

zinc sulfate, solution

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

1.1. Product identifier

Product name : zinc sulfate, solution
Synonyms : gezuiverde oplossing; sulfate de zinc; zinc sulphate liquor; Zinksulfatlauge; zinksulphate liquor; ZnSO₄, NEUTRAL BLEED
Registration number REACH : 01-2119486968-11-0002 (Nyrstar Belgium NV/SA)
 01-2119486968-11-0003 (Nyrstar Budel BV)
 01-2119486968-11-0004 (Nyrstar France SAS)
Product type REACH : On-site isolated intermediate
 : Transported isolated intermediate
 : Substance/UVCB
CAS number : 69012-24-4
EC number : 273-723-4

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

1.2.1 Relevant identified uses

The substance is defined as intermediate under Regulation (EC) No 1907/2006, not fulfilling the definition of strictly controlled conditions for which consequently an Article 10 (full) registration is required
 Industrial use: manufacturing of chemicals
 For further details concerning the management measures: see the attached annex

1.2.2 Uses advised against

No uses advised against known

1.3. Details of the supplier of the safety data sheet

Supplier of the safety data sheet

Nyrstar Belgium N.V. on behalf of Nyrstar Sales & Marketing A.G.
 Zinkstraat 1
 B-2490 Balen
 ☎ +32 14 44 95 00
 📠 +32 14 81 05 31
 infoSDS@nyrstar.com

Nyrstar Budel B.V. on behalf of Nyrstar Sales & Marketing A.G.
 Hoofdstraat 1
 6024 AA Budel-Dorplein
 ☎ +32 14 44 96 80
 📠 +32 14 44 95 52
 infoSDS@nyrstar.com

Nyrstar France S.A.S. on behalf of Nyrstar Sales & Marketing A.G.
 Rue Jean Jacques Rousseau
 F-59950 Aubry
 ☎ +32 14 44 96 80
 📠 +33 3 27 88 39 48
 infoSDS@nyrstar.com

Manufacturer of the product

Nyrstar Sales & Marketing SA
 1 Rue de Jargonnant
 CH-1207 Geneva
 infoSDS@nyrstar.com

1.4. Emergency telephone number

24h/24h (Telephone advice: English, French, German, Dutch) :
 +32 14 58 45 45 (BIG)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

Class	Category	Hazard statements
Acute Tox.	category 4	H302: Harmful if swallowed.
Eye Dam.	category 1	H318: Causes serious eye damage.
Aquatic Acute	category 1	H400: Very toxic to aquatic life.
Aquatic Chronic	category 1	H410: Very toxic to aquatic life with long lasting effects.

2.2. Label elements

zinc sulfate, solution



Signal word

Danger

H-statements

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

P-statements

P280 Wear eye protection.
 P264 Wash hands thoroughly after handling.
 P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P330 Rinse mouth.
 P310 Immediately call a POISON CENTER/doctor.
 P391 Collect spillage.

2.3. Other hazards

The criteria of PBT and vPvB as listed in Annex XIII of Regulation (EC) No 1907/2006 do not apply to inorganic substances

SECTION 3: Composition/information on ingredients

3.1. Substances

Name REACH Registration No	CAS No EC No	Conc. (C)	Classification according to CLP	Note	Remark	M-factors and ATE
zinc sulphate (anhydrous)	7733-02-0 231-793-3	C<30%	Acute Tox. 4; H302 Eye Dam. 1; H318 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	(1)(10)	Constituent	M: 1 (Acute, ECHA) M: 1 (Chronic, ECHA)
magnesium sulphate	7487-88-9 231-298-2	C<8%			Constituent	
manganese sulphate	7785-87-7 232-089-9	<2%	STOT RE 2; H373 Aquatic Chronic 2; H411	(1)(2)	Constituent	
sulphuric acid	7664-93-9 231-639-5	C<0.5%	Skin Corr. 1A; H314 Eye Dam. 1; H318 Skin Corr. 1A; H314: C≥15%, (CLP Annex VI (ATP 0)) Skin Irrit. 2; H315: 5%≤C<15% , (CLP Annex VI (ATP 0)) Eye Irrit. 2; H319: 5%≤C<15%, (CLP Annex VI (ATP 0))	(1)(2)(10)	Constituent	
water	7732-18-5 231-791-2				Constituent	

- (1) For H- and EUH-statements in full: see section 16
- (2) Substance with a Community workplace exposure limit
- (10) Subject to restrictions of Annex XVII of Regulation (EC) No. 1907/2006

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

General:

Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

After inhalation:

Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

After skin contact:

Rinse with water. Do not apply (chemical) neutralizing agents without medical advice. Take victim to a doctor if irritation persists.

After eye contact:

Rinse immediately with plenty of water for 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Do not apply (chemical) neutralizing agents without medical advice. Take victim to an ophthalmologist.

After ingestion:

Rinse mouth with water. Do not apply (chemical) neutralizing agents without medical advice. Consult a doctor/medical service if you feel unwell.

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

2 / 19

zinc sulfate, solution

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

4.2.1 Acute symptoms

After inhalation:

No effects known.

After skin contact:

Slight irritation.

After eye contact:

Corrosion of the eye tissue.

After ingestion:

AFTER INGESTION OF HIGH QUANTITIES: Gastrointestinal complaints. Nausea. Vomiting. Abdominal pain. Diarrhoea. Decreased renal function. Change in the haemogramme/blood composition.

4.2.2 Delayed symptoms

No effects known.

4.3. Indication of any immediate medical attention and special treatment needed

If applicable and available it will be listed below.

SECTION 5: Firefighting measures

5.1. Extinguishing media

5.1.1 Suitable extinguishing media:

Adapt extinguishing media to the environment for surrounding fires.

5.1.2 Unsuitable extinguishing media:

Not applicable.

5.2. Special hazards arising from the substance or mixture

On burning: release of toxic and corrosive gases/vapours (sulphur oxides, zinc oxide).

5.3. Advice for firefighters

5.3.1 Instructions:

Dilute toxic gases with water spray. Take account of toxic/corrosive precipitation water. Take account of environmentally hazardous firefighting water. Use water moderately and if possible collect or contain it.

5.3.2 Special protective equipment for fire-fighters:

Gloves (EN 374). Safety glasses (EN 166). Protective clothing (EN 14605 or EN 13034). Heat/fire exposure: self-contained breathing apparatus (EN 136 + EN 137).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

No naked flames.

6.1.1 Protective equipment for non-emergency personnel

See section 8.2

6.1.2 Protective equipment for emergency responders

Gloves (EN 374). Safety glasses (EN 166). Protective clothing (EN 14605 or EN 13034).

Suitable protective clothing

See section 8.2

6.2. Environmental precautions

Contain released product, collect/pump into suitable containers. Plug the leak, cut off the supply. Dam up the liquid spill. Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

Take up liquid spill into absorbent material, e.g.: sand, earth, vermiculite. Scoop absorbed substance into closing containers. Carefully collect the spill/leftovers. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

See section 13.

SECTION 7: Handling and storage

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

7.1. Precautions for safe handling

Keep away from naked flames. Gas/vapour heavier than air at 20°C. Observe normal hygiene standards. Do not discharge the waste into the drain. Keep container tightly closed.

7.2. Conditions for safe storage, including any incompatibilities

7.2.1 Safe storage requirements:

Keep container in a well-ventilated place. Provide for a tub to collect spills. Keep only in the original container. Meet the legal requirements.

7.2.2 Keep away from:

(Strong) bases.

7.2.3 Suitable packaging material:

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

3 / 19

zinc sulfate, solution

HDPE, stainless steel 316L.

7.2.4 Non suitable packaging material:

No data available

7.3. Specific end use(s)

If applicable and available, exposure scenarios are attached in annex. See information supplied by the manufacturer.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 Occupational exposure

a) Occupational exposure limit values

If limit values are applicable and available these will be listed below.

EU

Manganese and inorganic manganese compounds (as manganese)	Time-weighted average exposure limit 8 h (Indicative occupational exposure limit value)	0.05 mg/m ³ (2)
	Time-weighted average exposure limit 8 h (Indicative occupational exposure limit value)	0.2 mg/m ³ (1)
Sulphuric acid (mist)	Time-weighted average exposure limit 8 h (Indicative occupational exposure limit value)	0.05 mg/m ³

(2): Respirable fraction

(1): Inhalable fraction

Belgium

Acide sulfurique (brume)	Time-weighted average exposure limit 8 h	0.2 mg/m ³
Manganèse et ses composés (en Mn) (fraction respirable)	Time-weighted average exposure limit 8 h	0.2 mg/m ³

The Netherlands

Mangaan en anorganische mangaan-verbindingen (als mangaan)	Time-weighted average exposure limit 8 h (Public occupational exposure limit value)	0.05 mg/m ³
	Time-weighted average exposure limit 8 h (Public occupational exposure limit value)	0.2 mg/m ³
Zwavelzuur (nevel), gedefinieerd als de thoracale fractie	Time-weighted average exposure limit 8 h (Public occupational exposure limit value)	0.012 ppm
	Time-weighted average exposure limit 8 h (Public occupational exposure limit value)	0.05 mg/m ³

France

Acide sulfurique	Time-weighted average exposure limit 8 h (VRI: Valeur réglementaire indicative)	0.05 mg/m ³
	Short time value (VL: Valeur non réglementaire indicative)	3 mg/m ³
Manganèse et ses composés fraction alvéolaire exprimé en manganèse	Time-weighted average exposure limit 8 h (VRI: Valeur réglementaire indicative)	0.05 mg/m ³
Manganèse et ses composés fraction inhalable exprimé en manganèse	Time-weighted average exposure limit 8 h (VRI: Valeur réglementaire indicative)	0.20 mg/m ³

Germany

Mangan und seine anorganischen Verbindungen	Time-weighted average exposure limit 8 h (TRGS 900)	0.02 mg/m ³
	Time-weighted average exposure limit 8 h (TRGS 900)	0.2 mg/m ³
Schwefelsäure	Time-weighted average exposure limit 8 h (TRGS 900)	0.1 mg/m ³

Austria

Schwefelsäure	Tagesmittelwert (MAK)	0.1 mg/m ³
	Kurzzeitwert Mow 8x (MAK)	0.2 mg/m ³

UK

Manganese and its inorganic compounds (as Mn) (Inhalable fraction)	Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005))	0.2 mg/m ³
Manganese and its inorganic compounds (as Mn) (Respirable fraction)	Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005))	0.05 mg/m ³
Sulphuric acid (mist)	Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005))	0.05 mg/m ³

USA (TLV-ACGIH)

Manganese, elemental and inorganic compounds, as Mn	Time-weighted average exposure limit 8 h (TLV - Adopted Value)	0.1 mg/m ³ (I)
Sulfuric acid	Time-weighted average exposure limit 8 h (TLV - Adopted Value)	0.2 mg/m ³ (T)

(I): Inhalable fraction

(T): Thoracic fraction

b) National biological limit values

If limit values are applicable and available these will be listed below.

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

4 / 19

zinc sulfate, solution

8.1.2 Sampling methods

Product name	Test	Number
Manganese	OSHA	ID 121
Manganese	OSHA	ID 125G
NON-VOLATILE ACIDS (Sulfuric Acid)	NIOSH	7908
Sulfites, & Sulfates	NIOSH	6004
Sulfuric Acid (Acids, inorganic)	NIOSH	7903
Sulfuric Acid mist	ASTM	D 4856-88
Sulfuric Acid	NIOSH	7903
Sulfuric Acid	OSHA	ID 113
Sulfuric Acid	OSHA	ID 165SG
Zinc & Cpds (as Zn)	NIOSH	7030

8.1.3 Applicable limit values when using the substance or mixture as intended

If limit values are applicable and available these will be listed below.

8.1.4 Threshold values

DNEL/DMEL - Workers

zinc sulphate (anhydrous)

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	1 mg/m ³	
	Long-term systemic effects dermal	8.3 mg/kg bw/day	

magnesium sulphate

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	37.6 mg/m ³	
	Long-term systemic effects dermal	21.3 mg/kg bw/day	

manganese sulphate

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	0.2 mg/m ³	
	Long-term systemic effects dermal	0.004 mg/kg bw/day	

sulphuric acid

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term local effects inhalation	0.05 mg/m ³	
	Acute local effects inhalation	0.1 mg/m ³	

DNEL/DMEL - General population

zinc sulphate (anhydrous)

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	1.25 mg/m ³	
	Long-term systemic effects dermal	8.3 mg/kg bw/day	
	Long-term systemic effects oral	0.83 mg/kg bw/day	

magnesium sulphate

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	11.1 mg/m ³	
	Long-term systemic effects dermal	12.8 mg/kg bw/day	
	Long-term systemic effects oral	12.8 mg/kg bw/day	

manganese sulphate

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	0.043 mg/m ³	
	Long-term systemic effects dermal	0.002 mg/kg bw/day	

PNEC

zinc sulphate (anhydrous)

Compartments	Value	Remark
Fresh water	20.6 µg/l	
Marine water	6.1 µg/l	
STP	100 µg/l	
Fresh water sediment	117.8 mg/kg sediment dw	
Marine water sediment	56.5 mg/kg sediment dw	
Soil	35.6 mg/kg soil dw	

magnesium sulphate

Compartments	Value	Remark
Fresh water	0.68 mg/l	
Fresh water (intermittent releases)	6.8 mg/l	
Marine water	0.068 mg/l	
Fresh water (intermittent releases)	6.8 mg/l	
STP	10 mg/l	

zinc sulfate, solution

manganese sulphate

Compartments	Value	Remark
Fresh water	0.013 mg/l	
Marine water	0 mg/l	
Aqua (intermittent releases)	0.03 mg/l	
STP	56 mg/l	
Fresh water sediment	0.011 mg/kg sediment dw	
Marine water sediment	0.001 mg/kg sediment dw	
Soil	25.1 mg/kg soil dw	

sulphuric acid

Compartments	Value	Remark
Fresh water	0.0025 mg/l	
Marine water	0.00025 mg/l	
STP	8.8 mg/l	
Fresh water sediment	0.002 mg/kg sediment dw	
Marine water sediment	0.002 mg/kg sediment dw	

8.1.5 Control banding

If applicable and available it will be listed below.

8.2. Exposure controls

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

8.2.1 Appropriate engineering controls

Keep away from naked flames. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.

8.2.2 Individual protection measures, such as personal protective equipment

Observe normal hygiene standards. Do not eat, drink or smoke during work.

a) Respiratory protection:

If conc. in air > exposure limit: dust/aerosol mask with filter type P2.

b) Hand protection:

Protective gloves against chemicals (EN 374).

Materials	Remark
PVC with nylon coating	Good resistance

c) Eye protection:

Safety glasses (EN 166).

d) Skin protection:

Protective clothing (EN 14605 or EN 13034).

8.2.3 Environmental exposure controls:

See sections 6.2, 6.3 and 13

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical form	Liquid
Odour	Odourless
Odour threshold	Not applicable
Colour	Colourless
Particle size	Not applicable (liquid)
Explosion limits	No data available in the literature
Flammability	Not classified as flammable
Log Kow	Not applicable
Dynamic viscosity	No data available in the literature
Kinematic viscosity	No data available in the literature
Melting point	-20 °C
Boiling point	> 100 °C
Relative vapour density	No data available in the literature
Vapour pressure	No data available in the literature
Solubility	No data available in the literature
Relative density	1.4
Absolute density	1400 kg/m ³
Decomposition temperature	600 °C
Auto-ignition temperature	No data available in the literature
Flash point	Not applicable
pH	2 - 5

9.2. Other information

No data available

zinc sulfate, solution

SECTION 10: Stability and reactivity

10.1. Reactivity

Acid reaction.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Reacts exothermically with (some) bases.

10.4. Conditions to avoid

Precautionary measures

Keep away from naked flames.

10.5. Incompatible materials

(strong) bases.

10.6. Hazardous decomposition products

On burning: release of toxic and corrosive gases/vapours (sulphur oxides, zinc oxide).

SECTION 11: Toxicological information

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

11.1.1 Test results

Acute toxicity

zinc sulfate, solution

No (test)data available

zinc sulphate (anhydrous)

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral	LD50	OECD 401	1710 mg/kg bw		Rat (male)	Experimental value	
Dermal	LD50	OECD 402	> 2000 mg/kg bw	24 h	Rat (male / female)	Experimental value	

magnesium sulphate

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral	LD50	OECD 425	> 2000 mg/kg bw		Rat (male / female)	Experimental value	
Dermal	LD50	OECD 402	> 2000 mg/kg	24 h	Rat (male / female)	Read-across	
Inhalation						Data waiving	

manganese sulphate

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral	LD50		2150 mg/kg		Rat (male / female)	Experimental value	
Dermal						Data waiving	
Inhalation (dust)	LC50	OECD 403	> 4.45 mg/l air	4 h	Rat (male / female)	Experimental value	

sulphuric acid

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral	LD50	Equivalent to OECD 401	2140 mg/kg bw		Rat (male / female)	Experimental value	Aqueous solution
Dermal						Data waiving	
Inhalation (aerosol)	LC50	Equivalent to OECD 403	0.375 mg/l air	4 h	Rat (male / female)	Experimental value	

Conclusion

Harmful if swallowed.

Not classified as acute toxic in contact with skin

Not classified as acute toxic if inhaled

Corrosion/irritation

zinc sulfate, solution

No (test)data available

zinc sulfate, solution

zinc sulphate (anhydrous)

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Highly irritating	OECD 405		1; 24; 48; 72 hrs; 7; 14; 21 days	Rabbit	Experimental value of similar product	Single treatment without rinsing
Eye	Serious eye damage; category 1					Annex VI	
Skin	Not irritating	OECD 404	4 h	1; 24; 48; 72 hours	Rabbit	Experimental value	

magnesium sulphate

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Not irritating	OECD 405		24; 48; 72 hours	Rabbit	Read-across	
Not applicable (in vitro test)	Not irritating	EU Method B.46	5 minutes	15 minutes	Reconstructed human epidermis	Read-across	

manganese sulphate

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Serious eye damage	OECD 405		24; 48 hours	Rabbit	Experimental value	Single treatment
Skin	Not irritating	OECD 404	4 h	24; 72 hours	Rabbit	Experimental value	

Classification of this substance according to Annex VI is debatable as it does not correspond to the conclusion from the test

sulphuric acid

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Serious eye damage; category 1					Annex VI	
Skin	Highly corrosive; category 1A					Annex VI	

Conclusion

Causes serious eye damage.
Not classified as irritating to the skin
Not classified as irritating to the respiratory system

Respiratory or skin sensitisation

zinc sulfate, solution

No (test) data available

zinc sulphate (anhydrous)

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Skin	Not sensitizing	Equivalent to OECD 429			Mouse (female)	Experimental value	

magnesium sulphate

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Dermal (on the ears)	Not sensitizing	OECD 429			Mouse (female)	Experimental value	

manganese sulphate

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Skin	Not sensitizing	Equivalent to OECD 429			Mouse (female)	Read-across	

sulphuric acid

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Skin						Data waiving	
Inhalation						Data waiving	

Conclusion

Not classified as sensitizing for skin
Not classified as sensitizing for inhalation

Specific target organ toxicity

zinc sulfate, solution

No (test) data available

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

8 / 19

zinc sulfate, solution

zinc sulphate (anhydrous)

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral (diet)	NOEL	OECD 408	234 mg/kg bw/day - 243 mg/kg bw/day		No effect	13 weeks (daily)	Rat (male / female)	Experimental value
Dermal								Data waiving
Inhalation (aerosol)	NOAEL	Subchronic toxicity test			No effect	16 weeks (6h / day, 3 days / week)	Rat (male)	Experimental value

magnesium sulphate

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral (diet)	NOAEL	Equivalent to OECD 453	256 mg/kg bw/day - 284 mg/kg bw/day		No effect	52 week(s)	Rat (male / female)	Read-across
Dermal								Data waiving
Inhalation								Data waiving

manganese sulphate

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral (diet)	NOAEL	Other	1700 mg/kg bw/day		No effect	13 weeks (daily)	Rat (male)	Read-across
Oral (diet)	NOAEL	Other	2000 mg/kg bw/day		No effect	13 weeks (daily)	Rat (female)	Read-across
Dermal								Data waiving
Inhalation (aerosol)		Subchronic toxicity test		Brain	Haematological changes		Monkey (male)	Experimental value

sulphuric acid

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral								Data waiving
Dermal								Data waiving
Inhalation (aerosol)	LOAEC	OECD 412	0.3 mg/m ³ air	Respiratory tract	Histopathology	4 weeks (6h / day, 5 days / week)	Rat (female)	Experimental value
Inhalation		Human observation	> 1 mg/m ³ air	Lungs	Lung tissue affection/degeneration		Human	Weight of evidence

Conclusion

Not classified for subchronic toxicity

Mutagenicity (in vitro)

zinc sulfate, solution

No (test) data available

zinc sulphate (anhydrous)

Result	Method	Test substrate	Effect	Value determination	Remark
Negative with metabolic activation, negative without metabolic activation	Equivalent to OECD 471	Bacteria (<i>S.typhimurium</i>)		Experimental value	

magnesium sulphate

Result	Method	Test substrate	Effect	Value determination	Remark
Negative with metabolic activation, negative without metabolic activation	OECD 476	Mouse (lymphoma L5178Y cells)		Experimental value	

manganese sulphate

Result	Method	Test substrate	Effect	Value determination	Remark
Negative with metabolic activation, negative without metabolic activation	OECD 473	Human lymphocytes	No effect	Read-across	
Negative	OECD 471	Bacteria (<i>S.typhimurium</i>)	No effect	Read-across	
Negative with metabolic activation, negative without metabolic activation	OECD 476	Mouse (lymphoma L5178Y cells)	No effect	Read-across	

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

9 / 19

zinc sulfate, solution

sulphuric acid

Result	Method	Test substrate	Effect	Value determination	Remark
Negative with metabolic activation, negative without metabolic activation	Equivalent to OECD 471	Bacteria (S.typhimurium)	No effect	Experimental value	
Positive with metabolic activation, positive without metabolic activation	Equivalent to OECD 473	Chinese hamster ovary (CHO)	No effect	Experimental value	

Mutagenicity (in vivo)

zinc sulfate, solution

No (test)data available

zinc sulphate (anhydrous)

Result	Method	Exposure time	Test substrate	Organ	Value determination
Negative (Intraperitoneal)	Micronucleus test	2 dose(s)/24-hour interval	Mouse (male / female)		Experimental value

manganese sulphate

Result	Method	Exposure time	Test substrate	Organ	Value determination
Negative (Oral (stomach tube))	OECD 474		Mouse (female)		Read-across

sulphuric acid

Result	Method	Exposure time	Test substrate	Organ	Value determination
					Data waiving

Conclusion

Not classified for mutagenic or genotoxic toxicity

Carcinogenicity

zinc sulfate, solution

No (test)data available

zinc sulphate (anhydrous)

Route of exposure	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Oral (drinking water)	NOAEL	Carcinogenic toxicity study	> 22000 mg/l	52 weeks (daily)	Mouse (male / female)	No carcinogenic effect		Experimental value

magnesium sulphate

Route of exposure	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Unknown								Data waiving

manganese sulphate

Route of exposure	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Oral (diet)	NOAEL	Carcinogenic toxicity study	615 mg/kg bw	103 weeks (daily)	Rat (male)	No carcinogenic effect		Experimental value
Oral (diet)	NOAEL	Carcinogenic toxicity study	715 mg/kg bw	103 weeks (daily)	Rat (female)	No carcinogenic effect		Experimental value

sulphuric acid

Route of exposure	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Oral	Dose level	Carcinogenic toxicity study	200 µl/week	> 1 year(s)	Mouse (male / female)	Tumours of the gastrointestinal tract	Stomach	Weight of evidence

Conclusion

Not classified for carcinogenicity

Reproductive toxicity

zinc sulfate, solution

No (test)data available

zinc sulphate (anhydrous)

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity (Oral (stomach tube))	NOAEL	Developmental toxicity study	42.5 mg/kg bw/day	10 day(s)	Rat	No effect		Experimental value
Maternal toxicity (Oral (stomach tube))	NOAEL	Other	42.5 mg/kg bw/day	10 day(s)	Rat	No effect		Experimental value
Effects on fertility (Oral (diet))	Dose level		4000 ppm		Rat (male)	Adverse effect on sperm	Reproductive organs	Experimental value

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

10 / 19

zinc sulfate, solution

magnesium sulphate

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity (Oral (stomach tube))	NOAEL	OECD 422	≥ 1500 mg/kg bw/day	28 day(s) - 53 day (s)	Rat	No effect		Read-across
Maternal toxicity (Oral (stomach tube))	NOAEL	OECD 422	≥ 1500 mg/kg bw/day	28 day(s) - 53 day (s)	Rat	No effect		Read-across
Effects on fertility (Oral (stomach tube))	NOAEL	OECD 422	≥ 1500 mg/kg bw/day	4 week(s)	Rat (male / female)	No effect		Read-across

manganese sulphate

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity (Oral (diet))	NOAEL	Developmental toxicity study		8 week(s) - 10 week(s)	Rat	No effect		Experimental value
Effects on fertility (Oral (drinking water))				12 week(s)	Rat (male)	No effect	Reproductive organs	Experimental value

sulphuric acid

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity (Inhalation (aerosol))	NOAEC	Equivalent to OECD 414	19.3 mg/m ³ air	10 days (gestation, daily)	Mouse (female)	No effect		Experimental value
	NOAEC	Equivalent to OECD 414	19.3 mg/m ³ air	13 days (gestation, daily)	Rabbit (female)	No effect		Experimental value
Maternal toxicity (Inhalation (aerosol))	LOAEC	Equivalent to OECD 414	19.3 mg/m ³ air	10 days (gestation, daily)	Mouse (female)	Reduced food consumption	General	Experimental value
	NOAEC	Equivalent to OECD 414	5.7 mg/m ³ air	10 days (gestation, daily)	Mouse (female)	No effect		Experimental value
	LOAEC	Equivalent to OECD 414	19.3 mg/m ³ air	13 days (gestation, daily)	Rabbit (female)	Local effects	Respiratory tract	Experimental value
	NOAEC	Equivalent to OECD 414	5.7 mg/m ³ air	13 days (gestation, daily)	Rabbit (female)	No effect		Experimental value
Effects on fertility								Data waiving

Conclusion

Not classified for reprotoxic or developmental toxicity

Toxicity other effects

zinc sulfate, solution

No (test) data available

Chronic effects from short and long-term exposure

zinc sulfate, solution

Gastrointestinal complaints. Skin rash/inflammation.

11.2. Information on other hazards

No evidence of endocrine disrupting properties

SECTION 12: Ecological information

12.1. Toxicity

zinc sulfate, solution

No (test) data available

Classification is based on the relevant ingredients

zinc sulfate, solution

zinc sulphate (anhydrous)

	Parameter	Method	Value	Duration	Species	Test design	Fresh/salt water	Value determination
Acute toxicity fishes	LC50		330 µg/l - 780 µg/l	95 h	Pimephales promelas	Static system	Fresh water	Experimental value; Lethal
Acute toxicity crustacea	EC50	OECD 202	1.4 mg/l - 2.5 mg/l	48 h	Daphnia magna	Static system	Fresh water	Experimental value; Locomotor effect
Toxicity algae and other aquatic plants	IC50	OECD 201	136 µg/l	72 h	Pseudokirchneriella subcapitata	Static system	Fresh water	Experimental value; Growth rate
	NOEC	OECD 201	24 µg/l	72 h	Pseudokirchneriella subcapitata	Static system	Fresh water	Experimental value; Growth rate
Long-term toxicity fish	NOEC	OECD 210	56 µg/l - 61 µg/l	116 day(s)	Salmo trutta	Flow-through system	Fresh water	Experimental value
Long-term toxicity aquatic crustacea	NOEC		31 µg/l - 208 µg/l	50 day(s)	Daphnia magna	Semi-static system	Fresh water	Experimental value; Reproduction
Toxicity aquatic micro-organisms	EC50	Equivalent to OECD 209	5.2 mg/l	3 h	Activated sludge	Static system	Fresh water	Experimental value; Respiration

magnesium sulphate

	Parameter	Method	Value	Duration	Species	Test design	Fresh/salt water	Value determination
Acute toxicity fishes	LC50	EPA 600/4-90/027	680 mg/l	96 h	Pimephales promelas	Static system	Fresh water	Read-across; Lethal
	LC50		15500 mg/l	96 h	Gambusia affinis	Static system		
Acute toxicity crustacea	LC50	EPA 600/4-90/027	720 mg/l	48 h	Daphnia magna	Static system	Fresh water	Read-across; GLP
	EC50		1700 mg/l	24 h	Daphnia magna			
Toxicity algae and other aquatic plants	EC50		2700 mg/l	18 day(s)	Chlorella vulgaris	Static system	Fresh water	Read-across; Cell numbers
	EC10		≥ 100 mg/l	18 day(s)	Chlorella vulgaris	Static system	Fresh water	Estimated value; Cell numbers
Toxicity aquatic micro-organisms	EC50		84 g/l	30 minutes	Photobacterium phosphoreum			Experimental value

manganese sulphate

	Parameter	Method	Value	Duration	Species	Test design	Fresh/salt water	Value determination
Acute toxicity fishes	LC50		3.17 mg/l	96 h	Oncorhynchus mykiss	Flow-through system	Fresh water	Weight of evidence; Manganese ion
Acute toxicity crustacea	LC50		9.8 mg/l	48 h	Daphnia magna	Static system	Fresh water	Read-across; Manganese ion
Toxicity algae and other aquatic plants	EC50	OECD 201	61 mg/l	72 h	Desmodesmus subspicatus	Static system	Fresh water	Experimental value; Growth rate
	NOEC	OECD 201	1 mg/l	72 h	Desmodesmus subspicatus	Static system	Fresh water	Experimental value; Growth rate
Long-term toxicity fish	NOEC	Equivalent to OECD 210	0.76 mg/l	65 day(s)	Oncorhynchus mykiss	Flow-through system	Fresh water	Experimental value; Manganese ion
Long-term toxicity aquatic crustacea	NOEC		0.02 mg/l	20 day(s)	Crassostrea gigas	Static system	Salt water	Experimental value; Growth
Toxicity aquatic micro-organisms	EC50	OECD 209	> 1000 mg/l	3 h	Activated sludge	Static system	Fresh water	Experimental value; Respiration

sulphuric acid

	Parameter	Method	Value	Duration	Species	Test design	Fresh/salt water	Value determination
Acute toxicity fishes	LC50		16 mg/l - 28 mg/l	96 h	Lepomis macrochirus	Static system	Fresh water	Experimental value; Nominal concentration
Acute toxicity crustacea	EC50	OECD 202	> 100 mg/l	48 h	Daphnia magna	Static system	Fresh water	Experimental value; GLP
Toxicity algae and other aquatic plants	ErC50	OECD 201	> 100 mg/l	72 h	Desmodesmus subspicatus	Static system	Fresh water	Experimental value; GLP

Conclusion

Very toxic to aquatic life.

Very toxic to aquatic life with long lasting effects.

12.2. Persistence and degradability

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

12 / 19

zinc sulfate, solution

manganese sulphate

Biodegradation water

Method	Value	Duration	Value determination
			Data waiving

Biodegradation soil

Method	Value	Duration	Value determination
			Data waiving

Conclusion

Water

Biodegradability: not applicable

12.3. Bioaccumulative potential

zinc sulfate, solution

Log Kow

Method	Remark	Value	Temperature	Value determination
	Not applicable			

zinc sulphate (anhydrous)

BCF fishes

Parameter	Method	Value	Duration	Species	Value determination
BCF		0.4 - 7.51	45 day(s)	Channa punctatus	Experimental value

Log Kow

Method	Remark	Value	Temperature	Value determination
	No data available			

magnesium sulphate

Log Kow

Method	Remark	Value	Temperature	Value determination
	Not applicable (inorganic)			

manganese sulphate

BCF fishes

Parameter	Method	Value	Duration	Species	Value determination
					Data waiving

BCF other aquatic organisms

Parameter	Method	Value	Duration	Species	Value determination
					Data waiving

Log Kow

Method	Remark	Value	Temperature	Value determination
	No data available			

sulphuric acid

Log Kow

Method	Remark	Value	Temperature	Value determination
	Not applicable (inorganic)			

water

Log Kow

Method	Remark	Value	Temperature	Value determination
	Not applicable			

Conclusion

Contains bioaccumulative component(s)

12.4. Mobility in soil

No (test)data on mobility of the component(s) available

12.5. Results of PBT and vPvB assessment

The criteria of PBT and vPvB as listed in Annex XIII of Regulation (EC) No 1907/2006 do not apply to inorganic substances.

12.6. Endocrine disrupting properties

No evidence of endocrine disrupting properties

12.7. Other adverse effects

zinc sulfate, solution

Greenhouse gases

Not included in the list of fluorinated greenhouse gases (Regulation (EU) No 517/2014)

Ozone-depleting potential (ODP)

Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009)

Water ecotoxicity pH

pH shift

zinc sulfate, solution

zinc sulphate (anhydrous)

Water ecotoxicity pH

pH shift

magnesium sulphate

Groundwater

Groundwater pollutant

manganese sulphate

Water ecotoxicity pH

pH shift

sulphuric acid

Groundwater

Groundwater pollutant

Water ecotoxicity pH

pH shift

SECTION 13: Disposal considerations

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

13.1. Waste treatment methods

13.1.1 Provisions relating to waste

European Union

Hazardous waste according to Directive 2008/98/EC, as amended by Regulation (EU) No 1357/2014 and Regulation (EU) No 2017/997.

Waste material code (Directive 2008/98/EC, Decision 2000/0532/EC).

11 02 07* (wastes from non-ferrous hydrometallurgical processes: other wastes containing hazardous substances). Depending on branch of industry and production process, also other waste codes may be applicable.

13.1.2 Disposal methods

Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste.

Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Do not discharge into drains or the environment. Dispose of at authorized waste collection point.

13.1.3 Packaging/Container

European Union

Waste material code packaging (Directive 2008/98/EC).

15 01 10* (packaging containing residues of or contaminated by dangerous substances).

SECTION 14: Transport information

Road (ADR)

14.1. UN number

UN number	3082
-----------	------


14.2. UN proper shipping name

Proper shipping name	environmentally hazardous substance, liquid, n.o.s. (zinc sulphate (anhydrous))
----------------------	---


14.3. Transport hazard class(es)

Hazard identification number	90
Class	9
Classification code	M6

14.4. Packing group

Packing group	III
Labels	

14.5. Environmental hazards

Environmentally hazardous substance mark	
--	---

14.6. Special precautions for user

Special provisions	274
Special provisions	335
Special provisions	375
Special provisions	601

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

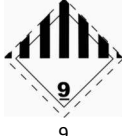

BIG number: 65766

14 / 19



zinc sulfate, solution

Limited quantities	Combination packagings: not more than 5 liters per inner packaging for liquids. A package shall not weigh more than 30 kg. (gross mass)
--------------------	---

Rail (RID)

14.1. UN number	
UN number	3082
14.2. UN proper shipping name	
Proper shipping name	environmentally hazardous substance, liquid, n.o.s. (zinc sulphate (anhydrous))
14.3. Transport hazard class(es)	
Hazard identification number	90
Class	9
Classification code	M6
14.4. Packing group	
Packing group	III
Labels	 9
14.5. Environmental hazards	
Environmentally hazardous substance mark	 yes
14.6. Special precautions for user	
Special provisions	274
Special provisions	335
Special provisions	375
Special provisions	601
Limited quantities	Combination packagings: not more than 5 liters per inner packaging for liquids. A package shall not weigh more than 30 kg. (gross mass)

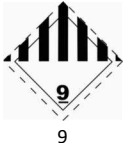

Inland waterways (ADN)

14.1. UN number	
UN number	3082
14.2. UN proper shipping name	
Proper shipping name	environmentally hazardous substance, liquid, n.o.s. (zinc sulphate (anhydrous))
14.3. Transport hazard class(es)	
Class	9
Classification code	M6
14.4. Packing group	
Packing group	III
Labels	 9
14.5. Environmental hazards	
Environmentally hazardous substance mark	 yes
14.6. Special precautions for user	
Special provisions	274
Special provisions	335
Special provisions	375
Special provisions	601
Limited quantities	Combination packagings: not more than 5 liters per inner packaging for liquids. A package shall not weigh more than 30 kg. (gross mass)



Sea (IMDG/IMSBC)

14.1. UN number	
UN number	3082
14.2. UN proper shipping name	

zinc sulfate, solution

Proper shipping name	environmentally hazardous substance, liquid, n.o.s. (zinc sulphate (anhydrous))
14.3. Transport hazard class(es)	
Class	9
14.4. Packing group	
Packing group	III
Labels	 9
14.5. Environmental hazards	
Marine pollutant	P
Environmentally hazardous substance mark	 yes
14.6. Special precautions for user	
Special provisions	274
Special provisions	335
Special provisions	969
Limited quantities	Combination packagings: not more than 5 liters per inner packaging for liquids. A package shall not weigh more than 30 kg. (gross mass)
14.7. Maritime transport in bulk according to IMO instruments	
Annex II of MARPOL 73/78	Not applicable, based on available data

Air (ICAO-TI/IATA-DGR)

14.1. UN number	
UN number	3082
14.2. UN proper shipping name	
Proper shipping name	environmentally hazardous substance, liquid, n.o.s. (zinc sulphate (anhydrous))
14.3. Transport hazard class(es)	
Class	9
14.4. Packing group	
Packing group	III
Labels	 9
14.5. Environmental hazards	
Environmentally hazardous substance mark	 yes
14.6. Special precautions for user	
Special provisions	A158
Special provisions	A197
Special provisions	A215
Special provisions	A97
Passenger and cargo transport	
Limited quantities: maximum net quantity per packaging	30 kg G

SECTION 15: Regulatory information

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

European legislation:

Explosives precursors

Due to the presence of one or more components in this mixture, acquisition, introduction, possession or use of this product by the general public is restricted by Regulation (EU) 2019/1148. All suspicious transactions, and significant disappearances and thefts should be reported to the relevant national contact point.

VOC content Directive 2010/75/EU

VOC content	Remark
	Not applicable (inorganic)

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

16 / 19

zinc sulfate, solution

European drinking water standards (98/83/EC and 2020/2184)

zinc sulphate (anhydrous)

Parameter	Parametric value	Note	Reference
Sulphate	250 mg/l		Listed in Annex I, Part C, of Directive (EU) 2020/2184 on the quality of water intended for human consumption.

magnesium sulphate

Parameter	Parametric value	Note	Reference
Sulphate	250 mg/l		Listed in Annex I, Part C, of Directive (EU) 2020/2184 on the quality of water intended for human consumption.

manganese sulphate

Parameter	Parametric value	Note	Reference
Manganese	50 µg/l		Listed in Annex I, Part C, of Directive (EU) 2020/2184 on the quality of water intended for human consumption.
Sulphate	250 mg/l		Listed in Annex I, Part C, of Directive (EU) 2020/2184 on the quality of water intended for human consumption.

sulphuric acid

Parameter	Parametric value	Note	Reference
Sulphate	250 mg/l		Listed in Annex I, Part C, of Directive (EU) 2020/2184 on the quality of water intended for human consumption.

REACH Annex XVII - Restriction

Contains component(s) subject to restrictions of Annex XVII of Regulation (EC) No 1907/2006: restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

	Designation of the substance, of the group of substances or of the mixture	Conditions of restriction
· sulphuric acid	Liquid substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: (a) hazard classes 2.1 to 2.4, 2.6 and 2.7, 2.8 types A and B, 2.9, 2.10, 2.12, 2.13 categories 1 and 2, 2.14 categories 1 and 2, 2.15 types A to F; (b) hazard classes 3.1 to 3.6, 3.7 adverse effects on sexual function and fertility or on development, 3.8 effects other than narcotic effects, 3.9 and 3.10; (c) hazard class 4.1; (d) hazard class 5.1.	1. Shall not be used in: — ornamental articles intended to produce light or colour effects by means of different phases, for example in ornamental lamps and ashtrays, — tricks and jokes, — games for one or more participants, or any article intended to be used as such, even with ornamental aspects, 2. Articles not complying with paragraph 1 shall not be placed on the market. 3. Shall not be placed on the market if they contain a colouring agent, unless required for fiscal reasons, or perfume, or both, if they: — can be used as fuel in decorative oil lamps for supply to the general public, and, — present an aspiration hazard and are labelled with H304, 4. Decorative oil lamps for supply to the general public shall not be placed on the market unless they conform to the European Standard on Decorative oil lamps (EN 14059) adopted by the European Committee for Standardisation (CEN). 5. Without prejudice to the implementation of other Community provisions relating to the classification, packaging and labelling of dangerous substances and mixtures, suppliers shall ensure, before the placing on the market, that the following requirements are met: a) lamp oils, labelled with H304, intended for supply to the general public are visibly, legibly and indelibly marked as follows: "Keep lamps filled with this liquid out of the reach of children"; and, by 1 December 2010, "Just a sip of lamp oil — or even sucking the wick of lamps — may lead to life-threatening lung damage"; b) grill lighter fluids, labelled with H304, intended for supply to the general public are legibly and indelibly marked by 1 December 2010 as follows: "Just a sip of grill lighter may lead to life threatening lung damage"; c) lamp oils and grill lighters, labelled with H304, intended for supply to the general public are packaged in black opaque containers not exceeding 1 litre by 1 December 2010.
· zinc sulphate (anhydrous) · sulphuric acid	Substances falling within one or more of the following points: (a) substances classified as any of the following in Part 3 of Annex VI to Regulation (EC) No 1272/2008: — carcinogen category 1A, 1B or 2, or germ cell mutagen category 1A, 1B or 2, but excluding any such substances classified due to effects only following exposure by inhalation — reproductive toxicant category 1A, 1B or 2 but excluding any such substances classified due to effects only following exposure by inhalation — skin sensitiser category 1, 1A or 1B — skin corrosive category 1, 1A, 1B or 1C or skin irritant category 2 — serious eye damage category 1 or eye irritant category 2 (b) substances listed in Annex II to Regulation (EC) No 1223/2009 of the European Parliament and of the Council (c) substances listed in Annex IV to Regulation (EC) No 1223/2009 for which a condition is specified in at least one of the columns g, h and i of the table in that Annex (d) substances listed in Appendix 13 to this	Mixtures for tattooing purposes are subject to the restrictions of Regulation (EU) 2020/2081

Reason for revision: 2020/878

Publication date: 2020-02-25

Date of revision: 2022-01-17

Revision number: 0100

BIG number: 65766

17 / 19

zinc sulfate, solution

Annex.
The ancillary requirements in paragraphs 7 and 8 of column 2 of this entry apply to all mixtures for use for tattooing purposes, whether or not they contain a substance falling within points (a) to (d) of this column of this entry.

National legislation Belgium

zinc sulfate, solution

No data available

sulphuric acid

Additional classification	Acide sulfurique (brume); C; La mention "C" signifie que l'agent en question relève du champ d'application de l'arrêté royal du 2 décembre 1993 concernant la protection des travailleurs contre les risques liés à l'exposition à des agents cancérigènes et mutagènes et reprotoxiques au travail.
---------------------------	--

National legislation The Netherlands

zinc sulfate, solution

Waterbezwaarlijkheid	A (1); Algemene Beoordelingsmethodiek (ABM)
----------------------	---

manganese sulphate

SZW - Lijst van voor de voortplanting giftige stoffen (ontwikkeling)	mangaan sulfaat; Opgenomen in SZW-lijst van voor de voortplanting giftige stoffen (ontwikkeling); 2
--	---

SZW - Lijst van voor de voortplanting giftige stoffen (vruchtbaarheid)	mangaan sulfaat; Opgenomen in SZW-lijst van voor de voortplanting giftige stoffen (vruchtbaarheid); 2
--	---

sulphuric acid

SZW - Lijst van kankerverwekkende stoffen	zwavelzuurlevels; Listed in SZW-list of carcinogenic substances
---	---

National legislation France

zinc sulfate, solution

No data available

National legislation Germany

zinc sulfate, solution

Lagerklasse (TRGS510)	12: Nicht brennbare Flüssigkeiten, die keiner der vorgenannten LGK zuzuordnen sind
-----------------------	--

WGK	3; Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen (AwSV) - 18. April 2017
-----	--

zinc sulphate (anhydrous)

TA-Luft	5.2.1
---------	-------

magnesium sulphate

TA-Luft	5.2.1
---------	-------

manganese sulphate

TA-Luft	5.2.2/III
---------	-----------

TRGS900 - Risiko der Fruchtschädigung	Mangan und seine anorganischen Verbindungen; Y; Risiko der Fruchtschädigung braucht bei Einhaltung des Arbeitsplatzgrenzwertes und des biologischen Grenzwertes nicht befürchtet zu werden
---------------------------------------	--

	Mangan und seine anorganischen Verbindungen; Y; Risiko der Fruchtschädigung braucht bei Einhaltung des Arbeitsplatzgrenzwertes und des biologischen Grenzwertes nicht befürchtet zu werden
--	--

sulphuric acid

TRGS900 - Risiko der Fruchtschädigung	Schwefelsäure; Y; Risiko der Fruchtschädigung braucht bei Einhaltung des Arbeitsplatzgrenzwertes und des biologischen Grenzwertes nicht befürchtet zu werden
---------------------------------------	--

National legislation Austria

zinc sulfate, solution

No data available

National legislation United Kingdom

zinc sulfate, solution

No data available

Other relevant data

zinc sulfate, solution

No data available

manganese sulphate

TLV - Carcinogen	Manganese, elemental and inorganic compounds, as Mn; A4
------------------	---

sulphuric acid

TLV - Carcinogen	Sulfuric acid; A2
------------------	-------------------

IARC - classification	1; Strong-inorganic-acid mists containing sulfuric acid
-----------------------	---

15.2. Chemical safety assessment

A chemical safety assessment has been performed.

zinc sulfate, solution

SECTION 16: Other information

Full text of any H- and EUH-statements referred to under section 3:

- H302 Harmful if swallowed.
- H314 Causes severe skin burns and eye damage.
- H318 Causes serious eye damage.
- H373 May cause damage to organs (brain) through prolonged or repeated exposure if inhaled.
- H400 Very toxic to aquatic life.
- H410 Very toxic to aquatic life with long lasting effects.
- H411 Toxic to aquatic life with long lasting effects.

(*)	INTERNAL CLASSIFICATION BY BIG
ADI	Acceptable daily intake
AOEL	Acceptable operator exposure level
ATE	Acute Toxicity Estimate
CLP (EU-GHS)	Classification, labelling and packaging (Globally Harmonised System in Europe)
DMEL	Derived Minimal Effect Level
DNEL	Derived No Effect Level
EC50	Effect Concentration 50 %
ERC50	EC50 in terms of reduction of growth rate
LC50	Lethal Concentration 50 %
LD50	Lethal Dose 50 %
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
OECD	Organisation for Economic Co-operation and Development
PBT	Persistent, Bioaccumulative & Toxic
PNEC	Predicted No Effect Concentration
STP	Sludge Treatment Process
vPvB	very Persistent & very Bioaccumulative

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question. Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided and cannot be held liable for any changes by third parties. This safety data sheet is only to be used within the European Union, Switzerland, Iceland, Norway and Liechtenstein. Any use outside of this area is at your own risk. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement or when this is failing the general conditions of BIG. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult the mentioned agreement/conditions for details.

Annex to the Safety Data Sheet

zinc sulfate solution

1. Exposure scenario 1: Manufacture - Production of Wastewater, zinc sulfate electrolytic, acid

Environment contributing scenario(s):			SPERC
CS 1	Production of Wastewater, zinc sulfate electrolytic, acid	ERC 1	Eurometaux SPERC 1.2.v2
Worker contributing scenario(s):			SWED
CS 2	Bleeding of the zinc sulphate solution	PROC 2, PROC 3	
CS 3	Transfer of substance or mixture (charging/discharging) at dedicated facilities; Transfer of substance or mixture into small containers (dedicated filling line, including weighing)	PROC 8b, PROC 9	

Further description of the use:

Zinc Sulphate solution can be bled either just before or after the electrolysis cellhouse

1.1 Env CS 1: Production of Wastewater, zinc sulfate electrolytic, acid (ERC 1)

Assessment entity group used for the assessment of this contributing scenario: Zinc sulphate purified solution

1.1.1 Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Daily use amount at site: ≤ 137 tonnes/day <i>Default assessment use rate as set by ERC 1. It is recommended to use a realistic substance use rate.</i>
<ul style="list-style-type: none"> Annual use amount at site: $\leq 5E4$ tonnes/year <i>Default number of emission days are derived from a multi-metal background database of measured site-specific release factors collected under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.</i> <i>182 days/year is the 10th percentile of reported site-specific number of emission days for 168 sites from production of metal compounds.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> On site treatment of off-air: Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter <i>Direct air emissions should be reduced by implementing one or more of the following RMMs:</i> <ul style="list-style-type: none"> Electrostatic precipitators using wide electrode spacing: $5 - 15 \text{ mg/Nm}^3$ Wet electrostatic precipitators: $< 5 \text{ mg/Nm}^3$ Cyclones, but as primary collector: $< 50 \text{ mg/Nm}^3$ Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values $< 5 \text{ mg/Nm}^3$. Membrane filtration techniques can achieve $< 1 \text{ mg/Nm}^3$ Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm^3 Wet scrubbers: $< 4 \text{ mg/Nm}$
<ul style="list-style-type: none"> On site treatment of wastewater: Chemical precipitation or sedimentation or filtration or

Annex to the Safety Data Sheet

zinc sulfate solution

electrolysis or reverse osmosis or ion exchange

Following IPPC-BREF note document, the treatment methods are very much dependent on the specific processes and the metals involved. Direct water emissions should be reduced by implementing one or more of the following RMMs:

- **Chemical precipitation:** used primarily to remove the metal ions (e.g. Ca(OH)_2 , pH 11 precipitation: >99% removal efficiency; Fe(OH)_3 , pH 11: 96% removal efficiency)
- **Sedimentation** (e.g. Na_2S , pH 11, >99% removal efficiency) • **Filtration:** used as final clarification step (e.g. ultrafiltration, pH 5.1: 93% removal efficiency, nanofiltration: 97% removal efficiency, reverse osmosis, pH 4-11: 99% removal efficiency)
- “• **Electrolysis:** for low metal concentration (e.g. electrodialysis: 13% removal efficiency within 2 hours at 2g/L, membrane electrolysis, electrochemical precipitation, pH 4-10, >99% removal efficiency) • **Reverse osmosis:** extensively used for the removal of dissolved metals Ion exchange: final cleaning step in the removal of heavy metal from process wastewater (e.g. 90% removal efficiency for clinoptilolite and 100% removal efficiency for synthetic zeolite) More information can be found in EC (2001), Integrated Pollution Prevention and Control (IPCC): reference document on Best Available Techniques in the Non Ferrous Metals Industries.

Conditions and measures related to biological sewage treatment plant

- Discharge rate of STP: $\geq 2\text{E}3$ m³/day
- Biological STP: Site specific [Effectiveness Water: 5.256%]
- Application of the STP sludge on agricultural soil: No

Conditions and measures related to external treatment of waste (including article waste)

- Particular considerations on the waste treatment operations: No (no waste)
No waste generated.

Fate (release percentage) in the biological sewage treatment plant

The biological STP is site specific and the releases to the various compartments have been set by the assessor for some assessment entities. They are distributed in the following way:

Assessment entities	Zinc	Magnesium	Manganese
Release to water	18%	94.14%	94.74%
Release to air	0.497%	0.792%	0.013%
Release to sludge	81.51%	5.06%	5.243%
Release degraded	0%	0%	0%

Explanation for Zinc:

Specific documented data

Explanation for Magnesium:

Default EUSES settings

Explanation for Manganese:

Default EUSES settings

1.1.2 Releases

The releases have been estimated on the basis of SPERC Eurometaux SPERC 1.2.v2: Manufacture of metal compounds

Annex to the Safety Data Sheet

zinc sulfate solution

Description of activities/processes covered by the SPERC

Since metal SPERCs are based on measured data at end-of-pipe on-site, all indicated PROCs are integrated in the release fractions from raw materials handling to cleaning and maintenance.

Product/substance domain:

Limitations of coverage compared to ERC relate to:

User groups: Manufacture of metal compounds. This SPERC does not cover production of organic or metallo-organic substances and mining and ore treatment at the mine site and producers of massive metal.

Substance groups or functions: Release defaults are derived from measured emissions. Metal representativeness of background data:

Metal (compound) is defined here in a broad sense. The definition includes alkali metals, alkaline earth metals, transition metals, post-transition metals, metalloids and their compounds but excludes non-metals, halogens, noble gases and metallo-organic compounds.

SPERC valid for metals with solid water partition coefficient for suspended matter between 1,000 L/kg and 400,000 L/kg.

Types of products: Metal compound

Explanation for the release factor to soil:

ERC default

Sub-SPERC Eurometaux SPERC 1.2b.v2 is used for Manganese, Magnesium:

Explanation for the release factor to water:

After on-site STP.

Reasonable worst-case (90th percentile) (available data too limited to develop robust regression). A relationship between solid-water partitioning coefficient for suspended matter K_d and the release factor to water can be justified because the K_d expresses the distribution between aqueous phase and suspended matter. K_d is an important parameter impacting the removal efficiency especially in sedimentation and precipitation RMMs but also in on-site runoff, cleaning operations, wet processes, etc

Explanation for the release factor to air:

Release after RMM. The 90th percentile of reported site-specific release factors to air for 145 sites from the production of massive metal and metal powder

Sub-SPERC Eurometaux SPERC 1.2f.v2 is used for Zinc:

Explanation for the release factor to water:

After on-site STP.

Realistic worst-case regression line ($RF = 10^{(1.59 - 1.14 \times \log(K_d))}$) of the metal-specific 90th percentile reported site-specific release factors to wastewater for 201 sites from the production of massive metal and metal powder.

A relationship between solid-water partitioning coefficient for suspended matter K_d and the release factor to water can be justified because the K_d expresses the distribution between aqueous phase and suspended matter. K_d is an important parameter impacting the removal efficiency especially in sedimentation and precipitation RMMs but also in on-site runoff, cleaning operations, wet processes, etc

Explanation for the release factor to air:

Release after RMM. The 90th percentile of reported site-specific release factors to air for 145 sites from the production of massive metal and metal powder

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

Annex to the Safety Data Sheet zinc sulfate solution

Table 1: Local releases to the environment

Release	Assessment entity	Release factor	Local release rate
Water	Zinc	5E-3%	4.658 kg/day
	Magnesium	0.2%	71.24 kg/day
	Manganese	0.2%	5.48 kg/day
Air	Zinc	0.03%	27.94 kg/day
	Magnesium	0.03%	10.68 kg/day
	Manganese	0.03%	0.822 kg/day
Non agricultural soil	Zinc	0.01%	- kg/day
	Magnesium	0.01%	- kg/day
	Manganese	0.01%	- kg/day

Releases to waste

Release factor to external waste: 0.736 %

The 90th percentile of reported site-specific release factors to solid waste for 62 manufacturing sites covering zinc, nickel, lead, cobalt, cadmium, antimony

1.1.3 Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 2: Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Zinc	Local PEC: 6.27E-4 mg/L (Measured data: water emissions) RCR = 0.04	Final RCR = 0.059
	Magnesium	Local PEC: 6.27E-4 mg/L (Measured data: Water emissions) RCR = 9.22E-4	
	Manganese	Local PEC: 6.27E-4 mg/L (Measured data: Water emissions) RCR = 0.018	
Sediment (freshwater)	Zinc	Local PEC: 0.064 g/kg dw (Measured data: water emissions) RCR = 0.232	Final RCR = 0.424
	Magnesium	Local PEC: 6.27E-4 g/kg dw (Measured data: Water emissions) RCR = 2.34E-3	
	Manganese	Local PEC: 6.27E-4 g/kg dw (Measured data: Water emissions) RCR = 0.19	
Marine water	Zinc	Local PEC: 0 mg/L (Measured data: water emissions)	Final RCR < 0.01

Annex to the Safety Data Sheet

zinc sulfate solution

Protection target	Assessment entity	Exposure concentration	Risk quantification
		RCR = 0	
	Magnesium	Local PEC: 0 mg/L (Measured data: Water emissions) RCR = 0	
	Manganese	Local PEC: 0 mg/L (Measured data: Water emissions) RCR = 0	
Sediment (marine water)	Zinc	Local PEC: 0 g/kg dw (Measured data: water emissions) RCR = 0	Final RCR < 0.01
	Magnesium	Local PEC: 0 g/kg dw (Measured data: Water emissions) RCR = 0	
	Manganese	Local PEC: 0 g/kg dw (Measured data: Water emissions) RCR = 0	
Sewage Treatment Plant	Zinc	Local PEC: 6.27E-4 mg/L (Measured data: water emissions) RCR = 6.27E-3	Final RCR < 0.01
	Magnesium	Local PEC: 6.27E-4 mg/L (Measured data: Water emissions) RCR = 6.27E-5	
	Manganese	Local PEC: 6.27E-4 mg/L (Measured data: Water emissions) RCR = 6.27E-6	
Man via environment - combined routes			

Risk characterisation

Safe use is described for all scenarios, except for marine water (RCR: 1.5). in this respect the following is noted:

- the risk ratio includes an additional safety factor of 10, due to the fact that the PNEC is derived using equilibrium partitioning. Referring to the a) ,freshwater PNECsediment, and b) to the PNECs for freshwater and marine waters, all derived based on extensive ecotoxicity datasets, allowing the statistical derivation of the PNEC, it is clear that the application of a safety factor 10 on the marine sediment PNEC is overly conservative. The actual PNECsediment marine water is only 5% of the value of the freshwater sediment, while the marine PNEC value is 34% of the freshwater value. recognising the uncertainty related to deriving PNECs with equilibrium partitioning approach, industry intends to revise the PNEC marine sediment, preferably by using a statistical approach (Metals and Inorganics Sectorial Approach programme - MISA)
- the bioavailability of zinc in sediment is defined by the level sulphide present in the sediment: zinc will bind strongly to the sulphide, by forming ZnS, which has very low solubility and makes the zinc practically unavailable to the organisms. In the EU risk assessment, a conservative default bioavailability factor of 2 was applied for sediment. Assuming the same conservative approach is valid for marine sediment, the RCR accounting also for bioavailability is 0.75. this aspect will also be

Annex to the Safety Data Sheet

zinc sulfate solution

further checked in the MISA programme.

1.2 Worker CS 2: Bleeding of the zinc sulphate solution (PROC 2, PROC 3)

Assessment entity group used for the assessment of this contributing scenario: Zinc sulphate purified solution
zinc exposure

1.2.1 Conditions of use

	Method
Product (article) characteristics	
<ul style="list-style-type: none"> Percentage (w/w) of substance in mixture/article: <= 100 % <i>Typical concentration of ZnSO4: 68.2%; MgSO4: 26.7%; MnSO4: 2.1%</i> 	
<ul style="list-style-type: none"> Physical form of the used product: Liquid <i>substances are in aqueous solution</i> 	
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration of activity: <= 8 h/day 	
Technical and organisational conditions and measures	
<ul style="list-style-type: none"> General ventilation: Good general ventilation (3-5 air changes per hour) [Effectiveness Inhalation: 30%] 	
<ul style="list-style-type: none"> Closed continuous process with occasional controlled exposure 	
<ul style="list-style-type: none"> Local exhaust ventilation: Yes [Effectiveness Inhalation: 82%, Dermal: 0%] <i>default exposure reductions as mentioned by MEASE 1.02 are given</i> Inhalation explanation: <i>inhalation exposure reduction 82% with generic LEV</i> Dermal explanation: <i>no effect on dermal exposure considered with LEV generic</i> 	
Conditions and measures related to personal protection, hygiene and health evaluation	
<ul style="list-style-type: none"> Dermal protection: Yes (Chemically resistant gloves conforming to EN374 with basic employee training) and (other) appropriate dermal protection [Effectiveness Dermal: 90%] 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> Place of use: Indoor 	
<ul style="list-style-type: none"> Operating temperature: <= 40 °C 	

Annex to the Safety Data Sheet zinc sulfate solution

1.2.2 Exposure and risks for workers

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

Table 3: Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Zinc	2E-3 mg/m ³ (MEASE 1.02) RCR = 4E-4	Final RCR < 0.01
	Magnesium	2E-3 mg/m ³ (MEASE 1.02) RCR = 2E-4	
	Manganese	1E-3 mg/m ³ (MEASE 1.02) RCR = 5E-3	
Inhalation, local, long term	Manganese	1E-3 mg/m ³ (MEASE 1.02) Exposure/DMEL = 5E-3	Exposure/DMEL < 0.01
Inhalation, local, acute	Manganese	1E-3 mg/m ³ (MEASE 1.02) Exposure/DMEL = 5E-3	Exposure/DMEL < 0.01
Dermal, systemic, long term	Zinc	2E-3 mg/kg bw/day (MEASE 1.02) RCR = 2.41E-5	Final RCR = 0.1
	Manganese	4E-4 mg/kg bw/day (MEASE 1.02) RCR = 0.1	
Combined routes, systemic, long-term			Final RCR = 0.105

Remarks on exposure data from external estimation tools:

MEASE 1.02 for Zinc:

Explanation: MEASE 1.01 parameters:

- physical form: aqueous solution
- content in preparation: 5 - <25%
- PROC as indicated: 2 (3: worst case)
- scale of operation: industrial
- duration of exposure: > 240 minutes
- pattern of use: non-dispersive
- pattern of exposure control: direct handling
- contact level: incidental
- implemented RMMs: generic LEV
- RMM efficiency based on : median estimate
- respiratory protective equipment: as indicated
- use of gloves: as indicated

MEASE 1.02 for Magnesium:

Explanation: see parameters used for zinc above

MEASE 1.02 for Manganese:

Explanation: see parameters used for zinc above, with "content in preparation: 1 - <5%"

Annex to the Safety Data Sheet zinc sulfate solution

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute):

Substance is a solution, exposure by inhalation is unlikely

1.3 Worker CS 3: Transfer of substance or mixture (charging/discharging) at dedicated facilities; Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC 8b, PROC 9)

Assessment entity group used for the assessment of this contributing scenario: Zinc sulphate purified solution

1.3.1 Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	
• Physical form of the used product: Liquid <i>aqueous solution</i>	
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	
Technical and organisational conditions and measures	
• General ventilation: Good general ventilation (3-5 air changes per hour) [Effectiveness Inhalation: 30%]	
• Closed process without likelihood of exposure	
• Local exhaust ventilation: Yes [Effectiveness Inhalation: 82%, Dermal: 0%] <i>default exposure reduction of MEASE is applied</i> Inhalation explanation: <i>exposure reduction is estimated at 82%</i> Dermal explanation: <i>no effect on dermal exposure</i>	
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Yes (Chemically resistant gloves conforming to EN374 with basic employee training) and (other) appropriate dermal protection [Effectiveness Dermal: 90%]	
Other conditions affecting workers exposure	
• Place of use: Indoor	
• Operating temperature: <= 40 °C	

Annex to the Safety Data Sheet zinc sulfate solution

1.3.2 Exposure and risks for workers

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

Table 4: Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Zinc	2E-3 mg/m ³ (MEASE 1.02) RCR = 4E-4	Final RCR < 0.01
	Magnesium	2E-3 mg/m ³ (MEASE 1.02) RCR = 2E-4	
	Manganese	1E-3 mg/m ³ (MEASE 1.02) RCR = 5E-3	
Inhalation, local, long term	Manganese	1E-3 mg/m ³ (MEASE 1.02) Exposure/DMEL = 5E-3	Exposure/DMEL < 0.01
Inhalation, local, acute	Manganese	1E-3 mg/m ³ (MEASE 1.02) Exposure/DMEL = 5E-3	Exposure/DMEL < 0.01
Dermal, systemic, long term	Zinc	3E-3 mg/kg bw/day (MEASE 1.02) RCR = 3.61E-5	Final RCR = 0.175
	Manganese	7E-4 mg/kg bw/day (MEASE 1.02) RCR = 0.175	
Combined routes, systemic, long-term			Final RCR = 0.18

Remarks on exposure data from external estimation tools:

MEASE 1.02 for Zinc:

Explanation: MEASE 1.01 parameters:

- physical form: aqueous solution
- content in preparation: >25%
- PROC as indicated: 8b
- scale of operation: industrial
- duration of exposure: > 240 minutes
- pattern of use: non-dispersive
- pattern of exposure control: direct handling
- contact level: incidental
- implemented RMMs: generic LEV
- RMM efficiency based on : median estimate
- respiratory protective equipment: as indicated
- use of gloves: as indicated

MEASE 1.02 for Magnesium:

Explanation: as for zinc above

MEASE 1.02 for Manganese:

Explanation: as for zinc above, but content in preparation: 1-<5%

Annex to the Safety Data Sheet

zinc sulfate solution

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute):

Substance is a solution, exposure by inhalation is unlikely

2. Exposure scenario 2: Use at industrial sites - Use of intermediate

Product category used: PC 0: Other

Sector of use: SU 14: Manufacture of basic metals, including alloys

Environment contributing scenario(s):		
CS 1	Use of intermediate	ERC 6a
Worker contributing scenario(s):		
CS 2	Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange	PROC 4
CS 3	Transfer of substance or mixture (charging/discharging) at dedicated facilities	PROC 8b

2.1 Env CS 1: Use of intermediate (ERC 6a)

Assessment entity group used for the assessment of this contributing scenario: Zinc sulphate purified solution

Use of the intermediate as electrolyte for zinc cathode production

2.1.1 Conditions of use

Amount used, frequency and duration of use (or from service life)
• Daily use amount at site: <= 137 tonnes/day
• Annual use amount at site: <= 5E4 tonnes/year
Conditions and measures related to biological sewage treatment plant
• Biological STP: Standard [Effectiveness Water: 5.256%]
• Discharge rate of STP: >= 2E3 m3/day
• Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: No (low concentration) <i>Particular risks from waste treatment unlikely due low concentration of substance in waste stream. Waste disposal according to national/local legislation is sufficient.</i>
Other conditions affecting environmental exposure
• Receiving surface water flow rate: >= 1.8E4 m3/day

2.1.2 Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Annex to the extended Safety Data Sheet (eSDS)

Zinc sulfate solution

Table 5: Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Zinc	Measured release rate (effluent discharge)	Release factor after on site RMM: 4.58E-10% Local release rate: 6.27E-7 kg/day Explanation: Zinc is a measured value, corrected for dilution in receiving waters. Zinc values are used as worst case for Mg and Mn.
	Magnesium	Measured release rate (effluent discharge)	Release factor after on site RMM: 4.58E-10% Local release rate: 6.27E-7 kg/day Explanation: Zinc is a measured value, corrected for dilution in receiving waters. Zinc values are used as worst case for Mg and Mn.
	Manganese	Measured release rate (effluent discharge)	Release factor after on site RMM: 4.58E-10% Local release rate: 6.27E-7 kg/day Explanation: Zinc is a measured value, corrected for dilution in receiving waters. Zinc values are used as worst case for Mg and Mn.
Air	Zinc	Estimated release factor (SPERC)	Release factor before on site RMM: 0.03% Release factor after on site RMM: 0.03% Local release rate: 27.94 kg/day
	Magnesium	Estimated release factor (SPERC)	Release factor before on site RMM: 0.03% Release factor after on site RMM: 0.03% Local release rate: 10.68 kg/day
	Manganese	Estimated release factor (SPERC)	Release factor before on site RMM: 0.03% Release factor after on site RMM: 0.03% Local release rate: 0.822 kg/day
Non agricultural soil	Zinc	Estimated release factor (SPERC)	Release factor after on site RMM: 0.01%
	Magnesium	Estimated release factor (SPERC)	Release factor after on site RMM: 0.01%
	Manganese	Estimated release factor (SPERC)	Release factor after on site RMM: 0.01%

Releases to waste

Release factor to external waste: 0.736 %
90P from 70 plants

Annex to the extended Safety Data Sheet (eSDS)

Zinc sulfate solution

2.1.3 Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 6: Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Zinc	Local PEC: 2.13E-9 mg/L RCR = 1.35E-7	Final RCR < 0.01
	Magnesium	Local PEC: 2.95E-8 mg/L RCR = 4.34E-8	
	Manganese	Local PEC: 2.97E-8 mg/L RCR = 8.73E-7	
Sediment (freshwater)	Zinc	Local PEC: 2.34E-4 mg/kg dw RCR = 8.46E-7	Final RCR < 0.01
	Magnesium	Local PEC: 1.37E-6 mg/kg dw RCR = 5.11E-9	
	Manganese	Local PEC: 1.43E-6 mg/kg dw RCR = 4.32E-7	
Marine water	Zinc	Local PEC: 2.13E-10 mg/L RCR = 3.5E-8	Final RCR < 0.01
	Magnesium	Local PEC: 2.95E-9 mg/L RCR = 4.34E-9	
	Manganese	Local PEC: 2.97E-9 mg/L RCR = 9.89E-7	
Sediment (marine water)	Zinc	Local PEC: 2.34E-5 mg/kg dw RCR = 1.71E-7	Final RCR < 0.01
	Magnesium	Local PEC: 1.37E-7 mg/kg dw RCR = 5.11E-10	
	Manganese	Local PEC: 1.43E-7 mg/kg dw RCR = 4.19E-7	
Sewage Treatment Plant	Zinc	Local PEC: 5.64E-8 mg/L RCR = 5.64E-7	Final RCR < 0.01
	Magnesium	Local PEC: 2.95E-7 mg/L RCR = 2.95E-8	
	Manganese	Local PEC: 2.97E-7 mg/L RCR = 2.97E-9	
Agricultural soil	Zinc	Local PEC: 0.13 mg/kg dw RCR = 1.22E-3	Final RCR < 0.01
	Magnesium	Local PEC: 0.029 mg/kg dw RCR = 1.07E-4	
	Manganese	Local PEC: 3.99E-3 mg/kg dw RCR = 1.17E-3	

Annex to the extended Safety Data Sheet (eSDS)

Zinc sulfate solution

Protection target	Assessment entity	Exposure concentration	Risk quantification
Man via environment - Inhalation (systemic effects)	Zinc	Concentration in air: 7.77E-3 mg/m ³ RCR = 3.11E-3	Final RCR < 0.01
	Magnesium	Concentration in air: 2.97E-3 mg/m ³ RCR = 2.97E-4	
	Manganese	Concentration in air: 2.28E-4 mg/m ³ RCR = 5.57E-3	
Man via environment - Inhalation (local effects)	Manganese	Concentration in air: 2.28E-4 mg/m ³ RCR = 5.57E-3	Final RCR < 0.01
Man via environment - Oral	Zinc	Exposure via food consumption: 0.47 mg/kg bw/day RCR = 0.567	Final RCR = 0.568
	Magnesium	Exposure via food consumption: 4.15E-3 mg/kg bw/day RCR = 1.15E-3	
Man via environment - combined routes			Final RCR = 0.571

2.2 Worker CS 2: Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange (PROC 4)

Assessment entity group used for the assessment of this contributing scenario: Zinc sulphate purified solution

2.2.1 Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02
• Physical form of the used product: Liquid	MEASE 1.02
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02
• General ventilation: Basic general ventilation (1-3 air changes per hour) [Effectiveness Inhalation: 0%]	MEASE 1.02
• Local exhaust ventilation: No [Effectiveness Inhalation: 0%, Dermal: 0%]	MEASE 1.02
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protection: No [Effectiveness Inhalation: 0%]	MEASE 1.02
• Dermal protection: No [Effectiveness Dermal: 0%]	MEASE 1.02

Annex to the extended Safety Data Sheet (eSDS)

Zinc sulfate solution

	Method
Other conditions affecting workers exposure	
• Place of use: Indoor	MEASE 1.02
• Operating temperature: <= 40 °C	MEASE 1.02

2.2.2 Exposure and risks for workers

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

Table 7: Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Zinc	9E-3 mg/m ³ (MEASE 1.02) RCR = 1.8E-3	Final RCR = 0.048
	Magnesium	9E-3 mg/m ³ (MEASE 1.02) RCR = 9E-4	
	Manganese	9E-3 mg/m ³ (MEASE 1.02) RCR = 0.045	
Inhalation, local, long term	Manganese	9E-3 mg/m ³ (MEASE 1.02) Exposure/DMEL = 0.045	Exposure/DMEL = 0.045
Inhalation, local, acute	Manganese	9E-3 mg/m ³ (MEASE 1.02) Exposure/DMEL = 0.045	Exposure/DMEL = 0.045
Dermal, systemic, long term	Zinc	3.4E-3 mg/kg bw/day (MEASE 1.02) RCR = 4.1E-5	Final RCR = 0.85
	Manganese	3.4E-3 mg/kg bw/day (MEASE 1.02) RCR = 0.85	
Combined routes, systemic, long-term			Final RCR = 0.897

Remarks on exposure data from external estimation tools:

MEASE 1.02 for Zinc:

Explanation: MEASE 1.01 parameters:

- physical form: aqueous solution
- content in preparation: >25%
- PROC as indicated: 4
- scale of operation: industrial
- duration of exposure: > 240 minutes
- pattern of use: non-dispersive
- pattern of exposure control: indirect handling
- contact level: incidental
- implemented RMMs: generic LEV
- RMM efficiency based on : median estimate
- respiratory protective equipment: as indicated
- use of gloves: as indicated

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute):

Substance is a solution, exposure by inhalation is unlikely

2.3 Worker CS 3: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC 8b)

Assessment entity group used for the assessment of this contributing scenario: Zinc sulphate purified solution

2.3.1 Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02
• Physical form of the used product: Liquid	MEASE 1.02
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02
Technical and organisational conditions and measures	
• General ventilation: Basic general ventilation (1-3 air changes per hour) [Effectiveness Inhalation: 0%]	MEASE 1.02
• Occupational Health and Safety Management System: Advanced	MEASE 1.02
• Local exhaust ventilation: No [Effectiveness Inhalation: 0%, Dermal: 0%]	MEASE 1.02
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protection: No [Effectiveness Inhalation: 0%]	MEASE 1.02
• Dermal protection: No [Effectiveness Dermal: 0%]	MEASE 1.02
Other conditions affecting workers exposure	
• Place of use: Indoor	MEASE 1.02
• Operating temperature: <= 40 °C	MEASE 1.02

2.3.2 Exposure and risks for workers

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

Table 8: Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Zinc	2E-3 mg/m ³ (MEASE 1.02) RCR = 4E-4	Final RCR = 0.011
	Magnesium	2E-3 mg/m ³ (MEASE 1.02) RCR = 2E-4	
	Manganese	2E-3 mg/m ³ (MEASE 1.02)	

Annex to the extended Safety Data Sheet (eSDS)

Zinc sulfate solution

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
		RCR = 0.01 Supportive exposure (not used for RC): (TRA Workers)	
Inhalation, local, long term	Manganese	2E-3 mg/m ³ (MEASE 1.02) Exposure/DMEL = 0.01 Supportive exposure (not used for RC): (TRA Workers)	Exposure/DMEL = 0.01
Inhalation, local, acute	Manganese	2E-3 mg/m ³ (MEASE 1.02) Exposure/DMEL = 0.01 Supportive exposure (not used for RC): (TRA Workers)	Exposure/DMEL = 0.01
Dermal, systemic, long term	Zinc	3E-3 mg/kg bw/day (MEASE 1.02) RCR = 3.61E-5	Final RCR = 0.75
	Manganese	3E-3 mg/kg bw/day (MEASE 1.02) RCR = 0.75 Supportive exposure (not used for RC): (TRA Workers)	
Combined routes, systemic, long-term			Final RCR = 0.76

Remarks on exposure dataset obtained with ECETOC TRA

Percentage (w/w) of Manganese in mixture/article: 100 %

The vapour pressure at operating temperature (40°C) used for the calculation is 7.59E3 Pa for Manganese.

Additional conditions of use related to the exposure estimate:

- Percentage (w/w) of substance in mixture/article: <= 100 %
- Physical form of the used product: Liquid
- Duration of activity: <= 8 h/day
- Place of use: Indoor
- Operating temperature: <= 40 °C
- General ventilation: Basic general ventilation (1-3 air changes per hour) [Effectiveness Inhalation: 0%]
- Occupational Health and Safety Management System: Advanced
- Local exhaust ventilation: No [Effectiveness Inhalation: 0%, Dermal: 0%]
- Respiratory protection: No [Effectiveness Inhalation: 0%]
- Dermal protection: No [Effectiveness Dermal: 0%]

Remarks on exposure data from external estimation tools:

MEASE 1.02 for Zinc:

Explanation: MEASE 1.01 parameters:

Zinc sulfate solution

- physical form: aqueous solution
- content in preparation: >25%
- PROC as indicated: 8b
- scale of operation: industrial
- duration of exposure: > 240 minutes
- pattern of use: non-dispersive
- pattern of exposure control: direct handling
- contact level: incidental
- implemented RMMs: generic LEV
- RMM efficiency based on : median estimate
- respiratory protective equipment: as indicated
- use of gloves: as indicated

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute):
Substance is a solution, exposure by inhalation is unlikely