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**SAFETY DATA SHEET**

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

## 1.1 Product identifier

- Product Name: Zinc Phosphate
- Chemical Name: Trizinc bis(orthophosphate)
- Synonyms: C.I. 77964 / C.I. pigment white 32 / Delaphos 2 (D2) / Delaphos 2M (D2M) / Delaphos 4 (D4) / Delaphos 4M (D4M) / pigment white 32 / zinc acid phosphate / zinc orthophosphate / zinc(II) phosphate
- CAS Number: 7779-90-0
- EC Number: 231-944-3
- REACH Registration Number: 01-2119485044-40-XXXX

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

- Use of the substance/mixture: Industrial use. Corrosion inhibitor. Used in the manufacture of anti-corrosive coatings
- Use advised against: No information available

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

- Name of Supplier: JPE Holdings Ltd
- Address of Supplier: The Lodge  
Warstone Road  
Essington  
Wolverhampton  
WV11 2AR  
UK
- Telephone: +44 (0) 1922 475055
- Email: stef@jpeh.co.uk

## 1.4 Emergency telephone number

- Emergency Telephone: +44 (0) 1922 475055

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**SECTION 2: Hazards identification**

## 2.1 Classification of the substance or mixture

- Classification (REGULATION (EC) No 1272/2008) [CLP/GHS]: Aquatic Acute 1, H400; Aquatic Chronic 1, H410
- Additional information: For full text of Hazard- and EU Hazard-statements: see section 16

## 2.2 Label elements



Signal Word: Warning

## Hazard statements

H410 - Very toxic to aquatic life with long lasting effects.

## Precautionary statements

P273 - Avoid release to the environment.

P391 - Collect spillage.

P501 - Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.

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**SECTION 2: Hazards identification (....)**

Supplemental Hazard information (EU)

None

## 2.3 Other hazards

- Not a PBT according to REACH Annex XIII
- Not a vPvB according to REACH Annex XIII
- Does not contain any substances with endocrine disrupting properties

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**SECTION 3: Composition/information on ingredients**

## 3.1 Substances

Chemical Name	Conc.	CAS No.	EC No.	Classification (REGULATION (EC) No 1272/2008) [CLP/GHS]	SCL/ M-Factor/ ATE	REACH Registration Number	WEL/ OEL
Zinc Phosphate	100 %	7779-90-0	231-944-3	Aquatic Acute 1, H400 Aquatic Chronic 1, H410	-	01-2119485044-40 -XXXX	No

## 3.2 Mixtures

- Not applicable

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**SECTION 4: First aid measures**

## 4.1 Description of first aid measures

Rescuers should put on approved personal protective equipment (PPE) before administering first aid

## Contact with eyes

If substance has got into eyes, immediately wash out with plenty of water for several minutes  
Remove contact lenses, if present and easy to do. Continue rinsing.  
If eye irritation persists: Get medical advice/attention.

## Contact with skin

Take off contaminated clothing and wash it before reuse.  
Wash affected area with plenty of soap and water  
If skin irritation occurs: Get medical advice/attention.

## Ingestion

Rinse mouth with water (do not swallow)  
Give plenty of water to drink  
Do NOT induce vomiting.  
IF exposed or concerned: Get medical advice/attention.

## Inhalation

No hazard expected under normal conditions of use  
If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.  
IF exposed or concerned: Get medical advice/attention

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

## Contact with eyes

No hazard expected under normal conditions of use  
May cause mild eye irritation

**SECTION 4: First aid measures (....)**

## Contact with skin

- No hazard expected under normal conditions of use
- May cause mild skin irritation

## Ingestion

- No hazard expected under normal conditions of use
- May cause gastro-intestinal irritation

## Inhalation

- No hazard expected under normal conditions of use
- Dust may cause respiratory irritation.

## 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: Not flammable. In case of fire use extinguishing media appropriate to surrounding conditions
- Unsuitable extinguishing media: High volume water jet; carbon dioxide

## 5.2 Special hazards arising from the substance or mixture

- Gives off irritating or toxic fumes (or gases) in a fire.

## 5.3 Advice for firefighters

- Collect contaminated fire extinguishing water separately. This MUST not be discharged into drains. Prevent fire extinguishing water from contaminating surface or ground water.
  - Special protective equipment: Wear self-contained breathing apparatus (SCBA). Wear full protective clothing including chemical protection suit.
  - Clothing for firefighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents
- 

**SECTION 6: Accidental release measures**

## 6.1 Personal precautions, protective equipment and emergency procedures

- No action shall be taken involving any personal risk or without suitable training
- Only trained and authorised personnel should carry out emergency response
- Personal precautions for non-emergency personnel: Avoid formation of dust; Ventilate area; Avoid contact with skin and eyes; Do not touch or walk through spilt material; Wash thoroughly after handling.
- Personal precautions for emergency responders: Ventilate area; Avoid formation of dust; If dust is formed, wear approved dust mask; Avoid contact with skin and eyes; Wear protective clothing as per section 8; Wash thoroughly after dealing with spillage

## 6.2 Environmental precautions

- Avoid release to the environment.
- Do not allow to enter public sewers and watercourses

## 6.3 Methods and material for containment and cleaning up

- Avoid formation of dust
  - Remove by mechanical means
  - Place in appropriate container
  - Seal containers and label them
  - Remove contaminated material to safe location for subsequent disposal
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**SECTION 6: Accidental release measures (....)**

- Ventilate the area and wash spill site after material pick-up is complete
- Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air)
- Seek expert advice for removal and disposal of all contaminated materials and wastes

## 6.4 Reference to other sections

- See section(s): 7, 8 & 13
- 

**SECTION 7: Handling and storage**

## 7.1 Precautions for safe handling

- No hazard expected under normal conditions of use
- Ensure adequate ventilation
- Wear protective clothing as per section 8
- Do not eat, drink or smoke when using this product.
- Wash hands thoroughly after using this substance
- Wash thoroughly after handling.

## 7.2 Conditions for safe storage, including any incompatibilities

- Store in a cool, dry well-ventilated place. Keep container tightly closed.
- Store at 0 - 50 °C
- Incompatible with strong acids, strong bases

## 7.3 Specific end use(s)

- Used in the manufacture of anti-corrosive coatings
- 

**SECTION 8: Exposure controls/personal protection**

## 8.1 Control parameters

- If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.  
Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace exposure - Measurement of exposure by inhalation to chemical agents - Strategy for testing compliance with occupational exposure limit values). European Standard EN 14042 (Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents). European Standard EN 482 (Workplace exposure. General requirements for the performance of procedures for the measurement of chemical agents). Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

## Zinc Phosphate

PNEC aqua (freshwater) 14.4 - 85 µg/L  
PNEC aqua (marine water) 7.2 - 42.5 µg/L  
PNEC (STP) 100 - 590.5 µg/L  
PNEC sediment (freshwater) 146.9 - 867.4 mg/kg  
PNEC sediment (marine water) 162.2 - 957.7 mg/kg  
PNEC terrestrial (soil) 83.1 - 490.7 mg/kg

## 8.2 Exposure controls

- Selection and use of personal protective equipment should be based on a risk assessment of exposure potential
  - Engineering controls
    - Ensure adequate ventilation
    - Provide appropriate exhaust ventilation at places where airborne dust is generated
  - Respiratory protection
    - In case of insufficient ventilation, wear suitable respiratory equipment
-

**SECTION 8: Exposure controls/personal protection (....)**

- Use type FFP1 or FFP2 (EN 143) dust masks
- Skin protection
    - Wear suitable protective clothing
    - Wear dustproof working clothes
    - Wear protective gloves. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and standard EN 374.
    - The selection of a suitable glove depends on work conditions and whether the product is present on its own or in combination with other substances. Breakthrough time is dependent on the characteristics of the brand of glove used and the supplier should be consulted.
    - Suitable glove material: Polyvinylchloride (PVC)
  - Eye/face protection
    - If there is a risk of product getting into eyes, wear safety glasses approved to standard EN 166.
  - Thermal hazards
    - None required for normal handling of product
  - Hygiene measures
    - Use good personal hygiene practices
    - Do not eat, drink or smoke when using this product.
    - Wash thoroughly after handling.
  - Environmental exposure controls
    - Avoid release to the environment.
- 

**SECTION 9: Physical and chemical properties**

## 9.1 Information on basic physical and chemical properties

- Physical state: Solid. Powder
- Colour: Off-white
- Odour: None
- Melting point/freezing point: In air, the substance starts melting at 846 °C
- Boiling point or initial boiling point and boiling range: The substance is a solid which decomposes before boiling
- Flammability: Not flammable
- Lower and upper explosion limit: Not applicable
- Flash point: Not applicable as the substance is inorganic
- Auto-ignition temperature: Not applicable
- Decomposition temperature: No data available
- pH: Not applicable
- Kinematic viscosity: At 20 °C, the substance is solid, and viscosity is not applicable.
- Solubility: 2.7 mg/L (slightly soluble)
- Partition coefficient n-octanol/water (log value): Not applicable as the substance is inorganic
- Vapour pressure: 0 Pa @ 20 °C
- Density and/or relative density: 3.26 @ 20 °C
- Relative vapour density: No data available
- Particle characteristics: No data available

## 9.2 Other information

- No information available
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**SECTION 10: Stability and reactivity**

## 10.1 Reactivity

## SECTION 10: Stability and reactivity (....)

- Considered stable under normal conditions
- 10.2 Chemical stability
- Stable under normal conditions
- 10.3 Possibility of hazardous reactions
- No hazardous reactions known if used for its intended purpose
- 10.4 Conditions to avoid
- Keep away from heat
- 10.5 Incompatible materials
- Incompatible with strong acids, strong bases
- 10.6 Hazardous decomposition products
- Under normal conditions of storage and use, hazardous decomposition products should not be produced

## SECTION 11: Toxicological information

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

- Acute Toxicity  
Based on available data, the classification criteria are not met

#### Substances

Chemical Name	LD <sub>50</sub> (oral, rat)	LC <sub>50</sub> (inhalation, rat)	LD <sub>50</sub> (dermal, rabbit)
Zinc Phosphate	5 000 mg/kg	(4 h) 5.7 mg/L	No data available

- Skin corrosion/irritation  
Based on available data, the classification criteria are not met

#### Substances

Chemical Name	Irritation/corrosion
Zinc Phosphate	No adverse effect observed (not irritating)

- Serious eye damage/irritation  
Based on available data, the classification criteria are not met

#### Substances

Chemical Name	Irritation/corrosion
Zinc Phosphate	No adverse effect observed (not irritating)

- Respiratory or skin sensitisation  
Based on the available data, the classification criteria are not met

#### Substances

Chemical Name	Skin sensitisation	Respiratory sensitisation
Zinc Phosphate	No adverse effect observed (not sensitising)	No study available

- Germ cell mutagenicity  
Based on available data, the classification criteria are not met

**SECTION 11: Toxicological information (....)**

Substances

Chemical Name	Toxicity - In Vitro	Toxicity - In Vivo
Zinc Phosphate	No adverse effect observed (negative)	No adverse effect observed (negative)

- Carcinogenicity

Based on available data, the classification criteria are not met

Substances

Chemical Name	NOAEL (oral, rat)	NOAEC (inhalation, rat)	NOAEL (dermal, rat)
Zinc Phosphate	No data available	No data available	No data available

- Reproductive toxicity

Based on available data, the classification criteria are not met

Substances

Chemical Name	NOAEL (oral, rat)	NOAEC (inhalation, rat)	NOAEL (dermal, rat)
Zinc Phosphate	No data available	No data available	No data available

- Specific target organ toxicity (STOT) - single exposure

Based on the available data, the classification criteria are not met

Substances

Chemical Name	Route	Remarks
Zinc Phosphate	Respiratory	No adverse effect observed (not irritating)

- Specific target organ toxicity (STOT) - repeated exposure

Based on the available data, the classification criteria are not met

Substances

Chemical Name	NOAEL (oral, rat)	NOAEC (inhalation, rat)	NOAEL (dermal, rat)
Zinc Phosphate	31.25 mg/kg bw/day	470 - 520 µg/m <sup>3</sup>	No data available

- Aspiration hazard

Based on the available data, the classification criteria are not met

- Contact with eyes

No hazard expected under normal conditions of use  
May cause mild eye irritation

- Contact with skin

No hazard expected under normal conditions of use  
May cause mild skin irritation

- Ingestion

No hazard expected under normal conditions of use  
May cause gastro-intestinal irritation

- Inhalation

No hazard expected under normal conditions of use  
Dust may cause respiratory irritation.

11.2 Information on other hazards

- Does not contain any substances with endocrine disrupting properties

**SECTION 12: Ecological information**

## 12.1 Toxicity

- Very toxic to aquatic life with long lasting effects

## Substances

Chemical Name	LC <sub>50</sub> (fish)	EC <sub>50</sub> (aquatic invertebrates)	EC <sub>50</sub> (aquatic algae)
Zinc Phosphate	(4 days) 102 - 35 980 µg/L	(48 h) 105 - 2 909 µg/L	(4 days) 42 - 1 036 µg/L

## 12.2 Persistence and degradability

## Substances

Chemical Name	Biodegradation
Zinc Phosphate	Not applicable, inorganic

## 12.3 Bioaccumulative potential

## Substances

Chemical Name	Bioconcentration Factor (BCF)	Log Kow
Zinc Phosphate	No data available	Not applicable, inorganic

## 12.4 Mobility in soil

## Substances

Chemical Name	Adsorption/desorption
Zinc Phosphate	Not determined

## 12.5 Results of PBT and vPvB assessment

- Not a PBT according to REACH Annex XIII
- Not a vPvB according to REACH Annex XIII

## 12.6 Endocrine disrupting properties

- No information available

## 12.7 Other adverse effects

- No information available

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**SECTION 13: Disposal considerations**

## 13.1 Waste treatment methods

- Disposal should be in accordance with local, state or national legislation
- Dispose of contents/container to an authorised waste collection point
- This material and/or its container must be disposed of as hazardous waste
- Avoid release to the environment.

## 13.2 Classification

- The waste must be identified according to the List of Wastes (2000/532/EC)
- Hazardous Property Code(s): HP 14 Ecotoxic

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**SECTION 14: Transport information**

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**SECTION 14: Transport information (...)**

## 14.1 UN number or ID number

- UN No.: 3077

## 14.2 UN proper shipping name

- Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Phosphate)

## 14.3 Transport hazard class(es)

- Hazard Class: 9

## 14.4 Packing group

- Packing Group: III

## 14.5 Environmental hazards

- MARINE POLLUTANT/ENVIRONMENTALLY HAZARDOUS

## 14.6 Special precautions for user

- No information available

## 14.7 Maritime transport in bulk according to IMO instruments

- Not applicable

## 14.8 Road/Rail (ADR/RID)

- ADR UN No.: 3077
- Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Phosphate)
- ADR Hazard Class: 9
- ADR Packing Group: III
- Tunnel Code: (-)

## 14.9 Sea (IMDG)

- IMDG UN No.: 3077
- Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Phosphate)
- IMDG Hazard Class: 9
- IMDG Packing Group: III

## 14.10 Air (ICAO/IATA)

- ICAO UN No.: 3077
- Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Phosphate)
- ICAO Hazard Class: 9
- ICAO Packing Group: III

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**SECTION 15: Regulatory information**

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

- This safety data sheet is provided in compliance with REACH Regulation (EC) No 1907/2006 (as amended by Regulation (EU) 2020/878) and UK REACH
- The GB Classification, Labelling and Packaging Regulation (GB CLP) applies in Great Britain

**SECTION 15: Regulatory information (....)**

- Regulation (EC) No. 1272/2008 on the classification, labelling and packaging of substances and mixtures (CLP Regulation) applies in Europe
- Seveso III Directive (2012/18/EU, Dangerous Substances in Annex I: Class E1 (Hazardous to the Aquatic Environment in Category Acute 1 or Chronic 1), LT 100 te, UT 200 te
- Restrictions on use according to Annex XVII to REACH Regulation: None

## 15.2 Chemical safety assessment

- A REACH chemical safety assessment has been carried out
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**SECTION 16: Other information**

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. This company shall not be held liable for any damage resulting from handling or from contact with the above product.

Sources of data: Information from published literature and company data

Revision No. 2.1.0. Revised June 2026.

Changes made: Revised to conform to the latest version of REACH Annex II

## Training advice

- Workers must be informed of the presence of hazardous ingredients and trained in the proper use and handling of this product as required under applicable regulations

Text not given with phrase codes where they are used elsewhere in this safety data sheet:

- H400: Very toxic to aquatic life
- H410: Very toxic to aquatic life with long lasting effects

## Acronyms

- ATE: Acute Toxicity Estimate
- CAS: Chemical Abstracts Service
- DNEL: Derived No-Effect Level
- EC: European Community
- EC<sub>50</sub>: Effective Concentration, 50%
- GHS: Globally Harmonised System
- IARC: International Agency for Research on Cancer
- LC<sub>50</sub>: Lethal Concentration, 50%
- LD<sub>50</sub>: Lethal Dose, 50%
- NOAEC: No Observed Adverse Effect Concentration
- NOAEL: No Observed Adverse Effect Level
- OEL: Occupational Exposure Limit
- PBT: Persistent, Bioaccumulative and Toxic
- PNEC: Predicted No-Effect Concentration
- REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals
- SCL: Specific Concentration Limit
- SVHC: Substances of Very High Concern
- vPvB: very Persistent and very Bioaccumulative
- WEL: Workplace Exposure Limit

--- end of safety datasheet ---

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## Annex to the safety data sheet

### Product exposure scenario(s)

ES Type	ES title
Worker	Industrial use of Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> in the formulation of preparations by mixing thoroughly, dry or in a solvent, the starting materials with potentially pressing, pelletising, sintering, possibly followed by packing.
Worker	Industrial use of zinc oxide or Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> -formulations in the manufacturing of other inorganic or organic zinc substances through different process routes, with potentially drying, calcining and packaging
Worker	Industrial and professional use of Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> as active laboratory reagent in aqueous or organic media, for analysis or synthesis
Worker	Industrial use of Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> or Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> -formulations as component for the manufacture of solid blends and matrices for further downstream use
Worker	Industrial use of Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> or Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> -formulations as component for the manufacture of dispersions, pastes or other viscous or polymerized matrices
Worker	Industrial and professional use of solid substrates containing less than 25%w/w of Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>
Worker	Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>

## 1. Exposure scenario GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -1

**Industrial use of Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> in the formulation of preparations by mixing thoroughly, dry or in a solvent, the starting materials with potentially pressing, pelletising, sintering, possibly followed by packing.**

ES Ref.: GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -1  
ES Type: Worker  
Version: 1.0

Date of issue: 19/10/2017

Use descriptors	SU3, SU10 PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, PROC14, PROC15, PROC22, PROC26 ERC1, ERC2
Processes, tasks, activities covered	Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> is used in the manufacture of preparations by mixing thoroughly the starting materials, followed by direct use of packaging of the preparation. Many different industrial uses are characterised by this process. Therefore these industrial uses are all covered by this generic exposure scenario. Formulation

## 2. Operational conditions and risk management measures

### 2.2 Contributing scenario controlling environmental exposure (ERC1, ERC2)

Removed from the packaging and stored in silos after delivery; Extracted from the silo, dosed and fed with the other reagents to the mixing tank. Mixing occurs batchwise or continuously, according the process receipt. The mixing occurs in a closed tank/chamber.; The preparation (dry or wet (solvent/paste) matrix) is further used as such or packed for further treatment/use.

ERC1	Manufacture of substances
ERC2	Formulation of preparations

#### Product characteristics

Physical form of product	Powder
Concentration of substance in product	> 80 %

#### Operational conditions

Amounts used	Annual site tonnage (tonnes/year):	5000 t/yr
Frequency and duration of use	Continuous release	7 days/week Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.
Environmental factors not influenced by risk management	Receiving surface water flow is 18000 m <sup>3</sup> /d	
Other given operational conditions affecting environmental exposure	Indoor use	
	Even when no process waters (e.g. when dry process throughout), some non-process water can be generated containing zinc (e.g. from cleaning)	
	All residues containing zinc are recycled.	

#### Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Process within closed systems.	
	Local exhaust is recommended where dust may occur	
	Containment of liquid volumes in sumps to collect/prevent accidental spillage	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Prevent discharge of undissolved substance to or recover from onsite wastewater	
	On-site waste water treatment techniques can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%).	
	Use appropriate air emissions abatement systems (e.g. wet or dry scrubber or local STP) to ensure that the emission levels defined by local regulations are not exceeded	
	Air emissions are controlled by use of bag-house	

	filters and/or other air emission abatement devices e.g. fabric (or bag) filters (up to 99% efficiency), wet scrubbers (50-99% efficiency). This may create a general negative pressure in the building.	
Organisation measures to prevent/limit release from site	Ensure operatives are trained to minimise releases	
	Regular cleaning of equipment and work area	
Conditions and measures related to sewage treatment plant	Size of the sewage treatment plant (STP). No additional information	
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	
Conditions and measures related to external recovery of waste	External recovery and recycling of waste should comply with applicable local and/or national regulations	

**2.1 Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, PROC14, PROC15, PROC22, PROC26)**

Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> is used in the manufacture of preparations by mixing thoroughly the starting materials, followed by direct use of packaging of the preparation. Many different industrial uses are characterised by this process.

Therefore these industrial uses are all covered by this generic exposure scenario.

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 for formulation of preparations and articles (multistage and/or significant contact)
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation 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	Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting
PROC26	Handling of solid inorganic substances at ambient temperature

**Product characteristics**

Physical form of product	Solid or liquid, When the preparation is in solid state, it can be in a) powdery, b) glassy or c) pelletized form. In the powder form, it can be characterised by high dustiness in a worst case situation.
Concentration of substance in product	<= 5% up to >25%

**Operational conditions**

Amounts used	Annual site tonnage (tonnes/year):	< 5000 t/yr
Frequency and duration of use	Exposure duration	< 8 h/day
Human factors not influenced by risk management	Uncovered body parts:	(Potentially) Face
Other given operational conditions affecting workers exposure	Elevated temperature steps (~=100°C) can occur	
	All indoor processes in confined area.	

**Risk Management Measures**

Technical conditions and measures at process level (source) to prevent release	During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points where emissions could occur. Outdoor, LEV is not generally required.	
	Containment of liquid volumes in sumps to collect/prevent accidental spillage	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least 90-95%	
	Cyclones/filters (for minimizing dust emissions) : efficiency: 70-90% (cyclones), 50-80% (dust filters), 85-95% (double stage, cassette filters)	
	Process enclosure, especially in the drying /calcination / packaging (potentially dusty) units	
	Dust control: dust and Zn in dust needs to be measured in the workplace air (static or individual) according to national regulations.	
	Special care for the general establishment and maintenance of a clean working environment by e.g.:	Cleaning of process equipment and workshop
	Storage of packaged Zn product in dedicated zones, eg:	

Organisational measures to prevent /limit releases, dispersion and exposure	Such management system would include general industrial hygiene practice e.g.:	information and training of workers on prevention of exposure/accidents. procedures for control of personal exposure (hygiene measures). regular cleaning of equipment and floors, extended workers instruction-manuals. procedures for process control and maintenance. personal protection measures (see below)
Conditions and measures related to personal protection, hygiene and health evaluation	With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:	dust filter-half mask P1 (efficiency 75%). dust filter-half mask P2 (efficiency 90%). dust filter-half mask P3 (efficiency 95%). dust filter-full mask P1 (efficiency 75%). dust filter-full mask P2 (efficiency 90 %). dust filter-full mask P3 (efficiency 97.5%)

**3. Exposure estimation and reference to its source**

3.1. Health

3.2. Environment

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

4.1. Health

4.2. Environment

## 1. Exposure scenario GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -2

### Industrial use of zinc oxide or Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> - formulations in the manufacturing of other inorganic or organic zinc substances through different process routes, with potentially drying, calcining and packaging

ES Ref.: GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -2  
ES Type: Worker  
Version: 1.1

Use descriptors	SU0, SU3, SU8, SU9, SU10, SU14, SU15 PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, PROC15, PROC21, PROC23, PROC26 PC7, PC14, PC19, PC20, PC21, PC24, PC29, PC39 AC2, AC7 ERC1, ERC2, ERC5, ERC6a
Processes, tasks, activities covered	Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> is used as a starting material for the manufacturing of several other inorganic and organic zinc compounds. All the manufacturing processes are covered by the present scenario. Manufacture

## 2. Operational conditions and risk management measures

### 2.2 Contributing scenario controlling environmental exposure (ERC1, ERC2, ERC5, ERC6a)

Description of activities/process(es) covered in the Exposure Scenario:

- Reception of the Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> or Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -containing formulation, or Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> - bearing raw material in the reaction tank
- Sequential addition of reagents for purification steps and filtration on press filter, when needed (ventilation is adapted).
- Concentration by water evaporation, under exhaust hood.
- Possible pouring on a cooling belt.
- Discharge and packaging of produced zinc compounds. 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 (ca. 1 m<sup>3</sup> capacity); solids are packed in bags or drums.
- Maintenance activities

ERC1	Manufacture of substances
ERC2	Formulation of preparations
ERC5	Industrial use resulting in inclusion into or onto a matrix
ERC6a	Industrial use resulting in manufacture of another substance (use of intermediates)

#### Product characteristics

Physical form of product	Powder
Concentration of substance in product	> 99 % or in solution.
Vapour pressure	< 1 hPa

#### Operational conditions

Amounts used	Annual site tonnage:	< 75 T per day of Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> is transformed to equivalent Zn compound
Frequency and duration of use	Continuous release	7 days/week Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.
Environmental factors not influenced by risk management	Default for generic scenario:	18000 m <sup>3</sup> /d unless specified otherwise
Other given operational conditions affecting environmental exposure	Wet processes (leaching, filtering, purification) followed by drying (possible grinding), and packaging All indoor processes, in confined area.	

#### Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Careful use of acids and corrosive solutions, if used
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	Sump containment is provided under the tanks and the filters i.o. to collect any accidental spillage	
	When applicable, process waters need to be specifically treated before release	
	Dosing and packaging operations occur under a special ventilation hood	
	Process air is filtered before release outside the building	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	On-site waste water treatment techniques are (if applicable) e.g.: chemical precipitation, sedimentation, filtration (efficiency 90-99.98%).	
	Containment of liquid volumes in sumps to collect/prevent accidental spillage	
	Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric (or bag) filters (up to 99% efficiency), wet scrubbers (50-99% efficiency). This may create a general negative pressure in the building. Air emissions are continuously monitored.	
Organisation measures to prevent/limit release from site	In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000, ISO 1400X series, or alike, and, when applicable, by being IPPC-compliant.	
	Such management system should include general industrial hygiene practice e.g.: - information and training of workers - regular cleaning of equipment and floors - procedures for process control and maintenance	
	Treatment and monitoring of releases to outside air, and exhaust gas streams (process & hygiene), according to national regulation.	
	SEVESO 2 compliance, if applicable	
Conditions and measures related to sewage treatment plant	In cases where applicable: default size, unless specified otherwise.	
Conditions and measures related to external treatment of waste for disposal	If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.	
	Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products	
	Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.	
Conditions and measures related to external recovery of waste	All residues from the wet process are recycled.	
	Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products	
	Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.	

**2.1 Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, PROC15, PROC21, PROC23, PROC26)**

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 for formulation of preparations and articles (multistage and/or significant contact)
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation 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
PROC23	Open processing and transfer operations with minerals/metals at elevated temperature
PROC26	Handling of solid inorganic substances at ambient temperature

**Product characteristics**

Physical form of product	Powder
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Concentration of substance in product	≈ 100 % or in solution.	
Vapour pressure	< 1 hPa	
<b>Operational conditions</b>		
Amounts used	Maximum daily site tonnage (kg/day):	< 25 T Ton Per Shift
Frequency and duration of use	Exposure duration	< 8 h/day Worst Case
Human factors not influenced by risk management	Uncovered body parts:	(Potentially) Face
Other given operational conditions affecting workers exposure	All indoor processes in confined area.	
<b>Risk Management Measures</b>		
Technical conditions and measures at process level (source) to prevent release	Process enclosures or semi-enclosures where appropriate.	
	Local exhaust ventilation work areas with potential dust and fumes generation, dust capturing and removal techniques	
	Containment of liquid volumes in sumps to collect/prevent accidental spillage	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least 90-95%	
	Cyclones/filters (for minimizing dust emissions) : efficiency: 70-90% (cyclones), 50-80% (dust filters), 85-95% (double stage, cassette filters)	
	Process enclosure, especially in the drying /calcination / packaging (potentially dusty) units	
	Dust control: dust and Zn in dust needs to be measured in the workplace air (static or individual) according to national regulations.	
	Special care for the general establishment and maintenance of a clean working environment by e.g.:	Cleaning of process equipment and workshop
	Storage of packaged Zn product in dedicated zones, eg:	
Organisational measures to prevent /limit releases, dispersion and exposure	In general integrated management systems are implemented at the workplace e.g. ISO 9000, ISO-ICS 13100, or alike, and are, when appropriate, IPPC-compliant.	
	Such management system would include general industrial hygiene practice e.g.:	information and training of workers on prevention of exposure/accidents. personal protection measures (see below). procedures for control of personal exposure (hygiene measures). procedures for process control and maintenance. regular cleaning of equipment and floors, extended workers instruction-manuals
Conditions and measures related to personal protection, hygiene and health evaluation	Wearing of gloves and protective clothing is compulsory (efficiency >=90%).	
	With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:	dust filter-half mask P1 (efficiency 75%). dust filter-half mask P2 (efficiency 90%). dust filter-half mask P3 (efficiency 95%). dust filter-full mask P1 (efficiency 75%). dust filter-full mask P2 (efficiency 90 %). dust filter-full mask P3 (efficiency 97.5%)
	Eyes	safety glasses are optional

### 3. Exposure estimation and reference to its source

#### 3.1. Health

#### 3.2. Environment

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

#### 4.1. Health

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4.2. Environment

## 1. Exposure scenario GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -3

### Industrial and professional use of Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> as active laboratory reagent in aqueous or organic media, for analysis or synthesis

ES Ref.: GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -3  
ES Type: Worker  
Version: 1.1

Use descriptors	SU3, SU10, SU22, SU24 PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15 PC19, PC21, PC28, PC39 ERC1, ERC2, ERC4, ERC6a, ERC6b, ERC8a, ERC8c, ERC8d, ERC8f
Processes, tasks, activities covered	Industrial use Professional use

## 2. Operational conditions and risk management measures

### 2.2 Contributing scenario controlling environmental exposure (ERC1, ERC2, ERC4, ERC6a, ERC6b, ERC8a, ERC8c, ERC8d, ERC8f)

Analysis: sample (solid or liquid) treatment or preparation: the substance is in the sample or in the reagents; or synthesis: manipulations are usually under ventilation (e.g. laminar flow, ventilation hood); The substance is used:

- at the industrial scale, in industrial installations for air control and water treatment
- at the professional scale by laboratories

ERC1	Manufacture of substances
ERC2	Formulation of preparations
ERC4	Industrial use of processing aids in processes and products, not becoming part of articles
ERC6a	Industrial use resulting in manufacture of another substance (use of intermediates)
ERC6b	Industrial use of reactive processing aids
ERC8a	Wide dispersive indoor use of processing aids in open systems
ERC8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
ERC8d	Wide dispersive outdoor use of processing aids in open systems
ERC8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix

#### Product characteristics

Physical form of product	Solid
Concentration of substance in product	< 80 % higher grades (>95%) are usual
Vapour pressure	< 1 hPa

#### Operational conditions

Amounts used		< 5 t/yr Industrial Scale < 0.5 t/yr Professional Scale
Frequency and duration of use		Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.
Environmental factors not influenced by risk management	Receiving surface water flow is 18000 m <sup>3</sup> /d	unless specified otherwise
Other given operational conditions affecting environmental exposure	All indoor processes, in confined area, All residues containing zinc are recycled.	

#### Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Process within closed systems.	
	If relevant, dust capturing and removal techniques are applied on local exhaust ventilation (centralised treatment, scrubbers, filters,...)	
	Containment of liquid volumes to collect waste streams	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	At industrial scale, the waste waters will be treated in the on-site waste water treatment techniques that can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%).	
	At professional scale, the emissions are treated	

	usually by STP. Professional services will be used for treating waste streams e.g. for the recovery of metallic solids (for recycling), and for the recovery of e.g. acid solutions containing the substance.	
	Air emissions are controlled by use filters and/or other air emission abatement devices e.g. fabric (or bag) filters (up to 99% efficiency), wet scrubbers (50-99% efficiency). This may create a general negative pressure in the laboratory.	
Organisation measures to prevent/limit release from site	In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000, ISO 1400X series, or alike, and, when applicable, by being IPPC-compliant.  Such management system should include general industrial hygiene practice e.g.: - information and training of workers - regular cleaning of equipment and floors - procedures for process control and maintenance	
	Treatment and monitoring of releases to outside air, and exhaust gas streams (process & hygiene), according to national regulation.	
Conditions and measures related to sewage treatment plant	In cases where applicable: default size, unless specified otherwise.	
Conditions and measures related to external treatment of waste for disposal	If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.	
Conditions and measures related to external recovery of waste	All residues are recycled or handled and conveyed according to waste legislation.	

**2.1 Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15)**

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 for formulation of preparations and articles (multistage and/or significant contact)
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 preparation into small containers (dedicated filling line, including weighing)
PROC15	Use as laboratory reagent

**Product characteristics**

Physical form of product	Solid, Liquid
Concentration of substance in product	> 80 % higher grades (>95%) are usual
Vapour pressure	< 1 hPa
Dustiness	Solid, high dustiness
Other product characteristics	When the preparation is in solid state, it can be in a) powdery, b) glassy or c) pelletized form.

**Operational conditions**

Amounts used	Annual site tonnage (tonnes/year):	< 5 t/yr Industrial Scale
	Annual site tonnage (tonnes/year):	< 0.5 t/yr Professional Scale
Frequency and duration of use	Use is usually intermittent but continuous use is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.	
Human factors not influenced by risk management	Uncovered body parts:	(Potentially) Face
Other given operational conditions affecting workers	high temperature steps can occur in protected zones	

exposure	(fume cupboards)	
	all indoor processes in confined area, including hazardous substances cabinets.	
<b>Risk Management Measures</b>		
Technical conditions and measures at process level (source) to prevent release	Process enclosures or semi-enclosures where appropriate.	
	Local exhaust ventilation work areas with potential dust and fumes generation, dust capturing and removal techniques	
	Containment of liquid volumes and collection in special circuits	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation systems are provided where needed on the benches and in the fume cupboards.	
	Process enclosures if relevant	
	Dust control: dust and Zn in dust needs to be measured in the workplace air (static or individual) according to national regulations.	
	Special care for the general establishment and maintenance of a clean working environment by e.g.:	Cleaning of process equipment and laboratory
	Storage of packaged Zn product in dedicated zones, eg:	hazardous substances cabinets
Organisational measures to prevent /limit releases, dispersion and exposure	In general integrated management systems are implemented at the workplace e.g. ISO 9000, ISO-ICS 13100, or alike, and are, when appropriate, IPPC-compliant.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wearing of protective clothing is compulsory (efficiency >=90%)	
	Gloves can be used occasionally if risk for direct contact with the substance.	
	With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:	dust filter-half mask P1 (efficiency 75%). dust filter-half mask P2 (efficiency 90%). dust filter-half mask P3 (efficiency 95%). dust filter-full mask P1 (efficiency 75%). dust filter-full mask P2 (efficiency 90 %). dust filter-full mask P3 (efficiency 97.5%)
	Eyes	safety glasses are optional but usually taken as "normal laboratory practice"

### 3. Exposure estimation and reference to its source

3.1. Health

3.2. Environment

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

4.1. Health

4.2. Environment

## 1. Exposure scenario GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -4

### Industrial use of Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> or Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> - formulations as component for the manufacture of solid blends and matrices for further downstream use

ES Ref.: GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -4  
ES Type: Worker  
Version: 1.1

Use descriptors	SU0, SU1, SU3, SU4, SU5, SU6a, SU8, SU9, SU10, SU11, SU12, SU13, SU14, SU16, SU20 PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, PROC14, PROC15, PROC22 PC1, PC9a, PC9b, PC9c, PC12, PC14, PC15, PC18, PC20, PC21, PC26, PC29, PC32 ERC1, ERC2, ERC3, ERC4, ERC5, ERC7, ERC10a, ERC10b, ERC11a
Processes, tasks, activities covered	Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> or Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> - containing preparations are used in the manufacture of dry preparations by mixing thoroughly the starting materials, possibly followed by pressing or pelletizing, and finally packaging of the preparation.

## 2. Operational conditions and risk management measures

### 2.2 Contributing scenario controlling environmental exposure (ERC1, ERC2, ERC3, ERC4, ERC5, ERC7, ERC10a, ERC10b, ERC11a)

In the described process, the Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> (Zn compound) containing preparation/mixture is optionally:

- Pressed at high temperature (>1000°C), grinded and re-pressed/sintered or fritted at high temperature
- Molten at high temperature (>500°C) and further cast as glassy material
- Pressed and pelletized at low temperature

And subsequently packed, or used as such, in further treatment/use

ERC1	Manufacture of substances
ERC2	Formulation of preparations
ERC3	Formulation in materials
ERC4	Industrial use of processing aids in processes and products, not becoming part of articles
ERC5	Industrial use resulting in inclusion into or onto a matrix
ERC7	Industrial 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	Wide dispersive indoor use of long-life articles and materials with low release

#### Product characteristics

Physical form of product	Solid
Concentration of substance in product	< 25 % usually <5%
Vapour pressure	< 1 hPa

#### Operational conditions

Amounts used	Annual site tonnage (tonnes/year):	< 5000 t/yr
Frequency and duration of use		Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.
Environmental factors not influenced by risk management	Receiving surface water flow is 18000 m <sup>3</sup> /d	unless specified otherwise
Other given operational conditions affecting environmental exposure	All dry processes throughout, no process waters. Even when no process waters occur (with dry process throughout), some non-process water can be generated containing zinc (e.g. from cleaning) High temperature steps are possible. All processes are performed indoor in a confined area. High temperature steps are possible. All residues containing zinc are recycled.	

#### Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Local exhaust ventilation on furnaces and other work areas with potential dust generation. Dust capturing and removal techniques are applied.
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	Process enclosures or semi-enclosures where appropriate.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	No process waters, so possible emissions to water are limited and non-process related.	
	On-site waste water treatment techniques can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%).	
	Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric or bag filters, wet scrubbers. This may create a general negative pressure in the building.	
Organisation measures to prevent/limit release from site	In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000, ISO 1400X series, or alike, and, when applicable, by being IPPC-compliant.	
	Such management system should include general industrial hygiene practice e.g.: - information and training of workers - regular cleaning of equipment and floors - procedures for process control and maintenance	
	Treatment and monitoring of releases to outside air, and exhaust gas streams (process & hygiene), according to national regulation. SEVESO 2 compliance, if applicable	
Conditions and measures related to sewage treatment plant	In cases where applicable: default size, unless specified otherwise.	
Conditions and measures related to external treatment of waste for disposal	If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.	
	Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products	
	Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.	
Conditions and measures related to external recovery of waste	All residues are recycled or handled and conveyed according to waste legislation.	
	Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products	
	Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.	

**2.1 Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, PROC14, PROC15, PROC22)**

Industrial formulation of dry preparations/mixtures by mixing thoroughly the zinc compounds with the other starting materials, with possible pressing, pelletising, sintering and packaging of the preparations/mixtures	
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 for formulation of preparations and articles (multistage and/or significant contact)
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation 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	Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting

**Product characteristics**

Physical form of product	Solid
Concentration of substance in product	< 25 %
	usually <5%
Vapour pressure	< 1 hPa

Dustiness	Solid, high dustiness	
Other product characteristics	The preparation is in the solid state, usually with a low level of dustiness; however, powder forms can occur, the high dustiness is therefore applied as a worst case	
<b>Operational conditions</b>		
Amounts used	Annual site tonnage (tonnes/year):	< 5000 t/yr
	Maximum daily site tonnage (kg/day):	< 15 T T/day
		< 5 T Ton Per Shift
Frequency and duration of use	8 hour shifts (default worst case) are assumed as starting point; it is emphasised that the real duration of exposure could be less. This has to be considered when estimating exposure.	
Human factors not influenced by risk management	Uncovered body parts:	(Potentially) Face
Other given operational conditions affecting workers exposure	Dry processes: dry operational conditions throughout the process; no process waters	
	high temperature steps can occur	
	indoor processes in confined area	
<b>Risk Management Measures</b>		
Technical conditions and measures at process level (source) to prevent release	Local exhaust ventilation work areas with potential dust and fumes generation, dust capturing and removal techniques	
	Process enclosures or semi-enclosures where appropriate.	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation systems and process enclosures are generally applied	
	Cyclones/filters (for minimizing dust emissions): efficiency 70%-90% (cyclones); dust filters (50-80%)	
	LEV in work area: efficiency 84% (generic LEV)	
Organisational measures to prevent /limit releases, dispersion and exposure	In general integrated management systems are implemented at the workplace e.g. ISO 9000, ISO-ICS 13100, or alike, and are, when appropriate, IPPC-compliant.	
	Such management system would include general industrial hygiene practice e.g.:	information and training of workers on prevention of exposure/accidents. procedures for control of personal exposure (hygiene measures). regular cleaning of equipment and floors, extended workers instruction-manuals. procedures for process control and maintenance. personal protection measures (see below)
Conditions and measures related to personal protection, hygiene and health evaluation	Wearing of protective clothing is compulsory (efficiency >=90%)	
	With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:	
	Eyes	dust filter-half mask P1 (efficiency 75%). dust filter-half mask P2 (efficiency 90%). dust filter-half mask P3 (efficiency 95%). dust filter-full mask P1 (efficiency 75%). dust filter-full mask P2 (efficiency 90 %). dust filter-full mask P3 (efficiency 97.5%) safety glasses are optional

### 3. Exposure estimation and reference to its source

3.1. Health

3.2. Environment

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

4.1. Health

4.2. Environment

## 1. Exposure scenario GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -5

### Industrial use of Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> or Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> - formulations as component for the manufacture of dispersions, pastes or other viscous or polymerized matrices

ES Ref.: GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -5  
ES Type: Worker  
Version: 1.1

Use descriptors	SU0, SU3, SU4, SU8, SU9, SU10, SU20 PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, PROC14, PROC15 PC9b, PC12, PC20, PC21, PC29 ERC2, ERC3, ERC5, ERC10a, ERC10b, ERC11a, ERC12b
Processes, tasks, activities covered	Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> or Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> -containing preparations are used in the manufacture of liquid preparations by mixing thoroughly the starting materials, with a solvent in order to obtain a solution, dispersion or paste.  Industrial use ManufactureFormulation

## 2. Operational conditions and risk management measures

### 2.2 Contributing scenario controlling environmental exposure (ERC2, ERC3, ERC5, ERC10a, ERC10b, ERC11a, ERC12b)

In the described process, the zinc phosphate containing preparation/mixture is:

- unpacked and stored in silos
- Extracted from the silo, dosed and fed with the other reagents and/or solvents to the mixing tank, batchwise or continuously, according to the process receipt.
- The resulting zinc salt containing mixture (solution, dispersion, paste) is directly further processed, or packed, for further treatment/use.

ERC2	Formulation of preparations
ERC3	Formulation in materials
ERC5	Industrial use resulting in inclusion into or onto a matrix
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	Wide dispersive indoor use of long-life articles and materials with low release
ERC12b	Industrial processing of articles with abrasive techniques (high release)

#### Product characteristics

Physical form of product	Solid
Concentration of substance in product	> 25 % usually <5%
Vapour pressure	< 1 hPa

#### Operational conditions

Amounts used	Annual site tonnage (tonnes/year):	< 5000 t/yr
Frequency and duration of use		Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.
Environmental factors not influenced by risk management	Receiving surface water flow is 18000 m <sup>3</sup> /d	unless specified otherwise
Other given operational conditions affecting environmental exposure	Even when no process waters (e.g. when dry process throughout), some non-process water can be generated containing zinc(e.g. from cleaning) All indoor processes, in confined area. All residues containing zinc are recycled.	

#### Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Local exhaust ventilation on mixing tanks and other work areas with potential dust generation. Dust capturing and removal techniques are applied. Process enclosures or semi-enclosures where appropriate.	
Technical onsite conditions and measures to reduce or	Most of the operations imply wet process-steps	

limit discharges, air emissions and releases to soil	Sump containment is provided under the tanks and the filters i.o. to collect any accidental spillage	
	On-site waste water treatment techniques can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%).	
	Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric or bag filters, wet scrubbers. This may create a general negative pressure in the building.	
Organisation measures to prevent/limit release from site	In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000, ISO 1400X series, or alike, and, when applicable, by being IPPC-compliant.	
	Such management system should include general industrial hygiene practice e.g.: - information and training of workers - regular cleaning of equipment and floors - procedures for process control and maintenance	
	Treatment and monitoring of releases to outside air, and exhaust gas streams (process & hygiene), according to national regulation.	
	SEVESO 2 compliance, if applicable	
Conditions and measures related to sewage treatment plant	In cases where applicable: default size, unless specified otherwise.	
Conditions and measures related to external treatment of waste for disposal	If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.	
	Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products	
	Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.	
Conditions and measures related to external recovery of waste	All residues are recycled or handled and conveyed according to waste legislation.	
	Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products	
	Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.	

## 2.1 Contributing scenario controlling worker exposure

### Product characteristics

Physical form of product	Solid	
Concentration of substance in product	< 25 %	
	usually <5%	
Vapour pressure	< 1 hPa	
Other product characteristics	The preparation is in the liquid state, as a paste or dispersion or other viscous or polymerized matrix, with a low level of dustiness; however, powder forms can occur, medium dustiness is therefore applied as a worst case	

### Operational conditions

Amounts used	Annual site tonnage (tonnes/year):	< 5000 t/yr 20 T/d = 7T/shift depending of application
Frequency and duration of use	8 hour shifts (default worst case) are assumed as starting point; it is emphasised that the real duration of exposure could be less. This has to be considered when estimating exposure.	
Human factors not influenced by risk management	Uncovered body parts:	(Potentially) Face
Other given operational conditions affecting workers exposure	Wet processes	
	All indoor processes in confined area.	

### Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Local exhaust ventilation on mixing tanks, furnaces and other work areas with potential dust generation, dust capturing and removal techniques	
	Process enclosures or semi-enclosures where appropriate.	

Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation systems and process enclosures are generally applied	
	Cyclones/filters (for minimizing dust emissions): efficiency 70%-90% (cyclones); dust filters (50-80%)	
	LEV in work area: efficiency 84% (generic LEV)	
Organisational measures to prevent /limit releases, dispersion and exposure	In general integrated management systems are implemented at the workplace e.g. ISO 9000, ISO-ICS 13100, or alike, and are, when appropriate, IPPC-compliant.	regular cleaning of equipment and floors, extended workers instruction-manuals. procedures for process control and maintenance. procedures for control of personal exposure (hygiene measures). information and training of workers on prevention of exposure/accidents. personal protection measures (see below)
Conditions and measures related to personal protection, hygiene and health evaluation	Wearing of protective clothing is compulsory (efficiency >=90%)	
	With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:	dust filter-half mask P1 (efficiency 75%). dust filter-half mask P2 (efficiency 90%). dust filter-half mask P3 (efficiency 95%). dust filter-full mask P1 (efficiency 75%). dust filter-full mask P2 (efficiency 90 %). dust filter-full mask P3 (efficiency 97.5%)
		In particular, when PROC 7, 11, 19 are involved, respiratory protection is recommended
	Eyes	safety glasses are optional

### 3. Exposure estimation and reference to its source

3.1. Health

3.2. Environment

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

4.1. Health

4.2. Environment

**1. Exposure scenario GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -6**

**Industrial and professional use of solid substrates containing less than 25%w/w of Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>**

ES Ref.: GES Zn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> -6 ES Type: Worker Version: 1.1	
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Use descriptors	
Processes, tasks, activities covered	No uses were identified that relate to this generic scenario. Industrial use Professional use

**2. Operational conditions and risk management measures**

**3. Exposure estimation and reference to its source**

3.1. Health

3.2. Environment

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

4.1. Health

4.2. Environment

## 1. Exposure scenario GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>- 7

### Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>

ES Ref.: GES Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>- 7  
ES Type: Worker  
Version: 1.1

Use descriptors	SU3, SU8, SU9, SU10, SU15, SU16, SU17, SU18, SU19 PROC4, PROC5, PROC7, PROC8b, PROC9, PROC10, PROC13, PROC19 PC1, PC9a, PC9b, PC9c, PC14, PC15, PC18 AC0 ERC8a, ERC8c, ERC8d, ERC8f, ERC10a, ERC10b, ERC11a, ERC12a, ERC12b
Processes, tasks, activities covered	Industrial use Professional use

## 2. Operational conditions and risk management measures

### 2.2 Contributing scenario controlling environmental exposure (ERC8a, ERC8c, ERC8d, ERC8f, ERC10a, ERC10b, ERC11a, ERC12a, ERC12b)

This scenario covers both the industrial scale processes and professional use. In the described process, the Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> -containing preparation/mixture is further processed, involving potentially the following steps:

- Reception/unpacking of material
- Final application, spraying, embedding or to produce the end product or article.

ERC8a	Wide dispersive indoor use of processing aids in open systems
ERC8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
ERC8d	Wide dispersive outdoor use of processing aids in open systems
ERC8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
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	Wide dispersive indoor use of long-life articles and materials with low release
ERC12a	Industrial processing of articles with abrasive techniques (low release)
ERC12b	Industrial processing of articles with abrasive techniques (high release)

#### Product characteristics

Physical form of product	Solid
Concentration of substance in product	< 25 %
Vapour pressure	< 1 hPa

#### Operational conditions

Amounts used	The quantities involved in this scenario are 10-50 times smaller than in blending (GES 4-GES 5); the concentration of the zinc substance is also lower (<25%).	
	Typical quantities for both industrial and professional are 50T/y (typical), maximum 500T/y (in industrial setting).	
Frequency and duration of use	Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.	
Environmental factors not influenced by risk management	Receiving surface water flow is 18000 m <sup>3</sup> /d	unless specified otherwise
Other given operational conditions affecting environmental exposure	Wet processes. All process and non-process waters should be recycled internally to a maximal extent. Even when no process waters occur, some non-process water can be generated containing zinc (e.g. from cleaning)	
	In industrial and professional setting, all processes are performed in a confined area. All residues containing zinc are recycled.	

#### Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	In industrial and professional setting the following applies:	Process enclosures or semi-enclosures where appropriate.
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		Local exhaust ventilation on furnaces and other work areas with potential dust generation. Dust capturing and removal techniques are applied. Containment of liquid volumes in sumps to collect/prevent accidental spillage
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		In industrial and professional setting, the following applies: - If zinc emissions to water, on-site waste water treatment techniques can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%). By exposure modelling it is predicted that at use quantities of >100T/y, refinement of the exposure assessment to water and sediment needs to be made (exposure assessment based on real measured data and local parameters). Treatment of the emissions to water may be needed under such conditions (see "exposure estimation and risk characterisation"). - Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric or bag filters, wet scrubbers. This may create a general negative pressure in the building.
Organisation measures to prevent/limit release from site	In general, emissions are controlled and prevented by implementing an appropriate management system. This would involve:	information and training of workers on prevention of exposure/accidents. regular cleaning of equipment and floors, extended workers instruction-manuals. procedures for process control and maintenance
	Treatment and monitoring of releases to outside air, and exhaust gas streams (process & hygiene), according to national regulation.	
	SEVESO 2 compliance, if applicable	
Conditions and measures related to sewage treatment plant	In cases where applicable: default size, unless specified otherwise.	
Conditions and measures related to external treatment of waste for disposal	If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.	
	Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products	
	Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.	
Conditions and measures related to external recovery of waste	All residues are recycled or handled and conveyed according to waste legislation.	

**2.1 Contributing scenario controlling worker exposure (PROC4, PROC5, PROC7, PROC8b, PROC9, PROC10, PROC13, PROC19)**

PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC7	Industrial spraying
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10	Roller application or brushing

PROC13	Treatment of articles by dipping and pouring	
PROC19	Hand-mixing with intimate contact and only PPE available	
<b>Product characteristics</b>		
Physical form of product	Solid	
Concentration of substance in product	< 25 %	
Vapour pressure	< 1 hPa	
Dustiness	Solid, low dustiness	
Other product characteristics	Most of the processes imply the use of solutions or pastes; the "solution status" is therefore taken as the worst case.	
<b>Operational conditions</b>		
Amounts used	The quantities involved in this scenario are 10-50 times smaller than in blending (GES 4-GES 5); the concentration of the zinc substance is also lower (<25%).	
	Typical quantities for both Industrial and professional are 50 T/y (typical), or 0.15 T/day, 0.05 T/shift	
	maximum use quantity is 500T/y (1.5T/d, 0.5T/shift) in industrial setting.	
Frequency and duration of use	8 hour shifts (default worst case) are assumed as starting point; it is emphasised that the real duration of exposure could be less. This has to be considered when estimating exposure.	
Human factors not influenced by risk management	Uncovered body parts:	(Potentially) Face
Other given operational conditions affecting workers exposure	Industrial / Professional:	Wet processes, all indoor in confined area
<b>Risk Management Measures</b>		
Technical conditions and measures at process level (source) to prevent release	Industrial / Professional:	Local exhaust ventilation work areas with potential dust and fumes generation, dust capturing and removal techniques. Process enclosures or semi-enclosures where appropriate.
Technical conditions and measures to control dispersion from source towards the worker	Industrial / Professional:	Local exhaust ventilation systems and process enclosures are generally applied. Cyclones/filters (for minimizing dust emissions): efficiency 70%-90% (cyclones); dust filters (50-80%). LEV in work area: efficiency 84% (generic LEV)
Organisational measures to prevent /limit releases, dispersion and exposure	In general, management systems are implemented; They include general industrial hygiene practice e.g.:	regular cleaning of equipment and floors, extended workers instruction-manuals. procedures for process control and maintenance. procedures for control of personal exposure (hygiene measures). information and training of workers on prevention of exposure/accidents. personal protection measures (see below)
Conditions and measures related to personal protection, hygiene and health evaluation	Wearing of protective clothing is compulsory (efficiency >=90%)	
	With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:	
	Eyes	dust filter-half mask P1 (efficiency 75%). dust filter-half mask P2 (efficiency 90%). dust filter-half mask P3 (efficiency 95%). dust filter-full mask P1 (efficiency 75%). dust filter-full mask P2 (efficiency 90 %). dust filter-full mask P3 (efficiency 97.5%) safety glasses are optional

### 3. Exposure estimation and reference to its source

#### 3.1. Health

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3.2. Environment

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

4.1. Health

4.2. Environment