemical properties**9.1 Information on basic physical and chemical properties**

Appearance: Form: solid, powder
Colour: white

Odour: odourless

Odour threshold: No data available

pH value: No data available



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Melting point/freezing point:	1013 hPa, Air: > 229 °C (Decomposition)
Initial boiling point and boiling range:	No data available
Flash point/flash point range:	not combustible
Evaporation rate:	No data available
Flammability:	No data available
Explosion limits:	No data available
Vapour pressure:	No data available
Vapour density:	No data available
Density:	at 20 °C: 3.35 g/cm ³
Water solubility:	at 20 °C: 210 g/L
Partition coefficient: n-octanol/water:	No data available
Auto-ignition temperature:	No data available
Decomposition temperature:	> 240 °C: Zinc sulphate, anhydrous > 680 °C: Formation of Sulphur trioxide
Viscosity, kinematic:	No data available
Explosive properties:	No data available
Oxidizing characteristics:	No data available

9.2 Other information

Bulk density:	approx. 1400 kg/m ³
Additional information:	Molar mass: 179.45 g/mol

SECTION 10: Stability and reactivity

10.1 Reactivity

No dangerous reactions are known.

10.2 Chemical stability

Product is stable under normal storage conditions.

10.3 Possibility of hazardous reactions

No dangerous reactions are known.

10.4 Conditions to avoid

Protect from excessive heat.

10.5 Incompatible materials

No data available

10.6 Hazardous decomposition products

Thermal decomposition:	In case of fire may be liberated: Sulphur oxides > 240 °C: Zinc sulphate, anhydrous > 680 °C: Formation of Sulphur trioxide
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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity:	LD50 Rat, oral: 574 - 2949 mg/kg LD50 Rat, dermal: > 2000 mg/kg
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Toxicological effects:

- Acute toxicity (oral): Acute Tox. 4; H302 = Harmful if swallowed.
- Acute toxicity (dermal): Based on available data, the classification criteria are not met.
- Acute toxicity (inhalative): Based on available data, the classification criteria are not met.
- Skin corrosion/irritation: Based on available data, the classification criteria are not met.
- Serious eye damage/irritation: Eye Dam. 1; H318 = Causes serious eye damage.
- Sensitisation to the respiratory tract: Based on available data, the classification criteria are not met.
- Skin sensitisation: Based on available data, the classification criteria are not met.
- Germ cell mutagenicity/Genotoxicity: Based on available data, the classification criteria are not met.
- Carcinogenicity: Based on available data, the classification criteria are not met.
- Reproductive toxicity: Based on available data, the classification criteria are not met.
- Effects on or via lactation: Based on available data, the classification criteria are not met.
- Specific target organ toxicity (single exposure): Based on available data, the classification criteria are not met.
- Specific target organ toxicity (repeated exposure): Based on available data, the classification criteria are not met.
- Aspiration hazard: Based on available data, the classification criteria are not met.

Symptoms

In case of inhalation: May cause irritations.
Cough, sore throat, shortage of breath.
In case of ingestion: Abdominal pain, diarrhoea, nausea, vomiting.
After contact with skin: Irritation and redness may occur.

SECTION 12: Ecological information**12.1 Toxicity**

Aquatic toxicity: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
pH < 7: EC50 Ceriodaphnia dubia: 1.13 mg/Zn/L/48h (US EPA 821-R-02-012)
pH > 7: EC50 Selenastrum capricornutum: 3.73 mg/Zn/L/72h (OECD 201)
M-factor: 1

12.2 Persistence and degradability

Further details: Methods for the determination of biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Significant bioaccumulation potential is not to be expected.
Partition coefficient: n-octanol/water:
No data available

12.4 Mobility in soil

Kp solids-water: 158.5 L/kg

12.5 Results of PBT and vPvB assessment

This substance does not meet the PBT/vPvB criteria of REACH, Annex XIII.

12.6 Other adverse effects

General information: Do not allow to enter into ground-water, surface water or drains.
Danger to drinking water.

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product**

Waste key number: 06 03 13* = Solid salts and solutions containing heavy metals
* = Evidence for disposal must be provided.

Recommendation: Incinerate according to applicable local, state and federal regulations.

Contaminated packaging

Recommendation: Dispose of waste according to applicable legislation.

Additional information

Discharge into the environment must be avoided.

SECTION 14: Transport information**14.1 UN number**

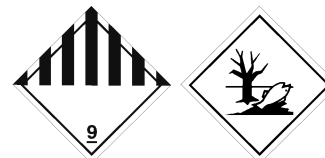
ADR/RID, IMDG, IATA-DGR:
UN 3077

14.2 UN proper shipping name

ADR/RID, IMDG, IATA-DGR:
UN 3077, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
(Zinc sulphate monohydrate)

14.3 Transport hazard class(es)

ADR/RID: Class 9, Code: M7
IMDG: Class 9, Subrisk -
IATA-DGR: Class 9

**14.4 Packing group**

ADR/RID, IMDG, IATA-DGR:
III

14.5 Environmental hazards

Marine pollutant: yes

14.6 Special precautions for user**Land transport (ADR/RID)**

Warning board: ADR/RID: Kemmler-number 90, UN number UN 3077
Hazard label: 9
Special provisions: 274 335 375 601
Limited quantities: 5 kg
EQ: E1
Contaminated packaging - Instructions: P002 IBC08 LP02 R001
Contaminated packaging - Special provisions: PP12 B3
Special provisions for packing together: MP10
Portable tanks - Instructions: T1 BK1 BK2 BK3
Portable tanks - Special provisions: TP33
Tank coding: SGAV LGBV
Tunnel restriction code: -

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Sea transport (IMDG)

EmS: F-A, S-F
Special provisions: 274, 335, 966, 967, 969
Limited quantities: 5 kg
Excepted quantities: E1
Contaminated packaging - Instructions: P002, LP02
Contaminated packaging - Provisions: PP12
IBC - Instructions: IBC08
IBC - Provisions: B3
Tank instructions - IMO: -
Tank instructions - UN: T1, BK2, BK2, BK3
Tank instructions - Provisions: TP33
Stowage and handling: Category A. SW23
Properties and observations: -
Segregation group: none

Air transport (IATA)

Hazard label: Miscellaneous
Excepted Quantity Code: E1
Passenger and Cargo Aircraft: Ltd.Qty.: Pack.Instr. Y956 - Max. Net Qty/Pkg. 30 kg G
Passenger and Cargo Aircraft: Pack.Instr. 956 - Max. Net Qty/Pkg. 400 kg
Cargo Aircraft only: Pack.Instr. 956 - Max. Net Qty/Pkg. 400 kg
Special provisions: A97 A158 A179 A197
Emergency Response Guide-Code (ERG): 9L

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

No data available

SECTION 15: Regulatory information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture****National regulations - Great Britain**

Hazchem-Code: 2Z
No data available

National regulations - EC member states**Labelling of packaging with <= 125mL content**

Signal word: **Danger**
Hazard statements: H302 Harmful if swallowed.
H318 Causes serious eye damage.
Precautionary statements: P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
P351 Rinse cautiously with water for several minutes.

15.2 Chemical Safety Assessment

For this substance a chemical safety assessment has been carried out.



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SECTION 16: Other information

Further information

Reason of change: Changes in section 2: Labelling (P-phrases: EU, ATP 8)
Date of first version: 26/6/2011

Department issuing data sheet

Contact person: see section 1: Dept. responsible for information

For abbreviations and acronyms, see: ECHA Guidance on information requirements and chemical safety assessment, chapter R.20 (Table of terms and abbreviations).

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product stated in this safety data sheet with other products or in the case of processing the information in this safety data sheet cannot be transferred to the new material unless specifically stated otherwise in the text.

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Exposure Scenario 0:
Generic exposure scenario: Industrial use of primary or secondary zinc bearing material in manufacture of Zinc sulphate in several process steps, collection of the substance

List of use descriptors

Sector of uses [SU]:	SU2a: Mining (without offshore industries) SU3: Industrial uses SU8: Manufacture of bulk, large scale chemicals (including petroleum products) SU9: Manufacture of fine chemicals SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys) SU0: Other
Product Categories:	PC19: Intermediate (precursor) PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents PC21: Laboratory chemicals

Application

Activities and processes: Manufacture of Zinc sulphate includes:
Reception of zinc-bearing materials (e.g.: the Intermediate Zinc sulphate solution), and transfer to the reaction tank (sulphate media).
Transfer of the primary materials into the mixing tank. Leaching reaction is kept at proper pH and temperature.
Separation of the leach residue occurs in covered settlers, if needed, the leachate may be filtered on adapted filters.
Purification steps will be applied sequentially, if needed:
1. Oxidation of some of the present elements (air/oxygen), followed by another sedimentation or filtration step
2. Hydrolysis of some of the present elements with ZnO, followed by another sedimentation or filtration step
3. Cementation of some of the present elements with zinc powder followed by another sedimentation or filtration step
Concentration by water evaporation under exhaust hood.
Pouring on a cooling belt.
Crystallisation and occasionally drying, in closed reactor.
Discharge and packaging of produced zinc sulphate crystals. Workers have to place and adjust the bag or drum under the discharge pipe and to set the process in motion. Filled bags or drums are subsequently closed and carried to the storage area.
Exposure to dust can occur during packing of the powder. Solutions are packed in intermediate bulk containers. Solids are packed in bags or drums.
Maintenance and service.

Contributing Scenarios:	1 Industrial use of primary or secondary zinc bearing material in manufacture of Zinc sulphate. (environment)	Page 12
	2 Industrial use of primary or secondary zinc bearing material in manufacture of Zinc sulphate. (worker)	Page 14

Contributing exposure scenario 1

Industrial use of primary or secondary zinc bearing material in manufacture of Zinc sulphate. (environment)**List of use descriptors**

Environmental release categories [ERC]:
ERC1: Manufacture of the substance

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Operational conditions

Concentration of the substance in a mixture:

Purity Minimum: 80 % Zinc sulphate
Purity Normally: > 95 % Zinc sulphate
Amounts used: 12500 t/y

Duration and frequency of use:

Continuous release

Environment factors not influenced by risk management:

Flow rate of receiving surface water.
Default is used unless specified otherwise.

Other relevant operational conditions:

Most of the operations are in wet phase.
Even when no process waters some non process water can be generated containing Zn (e.g. cleaning).
In enclosed areas: Indoor use. All residues are recycled.

Other information:

Methods used: ARCHE-tool; Zinc BLM-calculator.

Exposure prediction

Exposure estimation and reference to its source:

Predicted environmental concentration (PEC):
Water: < 0.0044 mg Zn/t
Sediment: < 156 mg Zn/kg/ dw
Floor: 41 mg Zn/kg/ dw
Sewage treatment plant: not applicable

Risk characterisation ratio (RCR):

Water: < 0.22
Sediment: < 0.67
Floor: 0.39
Sewage treatment plant: not applicable

Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Closed system.
With local exhaust ventilation.
Containment of liquid volumes in sumps to collect/prevent accidental spillage.
Characteristics of the surroundings: at temperatures 100 °C.
On-site waste water treatment. Prevent penetration into canalization, pits and cellars. e.g. precipitation, sedimentation of solids by filtration (efficiency of 90 - 99.8 %).
Careful use of Sulphuric acid and Sulfate solution.
Containment of liquid volumes in sumps to collect/prevent accidental spillage.
Measures to limit air emissions:
Wet scrubber for dust elimination of waste gases (efficiency of 50 - 99%).
Fabric filter (efficiency of < 99%).

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.
Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO 1400X
Good hygiene practices and housekeeping measures:
1. Educate and train employees in safe use of product.
2. Regular cleaning of equipment. Regular cleaning of work area.
3. Procedures for process control and maintenance
Treatment and monitoring of releases to outside air, and exhaust gas streams (process and hygiene) according to national regulation.
Consider compliance with applicable regulations. SEVESO 2.

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Disposal considerations

Conditions and measures related to sewage treatment plant:

Separation by sedimentation, precipitation, filtration: Estimated substance removal from wastewater via domestic sewage treatment.

Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to external treatment of waste for disposal:

External treatment and disposal of waste should comply with applicable local and/or national regulations.

Do not allow to enter into ground-water, surface water or drains.

Daily yearly use/Product waste:

Zinc manufacturer = 3.1 %

Zinc-Mixture manufacturer: 0.056 %

Downstream user: 0.30 %

Hazardous waste incineration: If recycling is not possible, dispose of according to local waste laws and regulations (information requirements of authorities).

Conditions and measures related to external recovery of waste:

All residues from the wet process are recycled.

By-products from the dry process that are formed in the reactor, are recovered and either recycled in the system or handled further according the waste legislation.

Users of Zn have to favour the recycling channels of the end-of-life products. Users of Zn have to minimize waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

Contributing exposure scenario 2

Industrial use of primary or secondary zinc bearing material in manufacture of Zinc sulphate. (worker)**List of use descriptors**

Process categories [PROC]:

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC5: Mixing or blending in batch processes

PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)

PROC22: Manufacturing and processing of minerals and/or metals at substantially elevated temperature

PROC26: Handling of solid inorganic substances at ambient temperature

Operational conditions

Product characteristics: Hygroscopic, crystalline, dust-free

Particle size distribution (median value): 0.1 - 0.5 mm (heptahydrate); 0.005 - 0.170 mm (monohydrate)

Level of dustiness: 26.7 mg/g (monohydrate); 0.25 mg/g (hexahydrate)

Amounts used (maximum): 96 t/d; 32 t/full shift

Concentration of the substance in a mixture:

approx. 75 % Zinc sulphate: Hexahydrate and heptahydrate (crystalline)

Duration and frequency of use:

8h/d (full shift)

Human factors not influenced by risk management:

Potentially exposed body parts: face

Absorption (dermal): 0.2 %

Absorption (inhalative): 100 % (40 % Zinc sulphate, 40 % Zinc chloride, 20 % Zinc oxide)

Respiration volume under conditions of use: 10 m³/full shift

Other relevant operational conditions:

Indoor use.

Processing temperature: up to 100 °C.

Assumes a good basic standard of occupational hygiene is implemented.



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Exposure prediction

Exposure estimation and reference to its source:

Inhalative (systemic):

3.6 mg/d for the production of monohydrate

0.8 mg/d for the production of hexahydrate

Inhalative (zinc in workplace):

0,9 mg/m³ for the production of monohydrate

0,2 mg/m³ for the production of hexahydrate

Dermal (systemic):

2.1 mg/d for the production of monohydrate

1.6 mg/d for the production of hexahydrate

Risk characterisation ratio (RCR):

Inhalative (systemic):

0.4 for the production of monohydrate

0.08 for the production of hexahydrate

Inhalative (zinc in workplace):

0.9 for the production of monohydrate

0.2 for the production of hexahydrate

Total (systemic):

0.6 for the production of monohydrate

0.24 for the production of hexahydrate

Zinc sulphate monohydrate

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

- Use local exhaust.
- Enclosed, semi-closed process.
- Careful use of sulphuric acid, Sulfate solution.
- Containment of liquid volumes in sumps to collect/prevent accidental spillage.
- Provide a good standard of controlled ventilation.
- Local exhaust ventilation - efficiency of at least [%]: 90 - 95 (Worst case assumption: [%]: 84).
- Avoid generation of dust.
- In case of dust formation:
 - Air cyclones for dust collection (Efficiency of 70 - 90 %).
 - Filter (Efficiency of 50 - 80 %).
 - Two stage dust filter (Efficiency of 85 - 95 %).
 - Process enclosure, especially in potentially dusty units.
 - Workplace measurements: zinc dust and dust according to national regulation.
 - Equipment cleaning and maintenance.
 - Storage according to national regulation.

Operational conditions and risk management measures:

- In general emissions are controlled and prevented by implementing an integrated management system.
- Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100
- Educate and train employees in safe use of product.
- procedures for control of personal exposure.
- Regular cleaning of equipment and floor.
- procedures for process control and maintenance.
- Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

- Wear protective gloves/protective clothing. (efficiency of ≥ 90 %).
- In case of prolonged exposure: Respiratory protection mask with adequate filter:
 - Half mask with particle filter P1 according to EN 143. (efficiency of 75%)
 - Half mask with particle filter P2 according to EN 143. (efficiency of 90%)
 - Half mask with particle filter P3 according to EN 143. (efficiency of 95%)
 - Filtering device (full mask or mouthpiece) with filter P1 (efficiency of 75%)
 - Filtering device (full mask or mouthpiece) with filter P2 (efficiency of 90%)
 - Filtering device (full mask or mouthpiece) with filter P3 (efficiency of 97,5%)
- Eyes:
 - Although not required under normal conditions, we recommend the use of suitable protection goggles.

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

not applicable

Zinc sulphate monohydrate

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Exposure Scenario 1:
Generic exposure scenario: Industrial use of Zinc sulphate formulation into mixture by mixing thoroughly, dry or solvent, the starting materials with potentially pressing, pelletising, sintering possibly followed by packing

List of use descriptors

Sector of uses [SU]: SU2a: Mining (without offshore industries)
SU3: Industrial uses
SU8: Manufacture of bulk, large scale chemicals (including petroleum products)
SU9: Manufacture of fine chemicals
SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)

Application

Activities and processes: Removal of the packaging, storage (vessels).
Discharge from a silo, dosing and addition of the other reagents.
According to the manufacturer's instructions mixing. Perform the process in a closed tank/container (Mixing).
Mixture (solvent/paste) ready-to-use condition, can be packaged for later use.

Contributing Scenarios:	1	Industrial use of Zinc sulphate formulation into mixture by mixing thoroughly, dry or solvent, the starting materials with potentially pressing, pelletising, sintering possibly followed by packing (environment)	Page 17
	2	Industrial use of Zinc sulphate: Formulation into mixture; by mixing thoroughly, dry or solvent, the starting materials with potentially pressing, pelletising, sintering possibly followed by packing (worker)	Page 19

Contributing exposure scenario 1

Industrial use of Zinc sulphate formulation into mixture by mixing thoroughly, dry or solvent, the starting materials with potentially pressing, pelletising, sintering possibly followed by packing (environment)**List of use descriptors**

Environmental release categories [ERC]:
ERC1: Manufacture of the substance
ERC2: Formulation into mixture

Operational conditions

Product characteristics: Wet/dry.
Amounts used: Maximum 5.000 t/y

Concentration of the substance in a mixture:
Purity: Minimum: 80 % Zinc sulphate
Purity: Normally: > 95 % Zinc sulphate

Duration and frequency of use:
Worst case assumption: continuous process
Sporadic release, none continuous release (where there is potential for exposure).

Environment factors not influenced by risk management:
Water-flow rate: 18.000 m³/d (unless otherwise stated).

Other relevant operational conditions:
In enclosed areas: indoor use. All residues are recycled (Contains Zn).
Even when no process waters some non process water can be generated containing Zn (e.g. cleaning).

Other information: Methods used: Zinc BLM-calculator.

Zinc sulphate monohydrate

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Exposure prediction

Exposure estimation and reference to its source:

Predicted environmental concentration (PEC):

Water: <0.0034 mg Zn/L

Sediment: 45 mg Zn/kg/ dw

Floor: 41 mg Zn/kg/ dw

Sewage treatment plant: 0 mg Zn/L

Risk characterisation ratio (RCR):

Water: < 0.16

Sediment: 0.19

Floor: 0.39

Sewage treatment plant: 0 mg Zn/L

Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Ensure adequate ventilation, especially in confined areas.

Closed system with local exhaust ventilation.

Containment of liquid volumes in sumps to collect/prevent accidental spillage.

On-site waste water treatment.

Prevent penetration into canalization, pits and cellars. e.g. precipitation, sedimentation of solids by filtration (efficiency of 90 - 99,8 %).

Measures to limit air emissions:

Wet scrubber for dust elimination of waste gases (efficiency of 50 - 99%).

Fabric filter (efficiency of < 99%).

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.

Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO 1400X

Good hygiene practices and housekeeping measures:

1. Educate and train employees in safe use of product.
2. Regular cleaning of equipment. Regular cleaning of work area.
3. Procedures for process control and maintenance

Treatment and monitoring of releases to outside air, and exhaust gas streams (process and hygiene) according to national regulation.

Consider compliance with applicable regulations. SEVESO 2.

Zinc sulphate monohydrate

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Disposal considerations

Conditions and measures related to sewage treatment plant:

Separation by sedimentation, precipitation, filtration.
Estimated substance removal from wastewater via domestic sewage treatment.
Sludge should be incinerated, contained or reclaimed.
In cases where applicable: Default size (Default is used unless specified otherwise.)

Conditions and measures related to external treatment of waste for disposal:

External treatment and disposal of waste should comply with applicable local and/or national regulations.

Do not allow to enter into ground-water, surface water or drains.

Daily yearly use/Product waste:

Zinc manufacturer = 3.1 %

Zinc-Mixture manufacturer: 0.056 %

Downstream user: 0.30 %

Hazardous waste incineration: If recycling is not possible, dispose of according to local waste laws and regulations (information requirements of authorities).

Conditions and measures related to external recovery of waste:

All residues from the wet process are recycled.

By-products from the dry process that are formed in the reactor, are recovered and either recycled in the system or handled further according the waste legislation.

Users of Zn have to favour the recycling channels of the end-of-life products.

Users of Zn have to minimize waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

Do not allow to enter into ground-water, surface water or drains..

Contributing exposure scenario 2

Industrial use of Zinc sulphate: Formulation into mixture; by mixing thoroughly, dry or solvent, the starting materials with potentially pressing, pelletising, sintering possibly followed by packing (worker)

List of use descriptors

Process categories [PROC]:

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

PROC5: Mixing or blending in batch processes

PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)

PROC13: Treatment of articles by dipping and pouring

PROC14: Production of preparations or articles by tableting, compression, extrusion, pelletisation

PROC15: Use as laboratory reagent

PROC22: Manufacturing and processing of minerals and/or metals at substantially elevated temperature

Operational conditions

Product characteristics:

Mixture: liquid or solid

Solid: Glass, powder or pellets

Powder: high dustiness (worst case assumption)

Amounts used: 5000 t/y (Maximum): 14 t/d; 5 t/full shift (depending on the use).

Concentration of the substance in a mixture:

approx. <=5 % - > 25 % (application)

Duration and frequency of use:

8h/d (full shift) (worst case assumption)



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Human factors not influenced by risk management:

Potentially exposed body parts: face.

Other relevant operational conditions:

In enclosed areas: Indoor use.

Processing temperature: up to 100 °C.

Exposure prediction

Exposure estimation and reference to its source:

Inhalative (systemic):

0.9 mg/d for the production of monohydrate

0.2 mg/d for the production of hexahydrate

Inhalative (zinc in workplace):

3.6 mg/m³ for the production of monohydrate

0.8 mg/m³ for the production of hexahydrate

Dermal (systemic):

2.1 mg/d for the production of monohydrate

1.6 mg/d for the production of hexahydrate

Risk characterisation ratio (RCR):

Inhalative (systemic):

0.4 for the production of monohydrate

0.08 for the production of hexahydrate

Inhalative (zinc in workplace):

0.9 for the production of monohydrate

0.2 for the production of hexahydrate

Total (systemic):

0.6 for the production of monohydrate

0.24 for the production of hexahydrate

Zinc sulphate monohydrate

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

- Use local exhaust.
- Enclosed.
- Containment of liquid volumes in sumps to collect/prevent accidental spillage.
- Provide a good standard of controlled ventilation.
- Local exhaust ventilation - efficiency of at least [%]: 90 - 95.
- Avoid generation of dust.
- In case of dust formation:
 - Air cyclones for dust collection (Efficiency of 70 - 90 %).
 - Filter (Efficiency of 50 - 80 %).
 - Two stage dust filter (Efficiency of 85 - 95 %).
 - Process enclosure, especially in potentially dusty units.
 - Workplace measurements: zinc dust and dust according to national regulation.
 - Equipment cleaning and maintenance.
 - Storage according to national regulation.

Operational conditions and risk management measures:

- In general emissions are controlled and prevented by implementing an integrated management system.
- Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100
- Educate and train employees in safe use of product.
- Procedures for control of personal exposure.
- Regular cleaning of equipment and floor.
- Procedures for process control and maintenance.
- Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

- Wear protective gloves/protective clothing. (efficiency of ≥ 90 %)
- In case of prolonged exposure: Respiratory protection mask with adequate filter:
 - Half mask with particle filter P1 according to EN 143. (efficiency of 75%)
 - Half mask with particle filter P2 according to EN 143. (efficiency of 90%)
 - Half mask with particle filter P3 according to EN 143. (efficiency of 95%)
 - Filtering device (full mask or mouthpiece) with filter P1 (efficiency of 75%)
 - Filtering device (full mask or mouthpiece) with filter P2 (efficiency of 90%)
 - Filtering device (full mask or mouthpiece) with filter P3 (efficiency of 97,5%)
- Eyes:
 - Although not required under normal conditions, we recommend the use of suitable protection goggles.

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

not applicable

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Exposure Scenario 2:
Generic exposure scenario: Industrial use of Zinc sulphate and Zinc sulphate-composition manufacture of other inorganic or organic zinc substances in a solvent-based matrix with potentially filtering and packaging

List of use descriptors

Sector of uses [SU]:	SU3: Industrial uses SU8: Manufacture of bulk, large scale chemicals (including petroleum products) SU9: Manufacture of fine chemicals SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys) SU14: Manufacture of basic metals, including alloys SU15: Manufacture of fabricated metal products, except machinery and equipment SU17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment SU0: Other
Product Categories:	PC7: Base metals and alloys PC14: Metal surface treatment products PC19: Intermediate (precursor) PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents PC21: Laboratory chemicals PC24: Lubricants, greases, release products PC29: Pharmaceuticals PC39: Cosmetics, personal care products

Application

Activities and processes: Reception of zinc-bearing materials (e.g.: the Intermediate Zinc sulphate solution), and transfer to the reaction tank (sulphate media).
Sequential addition of reagents for purification steps, filtration.
Concentration by water evaporation under exhaust hood (optional).
Pouring on a cooling belt.
Discharge and packaging of produced zinc sulphate crystals. Workers have to place and adjust the bag or drum under the discharge pipe and to set the process in motion.
Filled bags or drums are subsequently closed and carried to the storage area.
Exposure to dust can occur during packing of the powder. Solutions are packed in intermediate bulk containers. Solids are packed in bags or drums.
Maintenance and service.
Electro-galvanising. The electro-galvanizing bath consists of one or more tanks. Is usually made of a ceramic material, contains Zinc sulphate (solid in solution).
Steel, Material(s) for galvanising surface coating: Zn"/"Fe-Zn-alloy.
Speed of the strip (up to 180 m/min). Short-term Exposure time: The coating consists of a thin layer.

Contributing Scenarios:	1	Industrial use of Zinc sulphate: manufacture of other inorganic or organic zinc substances in a solvent-based matrix with potentially filtering and packaging. (environment)	Page 23
	2	Industrial use of Zinc sulphate: manufacture of other inorganic or organic zinc substances in a solvent-based matrix with potentially filtering and packaging (worker)	Page 25



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Contributing exposure scenario 1

Industrial use of Zinc sulphate: manufacture of other inorganic or organic zinc substances in a solvent-based matrix with potentially filtering and packaging. (environment)

List of use descriptors

Environmental release categories [ERC]:

- ERC1: Manufacture of the substance
- ERC2: Formulation into mixture
- ERC5: Use at industrial site leading to inclusion into/onto article
- ERC6a: Use of intermediate

Operational conditions

Product characteristics: Solid or liquid.

Amounts used: up to: 75 t/d Zinc sulphate/Zn-compounds.

Concentration of the substance in a mixture:

> 99 % pure, or liquid (solution)

Duration and frequency of use:

Worst case assumption: continuous process.

Sporadic release, none continuous release (where there is potential for exposure).

Environment factors not influenced by risk management:

Water-flow rate: 18.000 m³/d (unless otherwise stated).

Other relevant operational conditions:

Wet formulation (extraction, filtration, cleaning), drying, packaging.

In enclosed areas: Indoor use.

Exposure prediction

Exposure estimation and reference to its source:

Predicted environmental concentration (PEC):

Water: < 0 mg/Zn/L

Sediment: 0 mg Zn/kg/ dw

Floor: 42 mg Zn/kg/ dw

Sewage treatment plant: 0 mg Zn/kg/ dw

Risk characterisation ratio (RCR):

Water: 0.22

Sediment: 0.71

Floor: 0.39

Sewage treatment plant: 0.57

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

- Careful use of Acids, Corrosive substances (in solution).
- Containment of liquid volumes in sumps to collect/prevent accidental spillage.
- Process waters need to be specifically treated before release.
- Dosing, packaging: Requires good ventilation.
- On-site waste water treatment.
- Prevent penetration into canalization, pits and cellars. e.g. precipitation, sedimentation of solids by filtration (efficiency of 90 - 99,8 %).
- Measures to limit air emissions:
 - Wet scrubber for dust elimination of waste gases (efficiency of 50 - 99%).
 - Fabric filter (efficiency of < 99%).

Operational conditions and risk management measures:

- In general emissions are controlled and prevented by implementing an integrated management system.
- Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO 1400X
- Good hygiene practices and housekeeping measures:
 1. Educate and train employees in safe use of product.
 2. Regular cleaning of equipment. Regular cleaning of work area.
 3. Procedures for process control and maintenance
- Treatment and monitoring of releases to outside air, and exhaust gas streams (process and hygiene) according to national regulation.
- Consider compliance with applicable regulations. SEVESO 2.

Disposal considerations

Conditions and measures related to sewage treatment plant:

- Separation by sedimentation, precipitation, filtration: Estimated substance removal from wastewater via domestic sewage treatment.
- Sludge should be incinerated, contained or reclaimed.

In cases where applicable: Default size (Default is used unless specified otherwise.)

Conditions and measures related to external treatment of waste for disposal:

- External treatment and disposal of waste should comply with applicable local and/or national regulations.
- Do not allow to enter into ground-water, surface water or drains.

Daily yearly use/Product waste:

Zinc manufacturer = 3.1 %

Zinc-Mixture manufacturer: 0.056 %

Downstream user: 0.30 %

Hazardous waste incineration: If recycling is not possible, dispose of according to local waste laws and regulations (information requirements of authorities).

Conditions and measures related to external recovery of waste:

- All residues from the wet process are recycled.
- By-products from the dry process that are formed in the reactor, are recovered and either recycled in the system or handled further according the waste legislation.
- Users of Zn have to favour the recycling channels of the end-of-life products.
- Users of Zn have to minimize waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

Zinc sulphate monohydrate

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Contributing exposure scenario 2

Industrial use of Zinc sulphate: manufacture of other inorganic or organic zinc substances in a solvent-based matrix with potentially filtering and packaging (worker)**List of use descriptors**

Process categories [PROC]:

- PROC1: Use in closed process, no likelihood of exposure
- PROC2: Use in closed, continuous process with occasional controlled exposure
- PROC3: Use in closed batch process (synthesis or formulation)
- PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises
- PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
- PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
- PROC13: Treatment of articles by dipping and pouring
- PROC15: Use as laboratory reagent
- PROC21: Low energy manipulation of substances bound in materials and/or articles
- PROC22: Manufacturing and processing of minerals and/or metals at substantially elevated temperature
- PROC23: Open processing and transfer operations with minerals/metals at elevated temperature
- PROC26: Handling of solid inorganic substances at ambient temperature

Operational conditions

- Product characteristics: Reacts with Zinc sulphate, reaction product: Zn-compounds
Zn-compounds: manufacture as a powder with varying particle size (worst case assumption) or as solution
Amounts used: 25t/full shift (maximum).
- Duration and frequency of use: 8h/d (full shift)
- Environment factors not influenced by risk management: Potentially exposed body parts: face
- Other relevant operational conditions: In enclosed areas: Indoor use

Exposure prediction

Exposure estimation and reference to its source:

- Inhalative (systemic): 2.8 mg/d
- Inhalative (zinc in workplace): 0.7 mg/m³
- Dermal (systemic): 0.8 mg/d

Risk characterisation ratio (RCR):

- Inhalative (systemic): 0.3
- Inhalative (zinc in workplace): 0.14
- Total (systemic): 0.08

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

- Industrial use in closed or semi-closed processes.
- Local exhaust ventilation is required.
- Containment of liquid volumes in sumps to collect/prevent accidental spillage.
- Provide a good standard of controlled ventilation.
- Local exhaust ventilation - efficiency of at least [%]: 90 - 95.
- Avoid generation of dust.
- In case of dust formation:
 - Air cyclones for dust collection (Efficiency of 70 - 90 %).
 - Filter (Efficiency of 50 - 80 %).
 - Two stage dust filter (Efficiency of 85 - 95 %).
 - Process enclosure, especially in potentially dusty units.
 - Workplace measurements: zinc dust and dust according to national regulation.
 - Equipment cleaning and maintenance.
 - Storage according to national regulation.

Operational conditions and risk management measures:

- In general emissions are controlled and prevented by implementing an integrated management system.
- Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100
- Educate and train employees in safe use of product.
- Procedures for control of personal exposure.
- Regular cleaning of equipment and floor.
- Procedures for process control and maintenance.
- Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

- Wear protective gloves/protective clothing.
- Wear protective gloves/protective clothing. (efficiency of ≥ 90 %)
- In case of prolonged exposure: Respiratory protection mask with adequate filter:
 - Half mask with particle filter P1 according to EN 143. (efficiency of 75%)
 - Half mask with particle filter P2 according to EN 143. (efficiency of 90%)
 - Half mask with particle filter P3 according to EN 143. (efficiency of 95%)
 - Filtering device (full mask or mouthpiece) with filter P1 (efficiency of 75%)
 - Filtering device (full mask or mouthpiece) with filter P2 (efficiency of 90%)
 - Filtering device (full mask or mouthpiece) with filter P3 (efficiency of 97,5%)
- Eyes:
 - Although not required under normal conditions, we recommend the use of suitable protection goggles.

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

not applicable

Zinc sulphate monohydrate

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Exposure Scenario 3:

Generic exposure scenario: Professional use and industrial use of Zinc sulphate, use as laboratory reagent, in organic materials, water, for analysis and Chemicals which are used in the chemicals industry for synthesis processes

List of use descriptors

Sector of uses [SU]: SU3: Industrial uses
SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
SU22: Professional uses
SU24: Scientific research and development

Product Categories: PC19: Intermediate (precursor)
PC21: Laboratory chemicals
PC28: Perfumes, fragrances
PC39: Cosmetics, personal care products

Application

Activities and processes: For analysis.
Sample treatment or preparation.
The substance is in the sample or in the reagent.
Chemicals which are used in the chemicals industry for synthesis processes.
For use in industrial installations and professional treatment only. (Water treatment, laboratory use).

Contributing Scenarios: 1 Industrial and professional use, use as laboratory reagent; in aqueous or organic solvents; for analysis and for organic synthesis (environment) Page 27

2 Industrial and professional use, use as laboratory reagent; in aqueous or organic solvents; for analysis and for organic synthesis (worker) Page 30

Contributing exposure scenario 1

Industrial and professional use, use as laboratory reagent; in aqueous or organic solvents; for analysis and for organic synthesis (environment)**List of use descriptors**

Environmental release categories [ERC]:
ERC1: Manufacture of the substance
ERC2: Formulation into mixture
ERC4: Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC6a: Use of intermediate
ERC6b: Use of reactive processing aid at industrial site (no inclusion into or onto article)
ERC8a: wide dispersive indoor use of processing aids in open systems
ERC8b: Wide dispersive indoor use of reactive substances in open systems
ERC8d: wide dispersive outdoor use of processing aids in open systems
ERC9a: Wide dispersive indoor use of substances in closed systems

Operational conditions

Product characteristics: Solid or liquid
Amounts used:
Maximum: 5 t/y (Industrial application)
Maximum: 0.5 t/y (Professional application)

Concentration of the substance in a mixture:
Purity: Minimum: 80 % Zinc sulphate
Purity Normally: > 95 % Zinc sulphate



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Duration and frequency of use:

Worst case assumption: continuous process.

Sporadic release, none continuous release (where there is potential for exposure).

Environment factors not influenced by risk management:

Water-flow rate: 18000 m³/d (unless otherwise stated)

Other relevant operational conditions:

In enclosed areas: indoor use.

Use dedicated equipment.

All residues are recycled.

Other information:

Methods used: Zinc BLM-calculator.

Exposure prediction

Exposure estimation and reference to its source:

Predicted environmental concentration (PEC):

Professional use Maximum: 0,5 t/y:

Water: 0.0047 mg Zinc/L

Sediment: 184 mg Zinc/kg dw

Floor: 41 mg Zinc/kg dw

Sewage treatment plant: 0.034 mg Zinc/L

Industrial use: Maximum: 5 t/y:

Water: 0.0034 mg Zinc/L

Sediment: 46 mg Zinc/kg dw

Floor: 41 mg Zinc/kg dw

Sewage treatment plant: 0.2 mg Zinc/L

Risk characterisation ratio (RCR):

Professional use: Maximum: 0.5 t/y:

Water: 0.23

Sediment: 0.79

Floor: 0.39

Sewage treatment plant: 0.66

Industrial use: Maximum: 5 t/y:

Water: 0.17

Sediment: 0.2

Floor: 0.39

Sewage treatment plant: 0

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Process enclosure, especially in potentially dusty units. Undertake operation under enclosed conditions.

Local exhaust ventilation is required.

Containment of liquid volumes in sumps to collect/prevent accidental spillage.

On-site waste water treatment.

Prevent penetration into canalization, pits and cellars. e.g. precipitation, sedimentation of solids by filtration (efficiency of 90 - 99,8 %).

Measures to limit air emissions:

Suitable waste treatment, suitable recovery operations (e.g. Metal-containing wastes, acid solution).

Wet scrubber for dust elimination of waste gases (efficiency of 50 - 99%).

Fabric filter (efficiency of < 99%).

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.

Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO 1400X

Good hygiene practices and housekeeping measures:

1. Educate and train employees in safe use of product.
2. Regular cleaning of equipment. Regular cleaning of work area.
3. Procedures for process control and maintenance

Treatment and monitoring of releases to outside air, and exhaust gas streams (process and hygiene) according to national regulation.

Consider compliance with applicable regulations. SEVESO 2.

Disposal considerations

Conditions and measures related to sewage treatment plant:

Separation by sedimentation, precipitation, filtration: Estimated substance removal from wastewater via domestic sewage treatment.

Sludge should be incinerated, contained or reclaimed.

In cases where applicable: Default size (Default is used unless specified otherwise.)

Conditions and measures related to external treatment of waste for disposal:

External treatment and disposal of waste should comply with applicable local and/or national regulations.

Do not allow to enter into ground-water, surface water or drains.

Daily yearly use/Product waste:

Zinc manufacturer = 3.1 %

Zinc-Mixture manufacturer: 0.056 %

Downstream user: 0.30 %

Hazardous waste incineration: If recycling is not possible, dispose of according to local waste laws and regulations (information requirements of authorities).

Conditions and measures related to external recovery of waste:

All residues from the wet process are recycled.

By-products from the dry process that are formed in the reactor, are recovered and either recycled in the system or handled further according the waste legislation.

Users of Zn have to favour the recycling channels of the end-of-life products.

Users of Zn have to minimize waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.



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Contributing exposure scenario 2

Industrial and professional use, use as laboratory reagent; in aqueous or organic solvents; for analysis and for organic synthesis (worker)

List of use descriptors

Process categories [PROC]:

- PROC1: Use in closed process, no likelihood of exposure
- PROC2: Use in closed, continuous process with occasional controlled exposure
- PROC3: Use in closed batch process (synthesis or formulation)
- PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises
- PROC5: Mixing or blending in batch processes
- PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
- PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
- PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
- PROC10: Roller application or brushing
- PROC15: Use as laboratory reagent

Operational conditions

- Product characteristics: Liquid or solid.
Solid: Glass, powder or pellets; high dustiness (worst case assumption).
Amounts used:
Maximum: 5 t/y (Industrial application)
Maximum: 0,5 t/y (Professional application)
- Concentration of the substance in a mixture:
Purity: Minimum: 80 % Zinc sulphate
Purity Normally: > 95 % Zinc sulphate
- Duration and frequency of use:
Worst case assumption: continuous process
Sporadic release, none continuous release: (where there is potential for exposure)
- Human factors not influenced by risk management:
Potentially exposed body parts: face
- Other relevant operational conditions:
Indoor use, enclosed
Processing temperature: Maximum process temperature.
Handle in a fume cupboard.

Exposure prediction

Exposure estimation and reference to its source:

- Inhalative (systemic):
0.04 mg/d
- Inhalative (zinc in workplace):
0.023 mg/m³
- Dermal (systemic):
0.05 mg/d

Risk characterisation ratio (RCR):

- Total (systemic):
0.004

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

- Closed system.
- Local exhaust ventilation is required.
- Containment of liquid volumes in sumps to collect/prevent accidental spillage.
- Provide a good standard of controlled ventilation.
- Dust control, ventilation control measures.
- Use fume cupboard.
- Workplace measurements according to national regulation.
- Equipment cleaning and maintenance.
- Storage, according to national regulation.

Operational conditions and risk management measures:

- In general emissions are controlled and prevented by implementing an integrated management system.
- Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100
- Educate and train employees in safe use of product.
- Procedures for control of personal exposure.
- Regular cleaning of equipment and floor.
- Procedures for process control and maintenance.
- Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

- Wear protective gloves/protective clothing. (efficiency of $\geq 90\%$).
- In case of prolonged exposure: Respiratory protection mask with adequate filter:
 - Half mask with particle filter P1 according to EN 143. (efficiency of 75%)
 - Half mask with particle filter P2 according to EN 143. (efficiency of 90%)
 - Half mask with particle filter P3 according to EN 143. (efficiency of 95%)
 - Filtering device (full mask or mouthpiece) with filter P1 (efficiency of 75%)
 - Filtering device (full mask or mouthpiece) with filter P2 (efficiency of 90%)
 - Filtering device (full mask or mouthpiece) with filter P3 (efficiency of 97,5%)

Eyes:

- Although not required under normal conditions, we recommend the use of suitable protection goggles.

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

not applicable

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Exposure Scenario 4:
Generic exposure scenario: Industrial use of Zinc sulphate and Zinc sulphate-formulation into mixture as a component for the manufacture of solid blends and matrices for downstream user

List of use descriptors

Sector of uses [SU]:	SU1: Agriculture, forestry, fishery SU3: Industrial uses SU4: Manufacture of food products SU5: Manufacture of textiles, leather, fur SU8: Manufacture of bulk, large scale chemicals (including petroleum products) SU9: Manufacture of fine chemicals SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys) SU11: Manufacture of rubber products SU12: Manufacture of plastics products, including compounding and conversion SU13: Manufacture of other non-metallic mineral products, e.g. plasters, cement SU14: Manufacture of basic metals, including alloys SU20: Health services
Product Categories:	PC1: Adhesives, sealants PC8: Biocidal product PC9a: Coatings and paints, thinners, paint removers PC9b: Fillers, putties, plasters, modelling clay PC9c: Finger paints PC12: Fertilizers PC14: Metal surface treatment products PC15: Non-metal surface treatment products PC18: Ink and toners PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents PC21: Laboratory chemicals PC26: paper and board dye, finishing and impregnation products: including bleaches and other processing aids PC28: Perfumes, fragrances PC29: Pharmaceuticals PC32: Polymer preparations and compounds PC35: Washing and cleaning products PC37: Water treatment chemicals PC39: Cosmetics, personal care products

Application

Activities and processes:	Manufacture of substance, dry formulation, mixing operations, Processing, pelletising, packaging	
Contributing Scenarios:	1 Industrial use of Zinc sulphate and Zinc sulphate-formulation into mixture as a component for the manufacture of solid blends and matrices for uses of downstream users. (environment)	Page 33
	2 Industrial use of Zinc sulphate and Zinc sulphate-formulation into mixture as a component for the manufacture of solid blends and matrices for uses of downstream users. (worker)	Page 35



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Contributing exposure scenario 1

Industrial use of Zinc sulphate and Zinc sulphate-formulation into mixture as a component for the manufacture of solid blends and matrices for uses of downstream users. (environment)

List of use descriptors

Product (Sub-)Categories: PC1: Adhesives, sealants
PC8: Biocidal product
PC9a: Coatings and paints, thinners, paint removers
PC9b: Fillers, putties, plasters, modelling clay
PC9c: Finger paints
PC12: Fertilizers
PC14: Metal surface treatment products
PC15: Non-metal surface treatment products
PC18: Ink and toners
PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents
PC21: Laboratory chemicals
PC26: paper and board dye, finishing and impregnation products: including bleaches and other processing aids
PC28: Perfumes, fragrances
PC29: Pharmaceuticals
PC32: Polymer preparations and compounds
PC35: Washing and cleaning products
PC37: Water treatment chemicals
PC39: Cosmetics, personal care products

Process categories [PROC]:

PROC1: Use in closed process, no likelihood of exposure
PROC2: Use in closed, continuous process with occasional controlled exposure
PROC3: Use in closed batch process (synthesis or formulation)
PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5: Mixing or blending in batch processes
PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
PROC13: Treatment of articles by dipping and pouring
PROC14: Production of preparations or articles by tableting, compression, extrusion, pelletisation
PROC15: Use as laboratory reagent
PROC22: Manufacturing and processing of minerals and/or metals at substantially elevated temperature

Environmental release categories [ERC]:

ERC1: Manufacture of the substance
ERC2: Formulation into mixture
ERC3: Formulation in materials
ERC4: Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5: Use at industrial site leading to inclusion into/onto article
ERC7: Use of functional fluid at industrial site
ERC8a: wide dispersive indoor use of processing aids in open systems
ERC8b: Wide dispersive indoor use of reactive substances in open systems
ERC8d: wide dispersive outdoor use of processing aids in open systems
ERC10a: Wide dispersive outdoor use of long-life articles and materials with low release
ERC10b: Wide dispersive outdoor use of long-life articles and materials with high or intended release (including abrasive processing)

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Operational conditions

Product characteristics: Solid or liquid.
Amounts used: maximum: 5000 t/y

Concentration of the substance in a mixture:
Zinc sulphate, Zn-compounds: < 5 => 25 %

Duration and frequency of use:
Worst case assumption: continuous process.
Sporadic release, none continuous release (where there is potential for exposure).

Environment factors not influenced by risk management:
Water-flow rate: 18000 m³/d (unless otherwise stated)

Other relevant operational conditions:
Compressed at temperatures >1000 °C.
Molten at temperatures >500 °C.
Compressed and pelletising: temperature low.
Packaging, ready-to-use condition; can be packaged for later use.

Other information: Methods used: Zinc BLM-calculator.

Exposure prediction

Exposure estimation and reference to its source:
Predicted environmental concentration (PEC):
Water: 0.0034 mg Zinc/L
Sediment: 45 mg Zinc/kg dw
Floor: 41 mg Zinc/kg dw
Sewage treatment plant: 0 mg Zinc/L

Risk characterisation ratio (RCR):
Processing:
Water: 0.19
Sediment: 1.7
Floor: 19
Sewage treatment plant: 47

Risk management measures

Technical conditions and measures at process level (source) to prevent release:
Dry processes. Process waters need to be specifically treated before release.
Process temperature: Elevated temperature.
In enclosed areas: indoor use. All residues are recycled.
Process enclosure, especially in potentially dusty units. Undertake operation under enclosed conditions.
Local exhaust ventilation is required.
Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.
On-site waste water treatment.
Prevent penetration into canalization, pits and cellars. e.g. precipitation, sedimentation of solids by filtration (efficiency of 90 - 99,8 %).
Measures to limit air emissions:
Wet scrubber for dust elimination of waste gases (efficiency of 50 - 99%).
Fabric filter (efficiency of < 99%).

Operational conditions and risk management measures:
In general emissions are controlled and prevented by implementing an integrated management system.
Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO 1400X
Good hygiene practices and housekeeping measures:
1. Educate and train employees in safe use of product.
2. Regular cleaning of equipment. Regular cleaning of work area.
3. Procedures for process control and maintenance
Treatment and monitoring of releases to outside air, and exhaust gas streams (process and hygiene) according to national regulation.
Consider compliance with applicable regulations. SEVESO 2.

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Disposal considerations

Conditions and measures related to sewage treatment plant:

Separation by sedimentation, precipitation, filtration: Estimated substance removal from wastewater via domestic sewage treatment.

Sludge should be incinerated, contained or reclaimed.

In cases where applicable: Default size (Default is used unless specified otherwise.)

Conditions and measures related to external treatment of waste for disposal:

External treatment and disposal of waste should comply with applicable local and/or national regulations.

Do not allow to enter into ground-water, surface water or drains.

Daily yearly use/Product waste:

Zinc manufacturer = 3.1 %

Zinc-Mixture manufacturer: 0.056 %

Downstream user: 0.30 %

Hazardous waste incineration: If recycling is not possible, dispose of according to local waste laws and regulations (information requirements of authorities).

Conditions and measures related to external recovery of waste:

All residues from the wet process are recycled.

By-products from the dry process that are formed in the reactor, are recovered and either recycled in the system or handled further according the waste legislation.

Users of Zn have to favour the recycling channels of the end-of-life products.

Users of Zn have to minimize waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

Contributing exposure scenario 2

Industrial use of Zinc sulphate and Zinc sulphate-formulation into mixture as a component for the manufacture of solid blends and matrices for uses of downstream users. (worker)**List of use descriptors**

Process categories [PROC]:

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

PROC5: Mixing or blending in batch processes

PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)

PROC13: Treatment of articles by dipping and pouring

PROC14: Production of preparations or articles by tableting, compression, extrusion, pelletisation

PROC15: Use as laboratory reagent

PROC22: Manufacturing and processing of minerals and/or metals at substantially elevated temperature

Operational conditions

Product characteristics:

Solid.

Powder: high dustiness (worst case assumption).

Particle size distribution (median value): 0.1 - 0.5 mm (heptahydrate), 0.005 - 0.170 mm (monohydrate)

Level of dustiness: 26.7 mg/g (monohydrate), 0.25 mg/g (hexahydrate)

Amounts used (maximum): 5000 t/y = 15 t/d = 5 t/full shift

Concentration of the substance in a mixture:

Zinc sulphate, Zn-compounds: < 5 => 25 %

Duration and frequency of use:

8h/d (full shift)



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Human factors not influenced by risk management:

Potentially exposed body parts: face

Other relevant operational conditions:

Dry processes.

Processing temperature: high.

Indoor use, use in contained systems.

Exposure prediction

Exposure estimation and reference to its source:

Inhalative (systemic):

3.6 mg/d for the production of monohydrate

0.8 mg/d for the production of hexahydrate

Inhalative (zinc in workplace):

0.9 mg/m³ for the production of monohydrate

0.2 mg/m³ for the production of hexahydrate

Dermal (systemic):

2.1 mg/d for the production of monohydrate

1.6 mg/d for the production of hexahydrate

Risk characterisation ratio (RCR):

Inhalative (systemic):

0.4 for the production of monohydrate

0.08 for the production of hexahydrate

Inhalative (zinc in workplace):

0.9 for the production of monohydrate

0.2 for the production of hexahydrate

Total (systemic):

0.6 for the production of monohydrate

0.24 for the production of hexahydrate



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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

- Enclosed.
- Furnace operations: Use local exhaust. Dust control. Vent dust from the work area.
- Provide a good standard of controlled ventilation.
- Local exhaust ventilation - efficiency of at least [%]: 90 - 95.
- Avoid generation of dust.
- In case of dust formation:
 - Air cyclones for dust collection (Efficiency of 70 - 90 %).
 - Filter (Efficiency of 50 - 80 %).
 - Two stage dust filter (Efficiency of 85 - 95 %).
 - Process enclosure, especially in potentially dusty units.
 - Workplace measurements: zinc dust and dust according to national regulation.
 - Equipment cleaning and maintenance.
 - Storage according to national regulation.

Operational conditions and risk management measures:

- In general emissions are controlled and prevented by implementing an integrated management system.
- Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100
- Educate and train employees in safe use of product.
- Procedures for control of personal exposure.
- Regular cleaning of equipment and floor.
- Procedures for process control and maintenance.
- Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

- Wear protective gloves/protective clothing. (efficiency of $\geq 90\%$)
- In case of prolonged exposure: Respiratory protection mask with adequate filter:
 - Half mask with particle filter P1 according to EN 143. (efficiency of 75%)
 - Half mask with particle filter P2 according to EN 143. (efficiency of 90%)
 - Half mask with particle filter P3 according to EN 143. (efficiency of 95%)
 - Filtering device (full mask or mouthpiece) with filter P1 (efficiency of 75%)
 - Filtering device (full mask or mouthpiece) with filter P2 (efficiency of 90%)
 - Filtering device (full mask or mouthpiece) with filter P3 (efficiency of 97,5%)
- Eyes:
 - Although not required under normal conditions, we recommend the use of suitable protection goggles.

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

not applicable

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Exposure Scenario 5:
Generic exposure scenario: Industrial use of Zinc sulphate and Zinc sulphate. component for the manufacture of dispersions, pastes, or other viscous or polymerised matrices

List of use descriptors

Sector of uses [SU]:	SU3: Industrial uses SU4: Manufacture of food products SU5: Manufacture of textiles, leather, fur SU6b: Manufacture of pulp, paper and paper products SU7: Printing and reproduction of recorded media SU8: Manufacture of bulk, large scale chemicals (including petroleum products) SU9: Manufacture of fine chemicals SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys) SU18: Manufacture of furniture SU20: Health services
Product Categories:	PC2: Adsorbents PC8: Biocidal product PC9a: Coatings and paints, thinners, paint removers PC9b: Fillers, putties, plasters, modelling clay PC12: Fertilizers PC14: Metal surface treatment products PC15: Non-metal surface treatment products PC18: Ink and toners PC19: Intermediate (precursor) PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents PC21: Laboratory chemicals PC23: Leather treatment products PC24: Lubricants, greases, release products PC25: Metal working fluids PC28: Perfumes, fragrances PC29: Pharmaceuticals PC32: Polymer preparations and compounds PC34: Textile dyes and impregnating products PC35: Washing and cleaning products PC39: Cosmetics, personal care products PC40: Extraction agents

Application

Activities and processes: Discharge from a silo and storage.
Discharge from a silo, dosing, addition of the other reagents, according to the manufacturer's instructions.

Contributing Scenarios:	1 Industrial use of Zinc sulphate and Zinc sulphate component for the manufacture of dispersions, pastes, or other viscous or polymerised matrices (environment)	Page 39
	2 Industrial use of Zinc sulphate and Zinc sulphate component for the manufacture of dispersions, pastes, or other viscous or polymerised matrices (worker)	Page 41

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Contributing exposure scenario 1

Industrial use of Zinc sulphate and Zinc sulphate component for the manufacture of dispersions, pastes, or other viscous or polymerised matrices (environment)**List of use descriptors**

Product (Sub-)Categories: PC2: Adsorbents
PC8: Biocidal product
PC9a: Coatings and paints, thinners, paint removers
PC9b: Fillers, putties, plasters, modelling clay
PC12: Fertilizers
PC14: Metal surface treatment products
PC15: Non-metal surface treatment products
PC18: Ink and toners
PC19: Intermediate (precursor)
PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents
PC21: Laboratory chemicals
PC23: Leather treatment products
PC24: Lubricants, greases, release products
PC25: Metal working fluids
PC28: Perfumes, fragrances
PC29: Pharmaceuticals
PC32: Polymer preparations and compounds
PC34: Textile dyes and impregnating products
PC35: Washing and cleaning products
PC39: Cosmetics, personal care products
PC40: Extraction agents

Article (Sub-)Categories: AC1: Vehicles
AC2: Machinery, mechanical appliances, electrical/electronic articles
AC7: Metal articles

Environmental release categories [ERC]:
ERC1: Manufacture of the substance
ERC2: Formulation into mixture
ERC3: Formulation in materials
ERC4: Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5: Use at industrial site leading to inclusion into/onto article
ERC6a: Use of intermediate
ERC6b: Use of reactive processing aid at industrial site (no inclusion into or onto article)
ERC6d: Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article)
ERC8a: wide dispersive indoor use of processing aids in open systems
ERC8b: Wide dispersive indoor use of reactive substances in open systems
ERC8d: wide dispersive outdoor use of processing aids in open systems
ERC9a: Wide dispersive indoor use of substances in closed systems
ERC9b: Wide dispersive outdoor use of substances in closed systems
ERC10a: Wide dispersive outdoor use of long-life articles and materials with low release
ERC10b: Wide dispersive outdoor use of long-life articles and materials with high or intended release (including abrasive processing)
ERC11a: Widespread use of articles with low release (indoor)

Operational conditions

Product characteristics: Amounts used: Maximum: 5000 t/y

Concentration of the substance in a mixture:

Preparation with Zinc sulphate: > 25 %

Duration and frequency of use:

Worst case assumption: continuous process.

Sporadic release, none continuous release (where there is potential for exposure).

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Environment factors not influenced by risk management:

Water-flow rate: 18000 m³/d (unless otherwise stated)

Other relevant operational conditions:

Process waters need to be specifically treated before release.

Indoor use, use in contained systems.

All residues are recycled.

Other information:

Methods used: Zinc BLM-calculator.

Exposure prediction

Exposure estimation and reference to its source:

Predicted environmental concentration (PEC): ZnO

Water: 0.0034 mg Zinc/L

Sediment: 45 mg Zinc/kg dw

Floor: 41 mg Zinc/kg dw

Sewage treatment plant: 0 mg Zinc/L

Predicted environmental concentration (PEC):

Zinc phosphate in liquid composition:

Water: 0.0047 mg Zinc/L

Sediment: 187 mg Zinc/kg dw

Floor: 41 mg Zinc/kg dw

Sewage treatment plant: 0 mg Zinc/L

Risk characterisation ratio (RCR):

Zinc chloride, assessment of measured data (industry): Agrochemical uses

Water: 0.03

Sediment: 0.51

Floor: 0.02

Sewage treatment plant: 0.39

Zinc phosphate in liquid composition:

Water: 0.23

Sediment: 0.79

Floor: 0.39

Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Local exhaust ventilation is required. Vent dust from the work area.

Dust must be exhausted directly at the point of origin.

Use in contained systems.

Process (wet):

Containment of liquid volumes in sumps to collect/prevent accidental spillage. Collect spillage.

On-site waste water treatment.

Prevent penetration into canalization, pits and cellars. e.g. precipitation, sedimentation of solids by filtration (efficiency of 90 - 99,8 %).

Measures to limit air emissions:

Wet scrubber for dust elimination of waste gases (efficiency of 50 - 99%).

Fabric filter (efficiency of < 99%).

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.

Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO 1400X

Good hygiene practices and housekeeping measures:

1. Educate and train employees in safe use of product.
2. Regular cleaning of equipment. Regular cleaning of work area.
3. Procedures for process control and maintenance

Treatment and monitoring of releases to outside air, and exhaust gas streams (process and hygiene) according to national regulation.

Consider compliance with applicable regulations. SEVESO 2.

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Disposal considerations

Conditions and measures related to sewage treatment plant:

Separation by sedimentation, precipitation, filtration: Estimated substance removal from wastewater via domestic sewage treatment.

Sludge should be incinerated, contained or reclaimed.

In cases where applicable: Default size (Default is used unless specified otherwise.)

Conditions and measures related to external treatment of waste for disposal:

External treatment and disposal of waste should comply with applicable local and/or national regulations.

Do not allow to enter into ground-water, surface water or drains.

Daily yearly use/Product waste:

Zinc manufacturer = 3.1 %

Zinc-Mixture manufacturer: 0.056 %

Downstream user: 0.30 %

Hazardous waste incineration: If recycling is not possible, dispose of according to local waste laws and regulations (information requirements of authorities).

Conditions and measures related to external recovery of waste:

All residues from the wet process are recycled.

By-products from the dry process that are formed in the reactor, are recovered and either recycled in the system or handled further according the waste legislation.

Users of Zn have to favour the recycling channels of the end-of-life products.

Users of Zn have to minimize waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

Contributing exposure scenario 2

Industrial use of Zinc sulphate and Zinc sulphate component for the manufacture of dispersions, pastes, or other viscous or polymerised matrices (worker)**List of use descriptors**

Article (Sub-)Categories: AC1: Vehicles

AC2: Machinery, mechanical appliances, electrical/electronic articles

AC7: Metal articles

Process categories [PROC]:

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

PROC5: Mixing or blending in batch processes

PROC6: Calendering operations

PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)

PROC10: Roller application or brushing

PROC13: Treatment of articles by dipping and pouring

PROC14: Production of preparations or articles by tableting, compression, extrusion, pelletisation

PROC15: Use as laboratory reagent



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Operational conditions

- Product characteristics: Liquid, paste, dispersion, polymerized matrix (low dustiness), powder (level of dustiness: medium).
Powder: high dustiness (worst case assumption).
Particle size distribution (median value): 0.1 - 0.5 mm (heptahydrate), 0.005 - 0.170 mm (monohydrate)
Level of dustiness: 26.7 mg/g (monohydrate), 0.25 mg/g (hexahydrate)
Amounts used (maximum): 5000 t/y = 20t/d = 7 t/full shift
- Concentration of the substance in a mixture:
Zinc sulphate: >25 %
- Duration and frequency of use:
8h/d (full shift/worst case assumption).
- Human factors not influenced by risk management:
Potentially exposed body parts: face
- Other relevant operational conditions:
-Wet-process
-Indoor use, use in contained systems.

Exposure prediction

- Exposure estimation and reference to its source:
- Inhalative (systemic):
3.6 mg/d for the production of monohydrate
0.8 mg/d for the production of hexahydrate
- Inhalative (zinc in workplace):
0.9 mg/m³ for the production of monohydrate
0.2 mg/m³ for the production of hexahydrate
- Dermal (systemic):
2.1 mg/d for the production of monohydrate
1.6 mg/d for the production of hexahydrate
- Risk characterisation ratio (RCR):
- Inhalative (systemic):
0.4 for the production of monohydrate
0.08 for the production of hexahydrate
- Inhalative (zinc in workplace):
0.9 for the production of monohydrate
0.2 for the production of hexahydrate
- Total (systemic):
0.6 for the production of monohydrate
0.24 for the production of hexahydrate



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Zinc sulphate monohydrate

Material number Z005

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Enclosed.
Furnace operations: Use local exhaust. Dust control. Vent dust from the work area.
Avoid generation of dust. In case of dust formation:
Air cyclones for dust collection (Efficiency of 70 - 90 %).
Filter (Efficiency of 50 - 80 %).
Two stage dust filter (Efficiency of 85 - 95 %).
Process enclosure, especially in potentially dusty units.
Workplace measurements: zinc dust and dust according to national regulation.
Equipment cleaning and maintenance.
Storage according to national regulation.

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.
Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100
Educate and train employees in safe use of product.
Procedures for control of personal exposure.
Regular cleaning of equipment and floor.
Procedures for process control and maintenance.
Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

Wear protective gloves/protective clothing. (efficiency of $\geq 90\%$).
In case of prolonged exposure: Respiratory protection mask with adequate filter:
Half mask with particle filter P1 according to EN 143. (efficiency of 75%)
Half mask with particle filter P2 according to EN 143. (efficiency of 90%)
Half mask with particle filter P3 according to EN 143. (efficiency of 95%)
Filtering device (full mask or mouthpiece) with filter P1 (efficiency of 75%)
Filtering device (full mask or mouthpiece) with filter P2 (efficiency of 90%)
Filtering device (full mask or mouthpiece) with filter P3 (efficiency of 97,5%)
Eyes:
Although not required under normal conditions, we recommend the use of suitable protection goggles.
PROC 7,11,19: Use appropriate respiratory protection.

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

not applicable

**Exposure Scenario 6:
Generic exposure scenario: Industrial and professional use of solid substrates with < 25 % w/w Zinc sulphate.****List of use descriptors**

Sector of uses [SU]:	SU3: Industrial uses SU5: Manufacture of textiles, leather, fur SU6b: Manufacture of pulp, paper and paper products SU9: Manufacture of fine chemicals SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys) SU22: Professional uses
Product Categories:	PC1: Adhesives, sealants PC8: Biocidal product PC9a: Coatings and paints, thinners, paint removers PC9b: Fillers, putties, plasters, modelling clay PC9c: Finger paints PC14: Metal surface treatment products PC15: Non-metal surface treatment products PC18: Ink and toners PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents PC21: Laboratory chemicals PC28: Perfumes, fragrances PC29: Pharmaceuticals PC35: Washing and cleaning products PC39: Cosmetics, personal care products

Application

Activities and processes:	Receipt and storage of raw materials. Specific end use(s), type of chemical product for final use.		
Contributing Scenarios:	1	Industrial and professional use of polymerised substrates, solid substrates with < 25 % w/w Zinc sulphate. (environment)	Page 44
	2	Industrial and professional use of polymerised substrates, solid substrates with < 25 % w/w Zinc sulphate. Exposure assessment and RCR for indoor use (worker)	Page 47
	3	Industrial and professional use of polymerised substrates, solid substrates with < 25 % w/w Zinc sulphate Exposure assessment and RCR for outdoor use (worker)	Page 50

Contributing exposure scenario 1

Industrial and professional use of polymerised substrates, solid substrates with < 25 % w/w Zinc sulphate. (environment)**List of use descriptors**

Environmental release categories [ERC]:	ERC8a: wide dispersive indoor use of processing aids in open systems ERC8d: wide dispersive outdoor use of processing aids in open systems ERC10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC11a: Widespread use of articles with low release (indoor)
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Operational conditions

Product characteristics:	Solid. Amounts used: < GES4-GES5 Industrial, professional: 50 t/y (typical) Industrial (maximum): 500 t/y
Concentration of the substance in a mixture:	Zinc sulphate or Zn-compounds < 25 %



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Duration and frequency of use:

Worst case assumption: continuous process.

Sporadic release, none continuous release (where there is potential for exposure).

Environment factors not influenced by risk management:

Water-flow rate: 18000 m³/d (unless otherwise stated)

Other relevant operational conditions:

Process (solid/dry).

Process waters need to be specifically treated before release.

Process (industrial/professional): Indoor use, use in contained systems.

All residues are recycled.

Other information:

Methods used: Zinc BLM-calculator.

Exposure prediction

Exposure estimation and reference to its source:

Predicted environmental concentration (PEC): 50 t/y:

Water: 0.0039 mg Zinc/L

Sediment: 101 mg Zinc/kg dw

Floor: 41 mg Zinc/kg dw

Sewage treatment plant: 0.014 mg Zinc/L

Predicted environmental concentration (PEC): 100 t/y:

Water: 0.0051 mg Zinc/L

Sediment: 231 mg Zinc/kg dw

Floor: 41 mg Zinc/kg dw

Sewage treatment plant: 0.046 mg Zinc/L

Risk characterisation ratio (RCR):

50 t/y:

Water: 0.19

Sediment: 0.43

Floor: 0.39

Sewage treatment plant: 0.26

100 t/y:

Water: 0.25

Sediment: 0.98

Floor: 0.39

Sewage treatment plant: 0.87

Zinc sulphate monohydrate

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Industrial, professional:

Local exhaust ventilation is required. Vent dust from the work area.

Dust must be exhausted directly at the point of origin.

Use in contained systems.

No release of water.

On-site waste water treatment.

Prevent penetration into canalization, pits and cellars. e.g. precipitation, sedimentation of solids by filtration (efficiency of 90 - 99,8 %).

Measures to limit air emissions:

Wet scrubber for dust elimination of waste gases (efficiency of 50 - 99%).

Fabric filter (efficiency of < 99%).

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.

Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO 1400X

Good hygiene practices and housekeeping measures:

1. Educate and train employees in safe use of product.
2. Regular cleaning of equipment. Regular cleaning of work area.
3. Procedures for process control and maintenance

Treatment and monitoring of releases to outside air, and exhaust gas streams (process and hygiene) according to national regulation.

Consider compliance with applicable regulations. SEVESO 2.

Disposal considerations

Conditions and measures related to sewage treatment plant:

Industrial:

Separation by sedimentation, precipitation, filtration: Estimated substance removal from wastewater via domestic sewage treatment.

Sludge should be incinerated, contained or reclaimed.

In cases where applicable: Default size (Default is used unless specified otherwise.).

Conditions and measures related to external treatment of waste for disposal:

External treatment and disposal of waste should comply with applicable local and/or national regulations.

Do not allow to enter into ground-water, surface water or drains.

Daily yearly use/Product waste:

Zinc manufacturer = 3.1 %

Zinc-Mixture manufacturer: 0.056 %

Downstream user: 0.30 %

Hazardous waste incineration: If recycling is not possible, dispose of according to local waste laws and regulations (information requirements of authorities).

Conditions and measures related to external recovery of waste:

All residues from the wet process are recycled.

By-products from the dry process that are formed in the reactor, are recovered and either recycled in the system or handled further according the waste legislation.

Users of Zn have to favour the recycling channels of the end-of-life products.

Users of Zn have to minimize waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

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Contributing exposure scenario 2

Industrial and professional use of polymerised substrates, solid substrates with < 25 % w/w Zinc sulphate.**Exposure assessment and RCR for indoor use (worker)****List of use descriptors**

Product (Sub-)Categories: PC1: Adhesives, sealants
PC8: Biocidal product
PC9a: Coatings and paints, thinners, paint removers
PC9b: Fillers, putties, plasters, modelling clay
PC9c: Finger paints
PC14: Metal surface treatment products
PC15: Non-metal surface treatment products
PC18: Ink and toners
PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents
PC21: Laboratory chemicals
PC28: Perfumes, fragrances
PC29: Pharmaceuticals
PC35: Washing and cleaning products
PC39: Cosmetics, personal care products

Article (Sub-)Categories: AC0: Other

Process categories [PROC]:
PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5: Mixing or blending in batch processes
PROC6: Calendaring operations
PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
PROC10: Roller application or brushing
PROC11: Non industrial spraying
PROC13: Treatment of articles by dipping and pouring
PROC19: Hand-mixing with intimate contact and only PPE available

Operational conditions

Product characteristics: Solid.
Level of dustiness: low dustiness
Powder: medium dustiness (worst case assumption).
Amounts used: < GES4-GES5
Industrial, professional: 50 t/y (typical) =0.15 t/d =0,05 t per shift
Industrial (maximum): 500 t/y =1.5 t/d; 0.5 t/per shift

Concentration of the substance in a mixture:

Zinc sulphate, Zn-compounds: < 25 %

Duration and frequency of use:

8h/d (full shift)

>240 min

Human factors not influenced by risk management:

Potentially exposed body parts: face

Other relevant operational conditions:

Process temperature: 25 °C

Process (dry): no process water

Indoor use. Use in contained systems.

Zinc sulphate monohydrate

Material number Z005

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Exposure prediction

Exposure estimation and reference to its source:

Industrial and professional use, < 25 % Zinc sulphate

MEASE model: professional (= worst case assumption for industrial)

Indoor.

Full shift.

PROC 4,5,6,8b,9,10,13

Inhalative (systemic):

=< 4.0 mg/d

Inhalative (zinc in workplace):

0.675 mg/m³

Dermal (systemic):

0.12 mg/d

MEASE model: professional (= worst case assumption for industrial)

Indoor.

Full shift.

PROC 11,19

Inhalative (systemic):

=< 12.0 mg/d

Inhalative (zinc in workplace):

3 mg/m³

Dermal (systemic):

0.12 mg/d

MEASE model: professional (= worst case assumption for industrial)

Indoor.

full shift.

PROC 11,19

Respiratory protection: > 1 hour, e.g. P1, MEASE: AFP4

Inhalative (systemic):

=< 3 mg/d

Inhalative (zinc in workplace):

0.75 mg/m³

Dermal (systemic):

0.12 mg/d

Risk characterisation ratio (RCR):

MEASE model: professional (= worst case assumption for industrial)

Indoor

Full shift.

PROC 4,5,6,8b,9,10,13

Inhalative (zinc in workplace):

<= 0.675

Total (systemic):

<= 0.4

MEASE model: professional (= worst case assumption for industrial)

Indoor.

Full shift.

PROC 11,19

Inhalative (zinc in workplace):

<= 3

Total (systemic):

<= 1.2

MEASE model: professional (= worst case assumption for industrial)

Indoor.

Full shift.

PROC 11,19

Respiratory protection: > 1 hour, e.g. P1, MEASE: AFP4

Inhalative (zinc in workplace):

<= 0.75

Total (systemic):

<= 0.3

Zinc sulphate monohydrate

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Enclosed.

Furnace operations: Use local exhaust. Dust control. Vent dust from the work area.

Avoid generation of dust. In case of dust formation:

Local exhaust ventilation is required (efficiency of 84 %).

Vent dust from the work area. (worst case assumption).

Air cyclones for dust collection (Efficiency of 70 - 90 %).

Filter (Efficiency of 50 - 80 %).

Two stage dust filter (Efficiency of 85 - 95 %).

Process enclosure, especially in potentially dusty units.

Workplace measurements: zinc dust and dust according to national regulation.

Equipment cleaning and maintenance.

Storage according to national regulation.

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.

Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100

Educate and train employees in safe use of product.

Procedures for control of personal exposure.

Regular cleaning of equipment and floor.

Procedures for process control and maintenance.

Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

Wear protective gloves/protective clothing. (efficiency of ≥ 90 %)

In case of prolonged exposure: Respiratory protection mask with adequate filter:

Half mask with particle filter P1 according to EN 143. (efficiency of 75%)

Half mask with particle filter P2 according to EN 143. (efficiency of 90%)

Half mask with particle filter P3 according to EN 143. (efficiency of 95%)

Filtering device (full mask or mouthpiece) with filter P1 (efficiency of 75%)

Filtering device (full mask or mouthpiece) with filter P2 (efficiency of 90%)

Filtering device (full mask or mouthpiece) with filter P3 (efficiency of 97,5%)

Eyes:

Although not required under normal conditions, we recommend the use of suitable protection goggles.

Indoor, worker/for professional use only:

PROC 4,5,6,8b,9,10,13: see risk management measures

PROC 11,19: Respiratory protection necessary at exposure of 4 h. Wear a respirator conforming to EN140 with Type P1 filter or better.

outdoor use:

PROC 4,5,6,8b,9,10,13,19: Respiratory protection necessary at exposure of 4 h. Wear a respirator conforming to EN140 with Type P1 filter or better.

PROC 11: Respiratory protection necessary at exposure of 4 h; efficiency of 95 % or exposure of 1-4 h; efficiency of >90 %

Other information:

Assumes a good basic standard of occupational hygiene is implemented.

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Contributing exposure scenario 3

Industrial and professional use of polymerised substrates, solid substrates with < 25 % w/w Zinc sulphate**Exposure assessment and RCR for outdoor use (worker)****List of use descriptors**

Product (Sub-)Categories: PC1: Adhesives, sealants
PC8: Biocidal product
PC9a: Coatings and paints, thinners, paint removers
PC9b: Fillers, putties, plasters, modelling clay
PC9c: Finger paints
PC14: Metal surface treatment products
PC15: Non-metal surface treatment products
PC18: Ink and toners
PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents
PC21: Laboratory chemicals
PC28: Perfumes, fragrances
PC29: Pharmaceuticals
PC35: Washing and cleaning products
PC39: Cosmetics, personal care products

Article (Sub-)Categories: AC0: Other

Process categories [PROC]:
PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5: Mixing or blending in batch processes
PROC6: Calendaring operations
PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
PROC10: Roller application or brushing
PROC11: Non industrial spraying
PROC13: Treatment of articles by dipping and pouring
PROC19: Hand-mixing with intimate contact and only PPE available

Operational conditions

Product characteristics: Solid.
Level of dustiness: low dustiness
Powder: medium dustiness (worst case assumption).
Amounts used: < GES4-GES5
Industrial, professional: 50 t/y (typical) =0.15 t/d =0,05 t per shift
Industrial (maximum): 500 t/y =1.5 t/d; 0.5 t/per shift

Concentration of the substance in a mixture:

Zinc sulphate, Zn-compounds: < 25 %

Duration and frequency of use:

8 h/d (full shift)

>240 min

Human factors not influenced by risk management:

Potentially exposed body parts: face

Other relevant operational conditions:

Process temperature: 25 °C

Process (dry): no process water

Indoor use. Use in contained systems.

Zinc sulphate monohydrate

Material number Z005

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Exposure prediction

Exposure estimation and reference to its source:

Industrial and professional use, < 25 % Zinc sulphate

MEASE model: professional (= worst case assumption for industrial)

Indoor.

Full shift.

PROC 4,5,6,8b,9,10,13,19

Inhalative (systemic):

=< 6.0 mg/d

Inhalative (zinc in workplace):

3 mg/m³

Dermal (systemic):

0.12 mg/d

MEASE model: professional (= worst case assumption for industrial)

Indoor.

Full shift.

PROC 4,5,6,8b,9,10,13,19

Respiratory protection: > 1 hour, e.g. P1, MEASE: AFP4

Inhalative (systemic):

=< 3 mg/d

Inhalative (zinc in workplace):

0.75 mg/m³

Dermal (systemic):

0.12 mg/d

MEASE model: professional (= worst case assumption for industrial)

Outdoor.

Full shift.

PROC 11

Inhalative (systemic):

=< 48.0 mg/d

Inhalative (zinc in workplace):

12 mg/m³

Dermal (systemic):

0.12 mg/d

MEASE model: professional (= worst case assumption for industrial)

Outdoor.

Full shift.

PROC 11

Respiratory protection: > 1 hour, e.g. P1, MEASE: AFP4

Inhalative (systemic):

=< 1.2 mg/d

Inhalative (zinc in workplace):

0.6 mg/m³

Dermal (systemic):

0.12 mg/d

Risk characterisation ratio (RCR):

MEASE model: professional (= worst case assumption for industrial)

Outdoor

Full shift.

PROC 11

Inhalative (zinc in workplace):

<= 12

Total (systemic):

<= 4.8

~~MEASE model: professional (= worst case assumption for industrial)~~

Outdoor.

Full shift.

Respiratory protection: > 1 hour, e.g. P1, MEASE: AFP4

PROC 11

Inhalative (zinc in workplace):

<= 0.6

Zinc sulphate monohydrate

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Enclosed.
Furnace operations: Use local exhaust. Dust control. Vent dust from the work area.
Avoid generation of dust. In case of dust formation:
Local exhaust ventilation is required (efficiency of 84 %).
Vent dust from the work area. (worst case assumption).
Air cyclones for dust collection (Efficiency of 70 - 90 %).
Filter (Efficiency of 50 - 80 %).
Two stage dust filter (Efficiency of 85 - 95 %).
Process enclosure, especially in potentially dusty units.
Workplace measurements: zinc dust and dust according to national regulation.
Equipment cleaning and maintenance.
Storage according to national regulation.

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.
Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100
Educate and train employees in safe use of product.
Procedures for control of personal exposure.
Regular cleaning of equipment and floor.
Procedures for process control and maintenance.
Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

Wear protective gloves/protective clothing. (efficiency of $\geq 90\%$)
In case of prolonged exposure: Respiratory protection mask with adequate filter:
Half mask with particle filter P1 according to EN 143. (efficiency of 75%)
Half mask with particle filter P2 according to EN 143. (efficiency of 90%)
Half mask with particle filter P3 according to EN 143. (efficiency of 95%)
Filtering device (full mask or mouthpiece) with filter P1 (efficiency of 75%)
Filtering device (full mask or mouthpiece) with filter P2 (efficiency of 90%)
Filtering device (full mask or mouthpiece) with filter P3 (efficiency of 97,5%)
Eyes:
Although not required under normal conditions, we recommend the use of suitable protection goggles.
Indoor, worker/for professional use only:
PROC 4,5,6,8b,9,10,13: see risk management measures
PROC 11,19: Respiratory protection necessary at exposure of 4 h. Wear a respirator conforming to EN140 with Type P1 filter or better.
outdoor use:
PROC 4,5,6,8b,9,10,13,19: Respiratory protection necessary at exposure of 4 h. Wear a respirator conforming to EN140 with Type P1 filter or better.
PROC 11: Respiratory protection necessary at exposure of 4 h; efficiency of 95 % or exposure of 1-4 h; efficiency of $>90\%$.

Other information:

Assumes a good basic standard of occupational hygiene is implemented.

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

not applicable

Exposure Scenario 7:
**Generic exposure scenario: Industrial and professional use of
dispersions, pastes and polymerised substrates with < 25 % w/w Zinc
sulphate**

List of use descriptors

Sector of uses [SU]: SU9: Manufacture of fine chemicals
SU20: Health services
SU22: Professional uses

Product Categories: PC8: Biocidal product
PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents
PC21: Laboratory chemicals
PC28: Perfumes, fragrances
PC29: Pharmaceuticals
PC35: Washing and cleaning products
PC39: Cosmetics, personal care products

Application

Activities and processes: Receipt and storage of raw materials.
Specific end use(s), type of chemical product for final use.

Contributing Scenarios:

1	Industrial and professional use of dispersions, pastes and polymerised substrates with < 25 % w/w Zinc sulphate (environment)	Page 53
2	Industrial and professional use of dispersions, pastes and polymerised substrates with < 25 % w/w Zinc sulphate. Exposure assessment and RCR for indoor use. (worker)	Page 55
3	Industrial and professional use of dispersions, pastes and polymerised substrates with < 25 % w/w Zinc sulphate. Exposure assessment and RCR for outdoor use (worker)	Page 57

Contributing exposure scenario 1

Industrial and professional use of dispersions, pastes and polymerised substrates with < 25 % w/w Zinc sulphate (environment)**List of use descriptors**

Product (Sub-)Categories: PC8: Biocidal product
PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents
PC21: Laboratory chemicals
PC28: Perfumes, fragrances
PC29: Pharmaceuticals
PC35: Washing and cleaning products
PC39: Cosmetics, personal care products

Process categories [PROC]: PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
PROC10: Roller application or brushing
PROC11: Non industrial spraying
PROC13: Treatment of articles by dipping and pouring

Environmental release categories [ERC]: ERC8a: wide dispersive indoor use of processing aids in open systems



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Operational conditions

Product characteristics: Solid.

Amounts used: < GES4-GES5
Industrial, professional: 50 t/y (typical)
Industrial (maximum): 500 t/y

Concentration of the substance in a mixture:

Zinc sulphate, Zn-compounds: < 25 %

Environment factors not influenced by risk management:

Water-flow rate: 18000 m³/d (unless otherwise stated)

Other relevant operational conditions:

Process (wet).

Process waters need to be specifically treated before release.

Other information:

Methods used: Zinc BLM-calculator.

Exposure prediction

Exposure estimation and reference to its source:

Predicted environmental concentration (PEC): 50 t/y:

Water: 0.0039 mg Zn/t

Sediment: 101 mg Zn/kg/ dw

Floor: 41 mg Zn/kg/ dw

Sewage treatment plant: : 0.014 mg Zn/kg/ dw

Predicted environmental concentration (PEC): 100 t/y:

Water: 0.0051 mg Zn/t

Sediment: 231 mg Zn/kg/ dw

Floor: 41 mg Zn/kg/ dw

Sewage treatment plant: : 0.046 mg Zn/kg/ dw

Risk characterisation ratio (RCR):

50 t/y:

Water: 0.19 mg Zn/t

Sediment: 0.43 mg Zn/kg/ dw

Floor: 0.39 mg Zn/kg/ dw

Sewage treatment plant: : 0.26 mg Zn/kg/ dw

100 t/y:

Water: 0.25 mg Zn/t

Sediment: 0.98 mg Zn/kg/ dw

Floor: 0.39 mg Zn/kg/ dw

Sewage treatment plant: 0.87 mg Zn/kg/ dw

Zinc sulphate monohydrate

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Industrial, professional:

Local exhaust ventilation is required. Vent dust from the work area.

Dust must be exhausted directly at the point of origin.

Indoor use. Use in contained systems.

All residues are recycled

Containment of liquid volumes in sumps to collect/prevent accidental spillage.

No release of water.

On-site waste water treatment.

Prevent penetration into canalization, pits and cellars. e.g. precipitation, sedimentation of solids by filtration (efficiency of 90 - 99,8 %).

Measures to limit air emissions:

Wet scrubber for dust elimination of waste gases (efficiency of 50 - 99%).

Fabric filter (efficiency of < 99%).

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.

Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO 1400X

Good hygiene practices and housekeeping measures:

1. Educate and train employees in safe use of product.
2. Regular cleaning of equipment. Regular cleaning of work area.
3. Procedures for process control and maintenance

Treatment and monitoring of releases to outside air, and exhaust gas streams (process and hygiene) according to national regulation.

Consider compliance with applicable regulations. SEVESO 2.

Disposal considerations

Conditions and measures related to sewage treatment plant:

Industrial:

Separation by sedimentation, precipitation, filtration: Estimated substance removal from wastewater via domestic sewage treatment.

Sludge should be incinerated, contained or reclaimed.

In cases where applicable: Default size (Default is used unless specified otherwise.).

Conditions and measures related to external treatment of waste for disposal:

External treatment and disposal of waste should comply with applicable local and/or national regulations.

Do not allow to enter into ground-water, surface water or drains.

Daily yearly use/Product waste:

Zinc manufacturer = 3.1 %

Zinc-Mixture manufacturer: 0.056 %

Downstream user: 0.30 %

Hazardous waste incineration: If recycling is not possible, dispose of according to local waste laws and regulations (information requirements of authorities).

Conditions and measures related to external recovery of waste:

All residues from the wet process are recycled.

By-products from the dry process that are formed in the reactor, are recovered and either recycled in the system or handled further according the waste legislation.

Users of Zn have to favour the recycling channels of the end-of-life products.

Users of Zn have to minimize waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.



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Zinc sulphate monohydrate

Material number Z005

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Contributing exposure scenario 2

Industrial and professional use of dispersions, pastes and polymerised substrates with < 25 % w/w Zinc sulphate.

Exposure assessment and RCR for indoor use. (worker)

Operational conditions

Product characteristics: Particles: sporadic release, low dustiness.
Liquid, solution, paste: worst case assumption.
Amounts used: < GES4-GES5
Industrial, professional: 50 t/y (typical) =0.15 t/d =0,05 t per shift
Industrial (maximum): 500 t/y =1.5 t/d; 0.5 t/per shift

Concentration of the substance in a mixture:
Zinc sulphate, Zn-compounds: < 25 %

Duration and frequency of use:
8h/d (full shift)

Human factors not influenced by risk management:
Potentially exposed body parts: face

Other relevant operational conditions:
Process (wet).
Indoor use. Use in contained systems.

Exposure prediction

Exposure estimation and reference to its source:

Operational conditions e.g. working temperature: 25 °C, in aqueous solution, content: 5-25 %, used model: MEASE-model

professional (worst case assumption for industrial), indoor, PROC 8b,9,10,13:

Inhalative (systemic):

<= 2.7 mg/d

Inhalative (zinc in workplace):

<= 0.675 mg/m³

Dermal (systemic):

<= 2.7 mg/d

professional (worst case assumption for industrial), indoor, full shift, respiratory protection PROC 11:

Inhalative (systemic):

<= 1.4 mg/d

Inhalative (zinc in workplace):

<= 0.7 mg/m³

Dermal (systemic):

<= 1.4 mg/d

Risk characterisation ratio (RCR):

Used model: MEASE-model.

professional (worst case assumption for industrial), indoor, PROC 8b,9,10,13:

Total (systemic):

<= 0.27

professional (worst case assumption for industrial), indoor, full shift, respiratory protection PROC 11:

Total (systemic):

<= 0.14

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Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Enclosed.
Furnace operations: Use local exhaust. Dust control. Vent dust from the work area.
Avoid generation of dust. In case of dust formation:
Local exhaust ventilation is required (efficiency of 84 %).
Vent dust from the work area. (worst case assumption).
Air cyclones for dust collection (Efficiency of 70 - 90 %).
Filter (Efficiency of 50 - 80 %).
Two stage dust filter (Efficiency of 85 - 95 %).
Process enclosure, especially in potentially dusty units.
Workplace measurements: zinc dust and dust according to national regulation.
Equipment cleaning and maintenance.
Storage according to national regulation.

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.
Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100
Educate and train employees in safe use of product.
Procedures for control of personal exposure.
Regular cleaning of equipment and floor.
Procedures for process control and maintenance.
Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

Use personal protective equipment as required.

Contributing exposure scenario 3

Industrial and professional use of dispersions, pastes and polymerised substrates with < 25 % w/w Zinc sulphate**Exposure assessment and RCR for outdoor use (worker)****Operational conditions**

Product characteristics: Particles: sporadic release, low dustiness.
Liquid, solution, paste: worst case assumption.
Amounts used: < GES4-GES5
Industrial, professional: 50 t/y (typical) =0.15 t/d =0,05 t per shift
Industrial (maximum): 500 t/y =1.5 t/d; 0.5 t/per shift

Concentration of the substance in a mixture:
Zinc sulphate, Zn-compounds: < 25 %

Duration and frequency of use:
8h/d (full shift)

Human factors not influenced by risk management:
Potentially exposed body parts: face

Other relevant operational conditions:
Process (wet).
Indoor use. Use in contained systems.

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Exposure prediction

Exposure estimation and reference to its source:

Operational conditions e.g. working temperature: 25 °C, in aqueous solution, content: 5-25 %, used model: MEASE-model

professional (worst case assumption for industrial), outdoor, PROC 8b,9,10,13

Inhalative (systemic):

<= 0.06 mg/d

Inhalative (zinc in workplace):

<= 0.6 mg/m³

Dermal (systemic):

<= 0.36 mg/d

professional (worst case assumption for industrial), outdoor, with AFP 20, efficiency of 95%, PROC 11:

Inhalative (systemic):

<= 2.4 mg/d

Inhalative (zinc in workplace):

<= 0.6 mg/m³

Dermal (systemic):

<= 2.7 mg/d

Risk characterisation ratio (RCR):

Used model: MEASE-model

professional (worst case assumption for industrial), outdoor, PROC 8b,9,10,13

Total (systemic): <= 0.04

professional (worst case assumption for industrial), outdoor, with AFP 20, efficiency of 95%

Total (systemic): 0.3

Risk management measures

Technical conditions and measures at process level (source) to prevent release:

Enclosed.

Furnace operations: Use local exhaust. Dust control. Vent dust from the work area.

Avoid generation of dust. In case of dust formation:

Local exhaust ventilation is required (efficiency of 84 %).

Vent dust from the work area. (worst case assumption).

Air cyclones for dust collection (Efficiency of 70 - 90 %).

Filter (Efficiency of 50 - 80 %).

Two stage dust filter (Efficiency of 85 - 95 %).

Process enclosure, especially in potentially dusty units.

Workplace measurements: zinc dust and dust according to national regulation.

Equipment cleaning and maintenance.

Storage according to national regulation.

Operational conditions and risk management measures:

In general emissions are controlled and prevented by implementing an integrated management system.

Ensure safe systems of work or equivalent arrangements are in place to manage risks: e.g. ISO 9000, ISO-ICS 13100

Educate and train employees in safe use of product.

Procedures for control of personal exposure.

Regular cleaning of equipment and floor.

Procedures for process control and maintenance.

Use personal protection equipment.

Conditions and measures related to personal protection, hygiene and health evaluation:

Use personal protective equipment as required.



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

not applicable



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Exposure Scenario 8: Generic exposure scenario, consumers: combined for all exposure routes

List of use descriptors

Sector of uses [SU]: SU21: Consumer uses

Application

Contributing Scenarios:	1	Generic exposure scenario, consumers: combined for all exposure routes (Consumer)	Page 60
	2	Generic exposure scenario, consumers: combined for all exposure routes (environment)	Page 60

Contributing exposure scenario 1

Generic exposure scenario, consumers: combined for all exposure routes (Consumer)

Operational conditions

Duration and frequency of use:

oral (food): 0.6 - 39 mg Zn/d

Absorption, estimated: 20%

(NOAEL human, oral: 50 mg Zn/d - WHO: 45 mg Zn/d)

Exposure prediction

Exposure estimation and reference to its source:

Exposure estimation:

Zinc, metal: negligible

Zinc oxide: 2.5 - 5.1 mg Zn/d

Zinc chloride: 0.2 mg Zn/d

Zinc sulphate: 0.00046 mg Zn/d

Zinc phosphate: 0.045 mg Zn/d

Zinc distearate: 0.0062 mg Zn/d

Cosmetics, personal care products: 1.6 mg Zn/d

Absorption, estimated: 20%

Indirect exposure to humans via the environment:

Manufacture, air: 0.00062 mg Zn/d

Processing, water: 0.16 mg Zn/d

Processing, air: 0.0074 mg Zn/d

Risk characterisation ratio (RCR):

RCR: 0.16

Risk management measures

Operational conditions and risk management measures:

not required



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Contributing exposure scenario 2

Generic exposure scenario, consumers: combined for all exposure routes (environment)

Exposure prediction

Exposure estimation and reference to its source:

PEC water (freshwater): 3.51 µg Zn/L
PEC water (marine water): 2.88 µg Zn/L
PEC sediment (freshwater): 418 mg Zn/kg dw
PEC sediment (marine water): 19.8 mg Zn/kg dw
PEC agriculture soil: 16.1 mg Zn/kg dw
PEC soil: 0.9 mg Zn/kg dw
PEC soil, industrial: 44 mg Zn/kg dw

Indirect exposure to humans via the environment:

PEC manufacture, air: 0.078 µg/m³
PEC Processing, water: 410 µg/m³
PEC Processing, air: 0.928 µg/m³

Risk characterisation ratio (RCR):

RCR water (freshwater): 0.17
RCR water (marine water): 0.47
RCR sediment (freshwater): 1.8
RCR sediment (marine water): 0.18
RCR agriculture soil: 0.15
RCR soil: 0.008
RCR soil, industrial: 0.41

Risk management measures

Technical conditions and measures at process level (source) to prevent release:

not required

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

not applicable

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VAT number	BE0405317567	NL001375945B01
recall procedure available	Yes	
emergency number (24/365)	+32 (0)56 77 69 44	+31 (0)78 6544 944
QUALITY SYSTEMS		
ISO 9001	Yes	Yes
ISO 14001	Yes	Yes
ISO 22000	Yes	Yes
FSSC 22000	Yes	Yes
GMP+ -feed	Yes	Yes
OHSAS18001	-	Yes
ESAD	Yes	Yes
other	-	AEO