

Sulfato de zinc

Fichas de datos de seguridad

conforme al reglamento (CE) n° 453/2010

Fecha de emisión: 25/09/2013

Fecha de revisión: 25/09/2013

:

Versión: 0.0

SECCIÓN 1: Identificación de la sustancia o la mezcla y de la sociedad o la empresa

1.1. Identificador del producto

Forma del product : Sustancia
Nombre de la sustancia : Sulfato de zinc
No CE : 231-793-3
No CAS : 7733-02-0
REACH número de registro : 01-2119474684-27

1.2. Usos pertinentes identificados de la sustancia o de la mezcla y usos desaconsejados

1.2.1. Usos pertinentes identificados

Uso de la sustancia/mezcla : Coadyuvantes de elaboración, elencati non altrimenti.
Uso de la sustancia/mezcla : Sustancias intermedias
Productos químicos de laboratorio
Fertilizante
Rellenos
Lubricantes y aditivos
Surface-active agents

1.2.2. Usos desaconsejados

No se dispone de más información

1.3. Datos del proveedor de la ficha de datos de seguridad

A.M.P.E.R.E. SYSTEM IBERICA S.L.
C/SANT MARTI DE L'ERM 1
E 08960 SANT JUST DESVERN - BARCELONA
T +34 9 34 70 31 71 - F +34 9 34 73 38 80
fichadedatosdeseguridad@ampere.com

1.4. Teléfono de emergencia

Número de emergencia : + 34 91 562 04 20 (solo emergencias toxicológicas)

SECCIÓN 2: Identificación de los peligros

2.1. Clasificación de la sustancia o de la mezcla

Clasificación según reglamento (UE) No. 1272/2008 [CLP]

Acute Tox. 4 (Oral) H302
Eye Dam. 1 H318
Aquatic Acute 1 H400
Aquatic Chronic 1 H410

Texto completo de las frases H: ver sección 16

Clasificación según las directivas 67/548/CEE o 1999/45/CE

Xn; R22

Xi; R41

N; R50/53

Texto completo de las frases R: ver sección 16

Efectos adversos fisicoquímicos, para la salud humana y el medio ambiente

No se dispone de más información




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2.2. Elementos de la etiqueta

Etiquetado según el reglamento (CE) No. 1272/2008 [CLP]

Pictogramas de peligro (CLP)	:	  
		GHS05 GHS07 GHS09
Palabra de advertencia (CLP)	:	Peligro
Indicaciones de peligro (CLP)	:	H302 - Nocivo en caso de ingestión H318 - Provoca lesiones oculares graves H410 - Muy tóxico para los organismos acuáticos, con efectos nocivos duraderos
Consejos de prudencia (CLP)	:	Frases P presentes en la etiqueta * P273 - Evitar su liberación al medio ambiente (*) P280 - Llevar guantes de protección, prendas de protección, gafas de protección, máscara de protección (*) P351 - Aclarar cuidadosamente con agua durante varios minutos (*) P501 - Eliminar el contenido o el recipiente conforme a la reglamentación local/regional/nacional/internacional. (*) P270 - No comer, beber ni fumar durante su utilización P301+P312 - EN CASO DE INGESTIÓN: Llamar a un CENTRO DE INFORMACIÓN TOXICOLÓGICA o a un médico si se encuentra mal

2.3. Otros peligros

Esta sustancia/mezcla no cumple los criterios PBT del anexo III del reglamento REACH
Esta sustancia/mezcla no cumple los criterios vPvB del anexo III del reglamento REACH

SECCIÓN 3: Composición/información sobre los componentes

3.1. Sustancia

Nombre	:	Sulfato de zinc
No CAS	:	7733-02-0
No CE	:	231-793-3

Nombre	Identificador del producto	%	Clasificación según la directiva 67/548/CEE
Sulfato de cinc	(No CAS)7733-02-0 (No CE)231-793-3 (No Índice)030-006-00-9 (REACH-no)01-2119474684-27	97,5	Xn; R22 Xi; R41 N; R50/53

Nombre	Identificador del producto	%	Clasificación según reglamento (UE) No. 1272/2008 [CLP]
Sulfato de cinc	(No CAS)7733-02-0 (No CE)231-793-3 (No Índice)030-006-00-9 (REACH-no)01-2119474684-27	97,5	Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Texto completo de las frases R y H : ver sección 16

3.2. Mezcla

No aplicable

SECCIÓN 4: Primeros auxilios

4.1. Descripción de los primeros auxilios

Medidas de primeros auxilios general	:	Consultar a un médico. Mostrarle esta ficha o, en su defecto, el envase o la etiqueta.
Medidas de primeros auxilios en caso de inhalación	:	Sacar al afectado de la zona contaminada y trasladarlo al aire libre. Colocar a la víctima en reposo. En caso de parada respiratoria, aplíquese respiración artificial. Consultar a un médico.
Medidas de primeros auxilios en caso de contacto con la piel	:	En caso de contacto con la piel, lavarse inmediata y abundantemente con agua y jabón. Si la irritación persiste, consultar con un médico.
Medidas de primeros auxilios en caso de contacto con los ojos	:	Lavar inmediatamente con agua abundante manteniendo los párpados bien separados (durante 15 minutos como mínimo). Quitar las lentes de contacto, si lleva y resulta fácil. Consultar a un médico.
Medidas de primeros auxilios en caso de ingestión	:	No administrar nada por vía oral a las personas en estado de inconsciencia. Enjuagarse la boca. Consultar a un médico.

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4.2. Principales síntomas y efectos, agudos y retardados

Síntomas y lesiones posibles en caso de inhalación	: Puede irritar las vías respiratorias. Puede provocar somnolencia o vértigo. Aturdimientos. Desorientación. Fatiga. Debilidad. Puede provocar síntomas de alergia o asma o dificultades respiratorias en caso de inhalación.
Síntomas y lesiones posibles en caso de contacto con la piel	: Contacto repetido y prolongado con la piel. May cause skin irritation. / Enrojecimiento / . Piel seca.
Síntomas y lesiones posibles en caso de contacto con los ojos	: Puede provocar una irritación grave.
Síntomas y lesiones posibles en caso de ingestión	: Puede ocasionar : Malestar.

4.3. Indicación de toda atención médica y de los tratamientos especiales que deban dispensarse inmediatamente

Tratamiento sintomático.

SECCIÓN 5: Medidas de lucha contra incendios

5.1. Medios de extinción

Medios de extinción apropiados	: No inflamable. Espuma resistente al alcohol. Dióxido de carbono. Polvo seco.
Medios de extinción inadecuados	: No hay datos disponibles.

5.2. Peligros específicos derivados de la sustancia o la mezcla

Peligro de incendio	: Destrucción térmica. / La combustión libera: Óxidos de carbono (CO, CO ₂) / Gases tóxicos / Vapores tóxicos.
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5.3. Recomendaciones para el personal de lucha contra incendios

Instrucciones para extinción de incendio	: No inhalar humos procedentes de incendios o de vapores en descomposición. Llevar : Se aconseja utilizar un aparato respiratorio.
Protección durante la extinción de incendios	: Llevar un aparato respiratorio autónomo +. Traje completo antideflagrante.

SECCIÓN 6: Medidas en caso de vertido accidental

6.1. Precauciones personales, equipo de protección y procedimientos de emergencia

Medidas generales	: Llevar un equipo de protección adecuado. Para más información, ver sección 8 : "Control de la exposición-protección individual". Úsense guantes adecuados. Llevar gafas de seguridad bien ajustadas o una pantalla facial. Úsese indumentaria protectora adecuada. No respirar el polvo, los vapores. Garantizar una ventilación adecuada.
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6.1.1. Para el personal que no forma parte de los servicios de emergencia

No se dispone de más información

6.1.2. Para el personal de emergencia

No se dispone de más información

6.2. Precauciones relativas al medio ambiente

Evite la dispersión del material derramado, su contacto con el suelo, el medio acuático, los desagües y las alcantarillas. Informe a las autoridades pertinentes si el producto ha causado contaminación medioambiental (alcantarillas, canales, tierra o aire). Evitar su liberación al medio ambiente.

6.3. Métodos y material de contención y de limpieza

Procedimientos de limpieza	: Evitar la formación de polvo. Barrer, recoger con pala o aspirar. Recicle o reutilizados, si es posible.
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6.4. Referencia a otras secciones

Véase la Sección 8. SECCIÓN 11. Véase el apartado 13 en lo relativo a la eliminación de los residuos resultantes de la limpieza.

SECCIÓN 7: Manipulación y almacenamiento

7.1. Precauciones para una manipulación segura

Precauciones para una manipulación segura	: Evitar el contacto con la piel, los ojos y la ropa. En caso de formación de polvo: Se recomienda la ventilación mecánica.
Medidas de higiene	: No fumar durante su utilización. Lavarse las manos y otras zonas expuestas con un jabón suave y con agua antes de comer, beber y fumar o de abandonar el trabajo. Quitarse inmediatamente las prendas contaminadas. No comer, beber ni fumar durante su utilización.

7.2. Condiciones de almacenamiento seguro, incluidas posibles incompatibilidades

Condiciones de almacenamiento	: Consérvese exclusivamente en el recipiente de origen. Mantener el recipiente herméticamente cerrado. Consérvese cerrado en un lugar seco, fresco y muy bien ventilado.
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7.3. Usos específicos finales

(ver sección(es) : 1.2).

SECCIÓN 8: Controles de exposición/protección individual

8.1. Parámetros de control

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PNEC (Agua)	
PNEC agua (de agua dulce)	20,6 µg/L (added value, « PNECadd »)
PNEC agua (agua de mar)	6,1 µg/L (added value, « PNECadd »)
PNEC (Sedimentos)	
PNEC sedimentos (de agua dulce)	235,6 mg/kg dwt (A generic bioavailability factor of 0.5 is applied by default, according to the EU risk assessment (ECB 2008))
PNEC sedimentos (agua de mar)	113 mg/kg dwt (A generic bioavailability factor of 0.5 is applied by default, according to the EU risk assessment (ECB 2008))
PNEC (Tierra)	
PNEC tierra	106,8 mg/kg (A generic bioavailability/ageing factor of 3 is applied by default (ECB 2008).)
PNEC (STP)	
PNEC estación depuradora	52 µg/L

DNEL : Fracción inhalable - Soluble (Zn) : 1 mg Zn/m3 / Fracción inhalable - Insoluble (Zn) : 5 mg Zn/m3

8.2. Controles de la exposición

Controles técnicos apropiados	: Prever sistema de extracción o ventilación general del local. . Si la operación genera polvo, humos, vapores o llovizna, use cercamientos del proceso, ventilación local, u otros controles de ingeniería para mantener la exposición del obrero a los contaminantes aerotransportado por debajo de todos los límites recomendados o estatutarios.
Protección de las manos	: Úsense guantes adecuados. Materiales recomendados. Nitrilo. Tiempo de penetración: >= 8h. Caucho natural (NR)(0,5 mm) . Caucho cloropreno. / Policloropreno (CR). (0,5 mm) . Caucho nitrílico (NBR)(0,35 mm) . Butilo. - Caucho butilo (0,5 mm) . Caucho fluor. (FKM)(0,4 mm) . Cloruro de polivinilo (PVC)(0,5 mm).
Protección ocular	: Gafas químicas o pantalla facial.
Protección de la piel y del cuerpo	: Llevar ropa de protección adecuada. Protección completa del cuerpo.
Protección de las vías respiratorias	: Llevar una máscara adecuada. - Respirador antipolvo homologado. (Semi-máscara / . Careta completa.). En caso de exposición a fuertes concentraciones de polvo o de vapores: Semi-máscara/Careta completa : P1 (Eficiencia : 75%) / Semi-máscara/Careta completa : P2 (Eficiencia : 90%) / Semi-máscara: P3 (Eficiencia : 95%)/Careta completa : P3 (Eficiencia : 97,5%).

SECCIÓN 9: Propiedades físicas y químicas

9.1. Información sobre propiedades físicas y químicas básicas

Forma/estado	: Sólido
Apariencia	: Powder. Polvo.
Color	: Incoloro.
Olor	: inodoro.
Umbral olfativo	: No hay datos disponibles
pH	: No aplicable
Grado de evaporación (acetato de butilo=1)	: No aplicable
Grado de evaporación (éter=1)	: No aplicable
Punto de fusión	: monohidrato (nitrógeno/En el aire :) : 231 °C / 229 °C // 6H2O (nitrógeno/En el aire :) : 56 °C / 204 °C // 7H2O (nitrógeno/En el aire :) : 56 °C / 196 °C
Punto de solidificación	: No hay datos disponibles
Punto de ebullición	: No hay datos disponibles
Punto de inflamación	: No hay datos disponibles
Temperatura de autoignición	: No hay datos disponibles
Temperatura de descomposición	: No aplicable
Inflamabilidad (sólido, gas)	: No hay datos disponibles
Presión de vapor	: No aplicable
Densidad relativa de vapor a 20 °C	: No aplicable
Densidad relativa	: No hay datos disponibles
Densidad	: monohidrato : 3,35 g/cm3 / 6H2O : 2,05 g/cm3 / 7H2O : 1,98 g/cm3
Solubilidad	: Agua: monohidrato : 210 g/l / 6H2O : 211 g/l / 7H2O : 208 g/l
Log Pow	: No aplicable (producto inorgánica)
Viscosidad, cinemático	: No aplicable
Viscosidad, dinámico	: No aplicable
Propiedades explosivas	: El producto no es explosivo.
Propiedad de provocar incendios	: No hay datos disponibles
Límites de explosión	: No hay datos disponibles

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9.2. Información adicional	
Otras propiedades	: Granulometría : monohidrato : D50 = 65 µm; D80 = 205 µm / 6H2O :D50 =458 µm; D80 = 706 µm / 7H2O : D50 = 457 µm; D80 = 706 µm.

SECCIÓN 10: Estabilidad y reactividad	
10.1. Reactividad	
No se conocen reacciones peligrosas.	
10.2. Estabilidad química	
El producto es estable bajo condiciones normales de temperaturas y presiones.	
10.3. Posibilidad de reacciones peligrosas	
Sin datos disponibles.	
10.4. Condiciones que deben evitarse	
Reacciona con (algunas) bases. Calor. Humedad.	
10.5. Materiales incompatibles	
Plomo,. calcio,. Estroncio (Sr). (Sales), Borax, . Alkali.	
10.6. Productos de descomposición peligrosos	
En caso de incendio, puede descomponerse: el gas/los vapores/humo (Tóxico) (Dióxido de carbono,Monóxido de carbono).	

SECCIÓN 11: Información toxicológica	
11.1. Información sobre los efectos toxicológicos	
Toxicidad aguda	: Nocivo en caso de ingestión. En caso de inhalación: El polvo de este producto puede provocar irritación de las vía respiratorias + Irritación de la garganta Nocivo por ingestión Irrita los ojos

Sulfato de zinc(7733-02-0)	
DL50 oral rata	monohidrato : 574 - 2,949 mg/kg / 6H2O : 862 - 4,429 mg/kg / 7H2O : 920 - 4,725 mg/kg - Fuente : Litton Bionetics, 1974 Courtois et al., 1978
CL50 inhalación rata (mg/l)	Posibles efectos después de exposición : (Inhalación) <tx:_ORGAN_LUNG
Sulfato de cinc (7733-02-0)	
DL50 cutánea rata	> 2000 Fuente : Van Huygevoort (1999a)
ATE CLP (oral)	500,000 mg/kg de peso corporal

Corrosión o irritación cutáneas	: No clasificado No irritante para la piel - Van Huygevoort, 1999b pH: No aplicable
Lesiones o irritación ocular graves	: Provoca lesiones oculares graves. Provoca lesiones oculares graves - Van Huygevoort, 1999f pH: No aplicable
Sensibilización respiratoria o cutánea	: No clasificado Sin efectos de sensibilización conocidos - Van Huygevoort, 1999 i
Mutagenicidad en células germinales	: No clasificado
Carcinogenicidad	: No clasificado
Toxicidad para la reproducción	: No clasificado
Toxicidad específica en determinados órganos (STOT) – exposición única	: No clasificado
Toxicidad específica en determinados órganos (STOT) – exposición repetida	: No clasificado
Peligro por aspiración	: No clasificado

SECCIÓN 12: Información ecológica	
12.1. Toxicidad	
Ecología - general	: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Sulfato de zinc(7733-02-0)	
CE50 Daphnia 1	Ceriodaphnia dubia : pH < 7 : 0,413 mg Zn++/l/48h (US EPA 821-R-02-012 - Fuente: Hyne et al 2005) // ZnSO4.H2O (ZnSO4.H2O/Zn - Proporción : 2,74) pH < 7 : 1,13 mg Zn/l/48h // ZnSO4.6H2O (ZnSO4.6H2O/Zn - Proporción : 4,12) pH < 7 : 1,70 mg Zn/l/48h // ZnSO4.7H2O (ZnSO4.7H2O/Zn - Proporción : 4,4) pH < 7 : 1,82 mg Zn/l/48h

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CE50 otros organismos acuáticos 1	algas (Selenastrum capricornutum) : 7<pH <8.5 : 0,136 mg Zn++/l/72h (=Pseudokirchneriella subcapitata) (OECD 201) - Fuente: Van Ginneken, 1994 // ZnSO4.H2O (ZnSO4.H2O/Zn - Proporción : 2,74) 7<pH <8.5 : 3,73 mg Zn/l/72h // ZnSO4.6H2O (ZnSO4.6H2O/Zn - Proporción : 4,12) 7<pH <8.5 : 0,56 mg Zn/l/72h // ZnSO4.7H2O (ZnSO4.7H2O/Zn - Proporción : 4,4) 7<pH <8.5 : 0,60 mg Zn/l/72h
	M-Factor =1

12.2. Persistencia y degradabilidad

Sulfato de zinc(7733-02-0)	
Biodegradación	No aplicable - producto inorgánica

12.3. Potencial de bioacumulación

Sulfato de zinc(7733-02-0)	
Log Pow	No aplicable (producto inorgánica)
Potencial de bioacumulación	No aplicable -. producto inorgánica.

12.4. Movilidad en el suelo

No se dispone de más información

12.5. Resultados de la valoración PBT y mPmB

Sulfato de zinc(7733-02-0)	
Esta sustancia/mezcla no cumple los criterios PBT del anexo III del reglamento REACH	
Esta sustancia/mezcla no cumple los criterios vPvB del anexo III del reglamento REACH	

12.6. Otros efectos adversos

No se dispone de más información

SECCIÓN 13: Consideraciones relativas a la eliminación

13.1. Métodos para el tratamiento de residuos

Métodos para el tratamiento de residuos : Este producto y su recipiente deben eliminarse de manera segura, de acuerdo con la legislación local. No verter a la alcantarilla o a los ríos. Tóxico para los organismos acuáticos.

SECCIÓN 14: Información relativa al transporte

Según los requisitos de ADR / RID / IMDG / IATA / ADN

14.1. Número ONU

N.º ONU	: 3077
N.º ONU (IATA)	: 3077
N.º ONU (IMDG)	: 3077
N.º ONU (ADN)	: 3077

14.2. Designación oficial de transporte de las Naciones Unidas

Designación oficial para el transporte	: SUSTANCIA SÓLIDA POTENCIALMENTE PELIGROSAS PARA EL MEDIO AMBIENTE, N. E. P.
Designación exacta de expedición/Descripción (IATA)	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Designación oficial para el transporte (IMDG)	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Designación exacta de expedición/Descripción (ADN)	: SUSTANCIA SÓLIDA POTENCIALMENTE PELIGROSAS PARA EL MEDIO AMBIENTE, N. E. P.
Descripción del documento del transporte	: UN 3077 SUSTANCIA SÓLIDA POTENCIALMENTE PELIGROSAS PARA EL MEDIO AMBIENTE, N. E. P., 9, III, (E)

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14.3. Clase(s) de peligro para el transporte

Clase (UN)	: 9
Código de clasificación (Naciones Unidas)	: M7
Clase (IATA)	: 9
Clase (IMDG)	: 9
Clase (ADN)	: 9
Etiquetas de peligro (UN)	: 9



Etiquetas de peligro (IATA)	: 9
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Etiquetas de peligro (IMDG)	: 9
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Etiquetas de peligro (ADN)	: 9
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14.4. Grupo de embalaje

Grupo de embalaje (UN)	: III
Grupo de embalaje (IATA)	: III
Grupo de embalaje (IMDG)	: III
Grupo de embalaje (ADN)	: III

14.5. Peligros para el medio ambiente

Peligroso para el medio ambiente	: Sí
Contaminador marino	: Sí

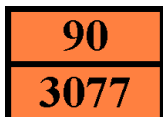


Información adicional	: No se dispone de información adicional.
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14.6. Precauciones particulares para los usuarios

14.6.1. Transporte por vía terrestre

Peligrónº (código Kemler)	: 90
Código de clasificación (Naciones Unidas)	: M7
Panel naranja	:



Disposición especial (ADR)	: 274, 335, 601
Categoría de transporte (ADR)	: 3
Clave de limitación de túnel	: E
Cantidades limitadas (ADR)	: 5kg
Cantidades exceptuadas (ADR)	: E1
Código EAC	: 2Z

14.6.2. Transporte marítimo

EmS-No. (Fire)	: F-A
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EmS-No. (Spillage)	: S-F
14.6.3. Transporte aéreo	No se dispone de más información
14.6.4. Transporte por vía fluvial	No se dispone de más información
14.7. Transporte a granel con arreglo anexo II del Convenio MARPOL 73/78 y del Código IBC	No aplicable

SECCIÓN 15: Información reglamentaria	
15.1. Reglamentación y legislación en materia de seguridad, salud y medio ambiente específicas para la sustancia o la mezcla	
15.1.1. UE-Reglamentos	Sin restricciones según el anexo XVII de REACH No contiene sustancias candidatas de REACH
15.1.2. Reglamentos nacionales	No se dispone de más información
15.2. Evaluación de la seguridad química	Se ha realizado una evaluación de la seguridad química de esta sustancia

SECCIÓN 16: Información adicional	
Texto completo de las frases R, H y EUH:	
Acute Tox. 4 (Oral)	Toxicidad aguda (oral), categoría 4
Aquatic Acute 1	Peligroso para el medio ambiente acuático — Peligro agudo, categoría 1
Aquatic Chronic 1	Peligroso para el medio ambiente acuático — Peligro crónico, categoría 1
Eye Dam. 1	Lesiones oculares graves o irritación ocular, categoría 1
H302	Nocivo en caso de ingestión
H318	Provoca lesiones oculares graves
H400	Muy tóxico para los organismos acuáticos
H410	Muy tóxico para los organismos acuáticos, con efectos nocivos duraderos
R22	Nocivo por ingestión
R41	Riesgo de lesiones oculares graves
R50/53	Muy tóxico para los organismos acuáticos, puede provocar a largo plazo efectos negativos en el medio ambiente acuático
N	Peligroso para el medio ambiente
Xi	Irritante
Xn	Nocivo

SDS EU (Anexo II REACH)

AVISO DE DESCARGO DE RESPONSABILIDAD

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9.1. Local scenarios

In table below, the generic exposure scenarios (GES) developed for ZnSO₄ are summarised.

Table 1. Generic exposure scenarios for zinc sulphate

Number	Sector	Uses	Code
0	Zinc sulphate production	Manufacture Substance	GES _{ZnSO₄} 0
1	Formulation step	Formulation general	GES _{ZnSO₄} 1
2	First tier applications	Manufacturing of other zinc compounds	GES _{ZnSO₄} 2
3		Laboratory reagent	GES _{ZnSO₄} 3
4		As component for solid blends & matrices	GES _{ZnSO₄} 4
5		As component for production of dispersions, pastes and other viscous matrices	GES _{ZnSO₄} 5
6	Second tier applications	DU of ZnSO ₄ -containing solid preparations	GES _{ZnSO₄} 6
7		DU of ZnSO ₄ -containing liquid & pasty preparations	GES _{ZnSO₄} 7

Numerous uses were identified for ZnSO₄. These are listed in table below, with the indication of the Generic Exposure Scenario (GES) that is relevant to these identified uses.

Table 2. Identified uses for ZnSO₄ and corresponding Generic Exposure Scenario (GES)

IU number	Identified Use (IU) name	GES code
1	Zinc Sulphate production -Wet	GES _{ZnSO₄} 0
5	Component for production of inorganic zinc compounds	GES _{ZnSO₄} 2
6	Electrogalvanizing	GES _{ZnSO₄} 2
7	Electroplating	GES _{ZnSO₄} 2
8	Zinc production by electrowinning	GES _{ZnSO₄} 2
9	Laboratory reagent	GES _{ZnSO₄} 3
10	Ore dressing (mining metallurgy)	GES _{ZnSO₄} 0, GES _{ZnSO₄} 1
11	Zinc production by pyrometallurgy	GES _{ZnSO₄} 2
12	Component for production of organic zinc compounds	GES _{ZnSO₄} 2
13	Component for production of Inorganic pigments, i.e. Lithopones	GES _{ZnSO₄} 1, GES _{ZnSO₄} 4
14	Component for production of Coatings / paints, inks, enamels, varnishes	GES _{ZnSO₄} 1, GES _{ZnSO₄} 4
15	Component for production of surface treatment preparations	GES _{ZnSO₄} 1, GES _{ZnSO₄} 4
16	Component for Paper coating	GES _{ZnSO₄} 1, GES _{ZnSO₄} 5
17	Use of ZnSO ₄ -containing paper coatings	GES _{ZnSO₄} 6
18	Component for Textile & leather coating / treatment	GES _{ZnSO₄} 1, GES _{ZnSO₄} 5

19	Use of ZnSO ₄ -containing textile & leather coatings	GESZnSO ₄ 6
20	Additive for the production of Lubricants / Grease / Metal working fluids	GESZnSO ₄ 1, GESZnSO ₄ 5
21	Use of ZnSO ₄ -containing Lubricants / Grease / Metal working fluids	Generic consumer/environment*
22	Use of ZnSO ₄ -containing catalysts	GESZnSO ₄ 1, GESZnSO ₄ 5
23	Additive for the formulation of animal feedstuffs	GESZnSO ₄ 1, GESZnSO ₄ 4, GESZnSO ₄ 5
24	Additive for the formulation of biocidal products	GESZnSO ₄ 1, GESZnSO ₄ 4, GESZnSO ₄ 5
25	Additive for the formulation of cleaning products	GESZnSO ₄ 1, GESZnSO ₄ 4, GESZnSO ₄ 5
26	Use of ZnSO ₄ -containing cleaning products	GESZnSO ₄ 6, GESZnSO ₄ 7, Generic consumer/environment
27	Additive for the formulation of fertilizers	GESZnSO ₄ 1, GESZnSO ₄ 4, GESZnSO ₄ 5
28	Use of ZnSO ₄ -containing fertilizer's formulations	Generic consumer/environment
29	Additive in the formulation of cosmetics	GESZnSO ₄ 1, GESZnSO ₄ 4, GESZnSO ₄ 5
30	Use of cosmetics	GESZnSO ₄ 6, GESZnSO ₄ 7, Generic consumer/environment
31	Additive in the formulation of pharma / veterinary products	GESZnSO ₄ 1, GESZnSO ₄ 4, GESZnSO ₄ 5
32	Use of Pharma / veterinary products	GESZnSO ₄ 6, GESZnSO ₄ 7, Generic consumer/environment

* corresponds to “GES 8” in IUCLID

9.1.1. GES ZnSO₄-0: Industrial use of primary or secondary zinc bearing material in the manufacture of Zn SO₄ in several process steps, collection of the substance produced and packaging.

Table 3. GES ZnSO₄-0

<i>Exposure Scenario Format (1) addressing uses carried out by workers</i>
9.1.1. Title of Exposure Scenario number GES ZnSO₄ - 0: Industrial use of primary or secondary zinc bearing material in the manufacture of ZnSO₄ in several process steps, collection of the substance produced and packaging.
<i>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;</i> SU: 2a, 3, 8, 9, 10 0, (Nace 7.2.9.) PROC: 2, 3, 5, 8b, 9, 22, 26 PC: 19, 20, 21 AC: not applicable ERC: 1
9.1.1. Exposure Scenario
9.1.1.1 Contributing scenario (1) controlling environmental exposure for the Industrial use of primary or secondary zinc bearing material in the manufacture of ZnSO₄ in several process steps, collection of the substance produced and packaging.
The manufacturing process includes:

<ul style="list-style-type: none"> • Reception of zinc-bearing materials, (e.g.: the Intermediate Zinc sulphate solution), and transfer to the reaction tank (sulphate media) • Feeding of the primary materials (e.g. ZnO or Zn(OH)₂) into the mixing tank. The leaching reaction with sulphuric acid solutions is kept at the proper pH and temperature. • Separation of the leach-residue (insoluble sulphates and steriles) occurs in covered settlers; if needed, the leachate may be filtered on adapted filters, • Purification steps will be applied sequentially: <ul style="list-style-type: none"> ○ By oxidation (with air or oxygen) of some of the present elements (i.e. Fe) followed by another sedimentation or filtration step, if needed ○ By hydrolysis (with ZnO-rich reagent) of some of the hydrolysable elements (i.e. Fe, Al, ...) followed by another sedimentation or filtration step, if needed ○ By cementation (with zinc powder) of some of the present elements (i.e. Cu, Cd, Ni, Co, ...) followed by another sedimentation or filtration step, if needed • Concentration by water evaporation, under exhaust hood. • Pouring on a cooling belt • Crystallisation and occasionally drying, in closed reactor. • Discharge and packaging of produced zinc sulphate crystals. Workers have to place and adjust the bag or drum under the discharge pipe and to set the process in motion. Filled bags or drums are subsequently closed and carried to the storage area. • Exposure to dust can occur during packing of the powder. Solutions are packed in intermediate bulk containers (ca. 1 m³ capacity); solids are packed in bags or drums. • Maintenance activities
Product characteristics
<i>Product related conditions:</i> <ul style="list-style-type: none"> • ZnSO₄ is produced in minimum 80% purity; higher grades (>95%) are usual.
Amounts used
<i>Daily and annual amount per site:</i> <ul style="list-style-type: none"> • maximum 12500 T/y;
Frequency and duration of use
<ul style="list-style-type: none"> • Continuous production
Environment factors not influenced by risk management
<i>Flow rate of receiving surface water:</i> <ul style="list-style-type: none"> • Default is used unless specified otherwise
Other given operational conditions affecting environmental exposure
<i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air;</i> <ul style="list-style-type: none"> • Most of the operations are in wet phase. • Even when no process waters some non-process water can be generated containing zinc (e.g. from cleaning) • All processes are performed indoor in a confined area. All residues containing zinc are recycled.
Technical conditions and measures at process level (source) to prevent release

Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR);

- Process enclosures and closed circuits where relevant and possible.
- Local exhaust ventilation on work areas with potential dust generation, dust capturing and removal techniques
- Containment of liquid volumes in sumps to collect/prevent accidental spillage, acid solutions are treated with alkali.
- Higher temperatures ($\sim 100^{\circ}\text{C}$) in the surroundings of the drying units are possible.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Technical measures, e.g. on-site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m³/d), degradation effectiveness and sludge treatment (if applicable);

- 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%).
- 1. Careful use of sulphuric acid and (irritating) sulphate solutions
- 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.

Organizational measures to prevent/limit release from site

Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.

- 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 municipal sewage treatment plant

Size of municipal sewage system/treatment plant (m³/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m³/d) will be rarely changeable for downstream uses.

- In cases where applicable: default size, unless specified otherwise.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by work-ers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment;

- If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;

- All residues from the wet process are recycled.
- By-products (ashes) from the dry process that are formed in the reactor, are recovered and either

<p>recycled in the system or handled further according the waste legislation.</p> <ul style="list-style-type: none"> • 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.
<p>9.1.1.2 Contributing scenario (2) controlling worker exposure for the industrial use of primary or secondary zinc bearing material in the manufacture of ZnSO₄ in several process steps, collection of the substance produced and packaging.</p>
<p>Product characteristic</p> <p><i>Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure)</i></p> <p>Zinc sulphate is hygroscopic in nature (especially the anhydrous form) and is produced in a dust-free crystalline form.</p> <p>Approximately 75% of the production of Zinc sulphate is in the form of the crystalline hexa- and hepta-hydrate.</p> <p>A particle size distribution for the heptahydrate shows a very coarse product (mean diameter > 500 µ, 99% > 100 µ), while the monohydrate has a broad particle size distribution with a mean diameter of 170 µ, 14% < 10 µ and 6% < 5 µ (Industry, 1999b).</p> <p>A study of dustiness, using the modified Heubach method, that includes a multi-stage impactor to separate different aerosol fractions, shows a total dustiness of 26.7 mg/g for monohydrate and 0.25 for hexahydrate. For monohydrate 92.11 % of the generated dust is larger than 8.13 µm and 79.85 % larger than 15.8 µm. For hexahydrate 97.02 % of the generated dust is larger than 8.13 µm and 85.01 % larger than 15.8 µm. For comparison, the total dustiness of zinc oxide is 30 mg/g with 84.53% larger than 8.13 µm and 73.92 % larger than 15.8 µm (Deutsche Montan Technologie GmbH, 2000).</p>
<p>Amounts used</p> <p><i>Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's exposure</i></p> <p>Maximum 96 T/day, 32T/shift</p>
<p>Frequency and duration of use/exposure</p> <p><i>Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure</i></p> <p>8hrs shift</p>
<p>Human factors not influenced by risk management</p> <p><i>Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity</i></p> <p>Uncovered body parts: (potentially) face</p>
<p>Other given operational conditions affecting workers exposure</p> <p><i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.</i></p> <ul style="list-style-type: none"> • All processes are carried out indoor in confined areas.
<p>Technical conditions and measures at process level (source) to prevent release</p> <p><i>Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)</i></p> <ul style="list-style-type: none"> • Local exhaust ventilation on furnaces and other work areas with potential dust generation, dust capturing and removal techniques • Process enclosures closed circuits or semi-enclosures where appropriate. 2. Careful use of sulphuric acid and (irritating) sulphate solutions • Containment of liquid volumes in sumps to collect/prevent accidental spillage • Local exhaust ventilation on furnaces and other work areas with potential dust and fumes generation,

dust capturing and removal techniques.
Technical conditions and measures to control dispersion from source towards the worker
<p><i>Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure</i></p> <ul style="list-style-type: none"> • Local exhaust ventilation systems (generic LEC (84%) as worst case; higher efficiencies (90-95%) are usual • Cyclones/filters (for minimizing dust emissions) : efficiency: 70-90% (cyclones), 50-80% (dust filters), 85-95% (double stage, cassette filters) • Process enclosure, especially in 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.: <ul style="list-style-type: none"> • Cleaning of process equipment and workshop • Storage of packaged Zn product in dedicated zones
Organisational measures to prevent /limit releases, dispersion and exposure
<p><i>Specific organisational measures or measures needed to support the functioning of particular technical measures (e.g. training and supervision). Those measures need to be reported in particular for demonstrating strictly controlled conditions (to justify exposure based waiving).</i></p> <p>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.</p> <p>Such management system would include general industrial hygiene practice e.g.:</p> <ul style="list-style-type: none"> ○ 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
<p><i>Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)</i></p> <p>Wearing of gloves and protective clothing is compulsory (efficiency $\geq 90\%$).</p> <p>With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:</p> <ul style="list-style-type: none"> -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%) <p>Eyes: safety glasses are optional</p>

9.1.2. GES ZnSO₄-1: Industrial use of ZnSO₄ 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

Table 1. GES ZnSO₄-1

<i>Exposure Scenario Format (1) addressing uses carried out by workers</i>
9.1.2. Title of Exposure Scenario number ZnSO₄ GES-1: Industrial use of ZnSO₄ 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 .
<p><i>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;</i> SU: 2a, 3, 8, 9, 10, Nace C7.2.9. PROC: 1,2,3,4,5, 8b,9,13, 14, 15, 22 PC: Not applicable (all) AC: not applicable ERC: 1,2</p>
<p><i>Further explanations (if needed)</i></p> <p>ZnSO₄ 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.</p>
9.1.2 Exposure Scenario
9.1.2.1 Contributing scenario (1) controlling environmental exposure for the Industrial use of ZnSO₄ 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 .
<p><i>Further specification:</i></p> <p>In the described process, the zinc sulphate is:</p> <ul style="list-style-type: none"> • 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 batch-wise 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.
Product characteristics
<p><i>Product related conditions:</i></p> <p>ZnSO₄ is used in minimum 80% purity; higher grades (>95%) are usual</p>
Amounts used
<p><i>Daily and annual amount per site:</i></p> <p>maximum 5000 T/y;</p>
Frequency and duration of use
<p>Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.</p>
Environment factors not influenced by risk management
<p><i>Flow rate of receiving surface water:</i></p> <p>default for generic scenario: 18,000 m³/d, unless specified otherwise</p>
Other given operational conditions affecting environmental exposure

Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air;

- All processes are performed indoor in a confined area. All residues containing zinc are recycled.
- Even when no process waters (e.g. when dry process throughout), some non-process water can be generated containing zinc(e.g. from cleaning)

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

Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR);

- Process enclosures and closed circuits where relevant and possible.
- Dust capturing and removal techniques are applied on local exhaust ventilation on furnaces and other work areas with potential dust generation.
- 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

Technical measures, e.g. on-site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m3/d), degradation effectiveness and sludge treatment (if applicable);

- 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 (up to 99% efficiency), wet scrubbers (50-99% efficiency). This may create a general negative pressure in the building.

Organizational measures to prevent/limit release from site

Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.

- 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 municipal sewage treatment plant

Size of municipal sewage system/treatment plant (m3/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m3/d) will be rarely changeable for downstream uses.

- In cases where applicable: default size, unless specified otherwise.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by work-ers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment;

- 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
<p><i>Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;</i></p> <ul style="list-style-type: none"> All residues are recycled or handled and conveyed according to waste legislation. .
9.1.2.2 Contributing scenario (2) controlling worker exposure for the Industrial use of ZnSO₄ 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 .
<p><i>Further specification</i></p> <p>ZnSO₄ 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.</p>
Product characteristic
<p><i>Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure)</i></p> <ul style="list-style-type: none"> The concentration of ZnSO₄ in the mixtures can cover a broad range ($\leq 5\%$ up to $>25\%$) depending on the application. The preparation can be 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.
Amounts used
<p><i>Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's exposure</i></p> <p>Max 5000T/y = 14T/d = 5T/shift depending on the application.</p>
Frequency and duration of use/exposure
<p><i>Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure</i></p> <p>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.</p>
Human factors not influenced by risk management
<p><i>Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity</i></p> <p>Uncovered body parts: (potentially) face</p>
Other given operational conditions affecting workers exposure
<p><i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.</i></p> <ul style="list-style-type: none"> elevated temperature steps ($\sim 100^{\circ}\text{C}$) can occur all indoor processes in confined area.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)</i></p> <ul style="list-style-type: none"> Process enclosures and closed circuits where relevant and possible. Local exhaust ventilation on furnaces and other work areas with potential dust 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

Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure

- Local exhaust ventilation systems (high efficiency 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

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

Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)

Wearing of gloves and protective clothing is compulsory (efficiency $\geq 90\%$).

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

9.1.3. GES ZnSO₄-2: industrial use of zinc chloride or ZnSO₄-formulations in the manufacturing of other inorganic or organic zinc substances in a solvent-based matrix with potentially filtering and packaging.

Table 1. GES ZnSO₄-2

<i>Exposure Scenario Format (1) addressing uses carried out by workers</i>
9.1.3 Title of Exposure Scenario number ZnSO₄ GES-2: industrial use of ZnSO₄ or ZnSO₄-formulations in the manufacturing of other inorganic or organic zinc substances in a solvent-based matrix with potentially drying, filtering and packaging.
<i>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;</i>
<ul style="list-style-type: none"> SU: 3, 8, 9, 10, 14, 15, 17, 0(Nace25.6.1., C24.4.3., E38.3) PROC: 1, 2, 3, 4, 8b, 9, 13, 15, 21, 22, 23, 26 PC : 7, 14, 19, 20, 21, 24, 29, 39 AC : 2, 7, 12 ERC : 1, 2, 5, 6a
<i>Further explanations (if needed)</i>
ZnSO ₄ 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.
9.1.3 Exposure Scenario
9.1.3.1 Contributing scenario (1) controlling environmental exposure for the industrial use of ZnSO₄ or ZnSO₄-formulations in the manufacturing of other inorganic or organic zinc substances in a solvent-based matrix with potentially drying, filtering and packaging.
<i>Further specification</i>
<p>Description of activities/process(es) covered in the Exposure Scenario</p> <ul style="list-style-type: none"> Reception of the ZnSO₄ or ZnSO₄-containing formulation, or ZnSO₄-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, is optional. Possible pouring on a cooling belt, is optional as well 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 m³ capacity), solid products are packed in bags or drums. Maintenance activities For the specific process of electrogalvanising, which is covered by this scenario, the electrogalvanising bath consists of one or more tanks, usually made of a ceramic material, which contain zinc sulphate in solution. The steel passes through the bath and its surface is coated with zinc/iron-zinc alloys. Because of the speed of the strip (up to 180 m/min) and the short exposure time, the coating consists of a very thin layer.
Product characteristics
<i>Product related conditions, e.g. the concentration of the substance in a mixture; viscosity of product; package design affecting expo-sure</i>
Zn-compounds are produced in their pure form e.g.: >99%, or in solution.

Amounts used
<i>Daily and annual amount per site (for uses in industrial setting) <u>or</u> daily and annual amount for wide disperse uses;</i>
Up to 75 T/d of ZnSO ₄ is transformed to equivalent Zn compound
Frequency and duration of use
<i>Intermittent (used < 12 times per year for not more than 24 h) <u>or</u> continuous use/release</i>
Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.
Environment factors not influenced by risk management
<i>Flow rate of receiving surface water (m3/d, usually 18,000 m3/d for the standard town by default; please note: the default flow rate will be rarely changeable for downstream uses.</i>
Default for generic scenario: 18,000 m3/d, unless specified otherwise
Other given operational conditions affecting environmental exposure
<i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air;</i> <ul style="list-style-type: none"> Wet processes (leaching, filtering, purification) followed by drying (possible grinding), and packaging; All indoor processes, in confined area.
Technical conditions and measures at process level (source) to prevent release
<i>Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR);</i> <ul style="list-style-type: none"> Careful use of acids and corrosive solutions, if used 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
<i>Technical measures, e.g. on-site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures;</i> <i>specify the size of industrial sewage treatment plant (m3/d), degradation effectiveness and sludge treatment (if applicable);</i> <ul style="list-style-type: none"> 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.
Organizational measures to prevent/limit release from site
<i>Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.</i> <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> Such management system should include general industrial hygiene practice e.g.: <ul style="list-style-type: none"> information and training of workers, regular cleaning of equipment and floors, procedures for process control and maintenance,...

<ul style="list-style-type: none"> 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 municipal sewage treatment plant
<i>Size of municipal sewage system/treatment plant (m³/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m³/d) will be rarely changeable for downstream uses.</i> <ul style="list-style-type: none"> In cases where applicable: default size, unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal
<i>Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by work-ers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment;</i> <ul style="list-style-type: none"> 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
<i>Fraction of used amount transferred to external waste treatment for recovery; specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;</i> <ul style="list-style-type: none"> 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.
9.1.3.2 Contributing scenario (2) controlling worker exposure for the industrial use of ZnSO₄ or ZnSO₄-formulations in the manufacturing of other inorganic or organic zinc substances in a solvent-based matrix with potentially drying, filtering and packaging.
Product characteristic
<i>Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure)</i> <ul style="list-style-type: none"> Zinc sulphate is transformed to equivalent pure zinc compound. The formed zinc compound can be produced as a powder with varying particle size (worst case scenario) or can be in solution.
Amounts used
<i>Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's exposure</i> Up to maximum 25T/shift
Frequency and duration of use/exposure
<i>Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure</i> 8hrs shift (worst case)
Human factors not influenced by risk management
<i>Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity</i> Uncovered body parts: (potentially) face

Other given operational conditions affecting workers exposure <i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.</i> All processes are carried out indoor in confined areas.
Technical conditions and measures at process level (source) to prevent release <i>Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)</i> <ul style="list-style-type: none"> • 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 <i>Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure</i> <ul style="list-style-type: none"> • Local exhaust ventilation systems (high efficiency 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.: <ul style="list-style-type: none"> • Cleaning of process equipment and workshop • Storage of packaged Zn product in dedicated zones
Organisational measures to prevent /limit releases, dispersion and exposure <i>Specific organisational measures or measures needed to support the functioning of particular technical measures (e.g. training and supervision). Those measures need to be reported in particular for demonstrating strictly controlled conditions (to justify exposure based waiving).</i> 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.: <ul style="list-style-type: none"> ○ 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 <i>Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)</i> Wearing of gloves and protective clothing is compulsory (efficiency $\geq 90\%$). 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

9.1.4. GES ZnSO4-3: Industrial and professional use of ZnSO4 as active laboratory reagent in aqueous or organic media, for analysis or synthesis.

Table 1. GES- ZnSO4-3

Exposure Scenario Format (1) addressing uses carried out by workers
9.1.4. Title of Exposure Scenario number ZnSO4 GES-3: Industrial and professional use of ZnSO4 as active laboratory reagent in aqueous or organic media, for analysis or synthesis.
<p>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant; SU: 3, 10, 22, 24 PROC: 1, 2, 3, 4, 5, 8a, 8b, 9, 10, 15 PC: 19, 21, 28, 39 AC: not applicable ERC: 1, 2, 4, 6a, 6b, 8a, 8b, 8d, 9a</p>
9.1.4.1. Contributing scenario (1) controlling environmental exposure for the Industrial and professional use of ZnSO4 as active laboratory reagent in aqueous or organic media, for analysis or synthesis.
<p>Further specification:</p> <p>The zinc sulphate is used for</p> <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> ○ at the industrial scale, in industrial installations for air control and water treatment ○ at the professional scale by laboratories
Product characteristics
<p>Product related conditions:</p> <p>ZnSO4 is used in minimum 80% purity; higher grades (>95%) are usual</p>
Amounts used
<p>Daily and annual amount per site:</p> <p>maximum 5 T/y (industrial scale) maximum 0.5 T/y (professional scale)</p>
Frequency and duration of use
<p>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.</p>
Environment factors not influenced by risk management
<p>Flow rate of receiving surface water:</p> <p>If applicable: default for generic scenario: 18,000 m3/d, unless specified otherwise</p>
Other given operational conditions affecting environmental exposure
<p>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air;</p>

<ul style="list-style-type: none"> All processes are performed indoor in a confined area, with dedicated laboratory equipment. All solid residues containing zinc are recovered for recycling.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR);</i></p> <ul style="list-style-type: none"> Process enclosures and closed circuits where relevant. 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
<p><i>Technical measures, e.g. on-site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m3/d), degradation effectiveness and sludge treatment (if applicable);</i></p> <ul style="list-style-type: none"> 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.
Organizational measures to prevent/limit release from site
<p><i>Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.</i></p> <ul style="list-style-type: none"> In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000/9001, ISO 1400X series, or alike, and, when applicable, by being IPPC-compliant. <ul style="list-style-type: none"> Such management system should include general industrial hygiene practice e.g.: <ul style="list-style-type: none"> information and training of laboratory personnel, regular cleaning of equipment and floors, procedures for process control and maintenance,... Treatment and monitoring of releases to outside air, and exhaust gas streams according to national regulation.
Conditions and measures related to municipal sewage treatment plant
<p><i>Size of municipal sewage system/treatment plant (m3/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m3/d) will be rarely changeable for downstream uses.</i></p> <ul style="list-style-type: none"> In cases where applicable: default size, unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal
<p><i>Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by work-ers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment;</i></p> <ul style="list-style-type: none"> 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
<p><i>Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;</i></p> <ul style="list-style-type: none"> All residues are recycled or handled and conveyed according to waste legislation. .
9.1.4.2. Contributing scenario (2) controlling worker exposure for the Industrial use of ZnSO₄ as active laboratory reagent in aqueous or organic media, for analysis or synthesis.
Product characteristic
<p><i>Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure)</i></p> <ul style="list-style-type: none"> ZnSO₄ is used in minimum 80% purity; higher grades (>95%) are usual The sample can be 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.
Amounts used
<p><i>Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's exposure</i></p> <p>maximum 5 T/y (industrial scale) maximum 0.5 T/y (professional scale) .</p>
Frequency and duration of use/exposure
<p><i>Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure</i></p> <p>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.</p>
Human factors not influenced by risk management
<p><i>Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity</i></p> <p>Uncovered body parts: (potentially) face</p>
Other given operational conditions affecting workers exposure
<p><i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.</i></p> <ul style="list-style-type: none"> high temperature steps can occur in protected zones (fume cupboards); all indoor processes in confined area, including hazardous substances cabinets.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)</i></p> <ul style="list-style-type: none"> Process enclosures and closed circuits where relevant and possible. Local exhaust ventilation on work areas with potential generation of dust or fumes, dust capturing and removal techniques (fume cupboards). Containment of liquid volumes and collection in special circuits
Technical conditions and measures to control dispersion from source towards the worker
<p><i>Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure</i></p> <ul style="list-style-type: none"> Local exhaust ventilation systems are provided where needed on the benches and in the fume cupboards. Process enclosures if relevant

- Dust control: dust to be measured in the workplace air 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 Zn products in dedicated zones, e.g.: 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 9000/9001, 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 personel 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

Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)

Wearing of protective clothing is compulsory (efficiency $\geq 90\%$).

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”

9.1.5. GES ZnSO₄-4 : Industrial use of ZnSO₄ or ZnSO₄-formulations as component for the manufacture of solid blends and matrices for further downstream use.

Table 1. GES ZnSO₄-4

<i>Exposure Scenario Format (1) addressing uses carried out by workers</i>
9.1.5. Title of Exposure Scenario number GES ZnSO₄ - 4 : Industrial use of ZnSO₄ or ZnSO₄ - formulations as component for the manufacture of solid blends and matrices for further downstream use.
<p>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant; SU: 1, 3, 4, 5, 8, 9, 10,11, 12, 13, 14, 20 PROC: 1, 2, 3, 4, 5 ,8b, 9,13, 14, 15, 22 PC: 1,8, 9a,9b,9c, 12, 14,15,18, 20, 21, 26,28, 29, 32, 35, 37, 39 AC: na ERC: 1, 2, 3, 4, 5, 7, 8a, 8b, 8d, 10a, 10b</p>
<p>Further explanations (if needed)</p> <p>ZnSO₄ or ZnSO₄-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.</p>
9.1.5 Exposure Scenario
9.1.5.1 Contributing scenario (1) controlling environmental exposure for the Industrial use of ZnSO₄ or ZnSO₄ - formulations as component for the manufacture of solid blends and matrices for further downstream use.
<p>Name of contributing scenario</p> <p>Further specification:</p> <p>In the described process, the ZnSO₄ (or Zn compound) containing preparation/mixture is optionally:</p> <ul style="list-style-type: none"> • Pressed at high temperature (>1000°C), grinded and re-pressed or fritted at high temperature • Molten at high temperature (>500°C) and further cast as glassy material • Pressed and pelletized at low temperature <p>And subsequently packed, or used as such, in further treatment/use</p>
Product characteristics
<p>Product related conditions:</p> <p>ZnSO₄ (or Zn compound) in the preparation can be > 25%, usually <5%</p>
Amounts used
<p>Daily and annual amount per site:</p> <p>maximum 5000 T/y;</p>
Frequency and duration of use
<p>Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.</p>
Environment factors not influenced by risk management
<p>Flow rate of receiving surface water:</p> <p>default for generic scenario: 18,000 m³/d, unless specified otherwise</p>
Other given operational conditions affecting environmental exposure

Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air;

- 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. All residues containing zinc are recycled.

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

Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR);

- Local exhaust ventilation on furnaces and other work areas with potential dust generation.
- Dust capturing and removal techniques are applied.
- Process enclosures where relevant and possible.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Technical measures, e.g. on-site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m³/d), degradation effectiveness and sludge treatment (if applicable);

- 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.

Organizational measures to prevent/limit release from site

Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.

In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000, ISO 1400X series, or alike, and, when appropriate, by being IPPC-compliant.

- 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 municipal sewage treatment plant

Size of municipal sewage system/treatment plant (m³/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m³/d) will be rarely changeable for downstream uses.

In cases where applicable: default size, unless specified otherwise.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by work-ers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment;

- 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
<p><i>Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;</i></p> <ul style="list-style-type: none"> All residues are recycled or handled and conveyed according to waste legislation. .
9.1.5.2 Contributing scenario (2) controlling worker exposure for the Industrial use of ZnSO ₄ or ZnSO ₄ -formulations as component for the manufacture of solid blends and matrices for further downstream use.
<p><i>Name of contributing scenario 2:</i></p> <p>Industrial formulation of dry preparations/mixtures by mixing thoroughly the ZnSO₄ (or other zinc compounds) with the other starting materials, with possible pressing, pelletising, sintering and packaging of the preparations/mixtures</p>
Product characteristic
<p><i>Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure)</i></p> <ul style="list-style-type: none"> The concentration of ZnSO₄ in the mixtures can be up to >25% but is usually of the order of ≤ 5%, depending on the application. A particle size distribution for the ZnSO₄ - heptahydrate shows a very coarse product (mean diameter > 500 µ, 99% > 100 µ), while the monohydrate has a broad particle size distribution with a mean diameter of 170 µ, 14% < 10 µ and 6% < 5 µ (RA ZnSO₄). A study of dustiness, using the modified Heubach method, that includes a multi-stage impactor to separate different aerosol fractions, shows a total dustiness of 26.7 mg/g for monohydrate and 0.25 for hexahydrate. For monohydrate 92.11 % of the generated dust is larger than 8.13 µm and 79.85 % larger than 15.8 µm. For hexahydrate 97.02 % of the generated dust is larger than 8.13 µm and 85.01 % larger than 15.8 µm. For comparison, the total dustiness of zinc oxide is 30 mg/g with 84.53% larger than 8.13 µm and 73.92 % larger than 15.8 µm (Deutsche Montan Technologie GmbH, 2000). 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.
Amounts used
<p><i>Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's exposure</i></p> <p>Max 5000T/y = 15T/d = 5T/shift depending of application.</p>
Frequency and duration of use/exposure
<p><i>Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure</i></p> <p>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.</p>
Human factors not influenced by risk management
<p><i>Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity</i></p> <p>Uncovered body parts: (potentially) face</p>
Other given operational conditions affecting workers exposure
<p><i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.</i></p> <ul style="list-style-type: none"> Dry processes: dry operational conditions throughout the process; no process waters; high temperature steps can occur;

<ul style="list-style-type: none"> indoor processes in confined area.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)</i></p> <ul style="list-style-type: none"> Local exhaust ventilation on furnaces and other work areas with potential dust generation, dust capturing and removal techniques Process enclosures where appropriate
Technical conditions and measures to control dispersion from source towards the worker
<p><i>Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure</i></p> <ul style="list-style-type: none"> 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
<p><i>Specific organisational measures or measures needed to support the functioning of particular technical measures (e.g. training and supervision). Those measures need to be reported in particular for demonstrating strictly controlled conditions (to justify exposure based waiving).</i></p> <p>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.</p> <p>Such management system would include general industrial hygiene practice e.g.:</p> <ul style="list-style-type: none"> 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
<p><i>Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)</i></p> <p>Wearing of gloves and protective clothing is compulsory (efficiency $\geq 90\%$).</p> <p>With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:</p> <ul style="list-style-type: none"> -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%) <p>Eyes: safety glasses are optional</p>

9.1.6. GES ZnSO₄-5: Industrial use of ZnSO₄ or ZnSO₄-formulations as component for the manufacture of dispersions, pastes or other viscous or polymerized matrices.

Table 1. GES ZnSO₄-5

<i>Exposure Scenario Format (1) addressing uses carried out by workers</i>
9.1.6 Title of Exposure Scenario number GES ZnSO₄ -5 : Industrial use of ZnSO₄ or ZnSO₄-formulations as component for the manufacture of dispersions, pastes or other viscous or polymerized matrices.
<p><i>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;</i> SU: 3,4, 5, 6b, 7, 8, 9, 10, 18, 20 PROC: 1, 2,3,4,5,6,8b,9,10, 13, 14,15 PC: 2, 8, 9a, 9b, 12, 14, 15, 18, 19, 20, 21, 23, 24, 25, 28, 29, 32, 34, 35, 39, 40 AC: 1,2,7 ERC: 1,2,3,4, 5,6a, 6b, 6d, 8a, 8b, 8d, 9a, 9b, 10a, 10b, 11a</p> <p><i>Further explanations (if needed)</i></p>
9.1.6 Exposure Scenario
9.1.6.1 Contributing scenario (1) controlling environmental exposure for the industrial use of ZnSO₄ or ZnSO₄-formulations as component for the manufacture of dispersions, pastes or other viscous or polymerized matrices.
<i>Name of contributing scenario</i>
<p><i>Further specification:</i></p> <p>In the described process, the zinc sulphate containing preparation/mixture is:</p> <ul style="list-style-type: none"> unpacked and stored in silos Extracted from the silo, dosed and fed with the other reagents and/or solvents to the mixing tank, batch-wise or continuously, according the process receipt. The resulting zinc salt containing mixture (solution, dispersion, paste) is directly further processed, or packed, for further treatment/use.
Product characteristics
<p><i>Product related conditions:</i></p> <p>ZnSO₄ in preparation can be > 25%</p>
Amounts used
<p><i>Daily and annual amount per site:</i></p> <p>maximum 5000 T/y;</p>
Frequency and duration of use
<p>Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.</p>
Environment factors not influenced by risk management
<p><i>Flow rate of receiving surface water:</i></p> <p>default for generic scenario: 18,000 m³/d, unless specified otherwise</p>
Other given operational conditions affecting environmental exposure
<p><i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air;</i></p>

<ul style="list-style-type: none"> • In parallel, non-process water can be generated containing zinc (e.g. from cleaning) • All processes are performed indoor in a confined area. • All residues containing zinc are recycled.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR);</i></p> <ul style="list-style-type: none"> • Local exhaust ventilation on mixing tanks and other work areas with potential dust generation. • Dust capturing and removal techniques are applied. • Process enclosures where relevant and possible.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
<p><i>Technical measures, e.g. on-site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m³/d), degradation effectiveness and sludge treatment (if applicable);</i></p> <ul style="list-style-type: none"> • Most of the operations imply wet process-steps • 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.
Organizational measures to prevent/limit release from site
<p><i>Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.</i></p> <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> ○ Such management system should include general industrial hygiene practice e.g.: <ul style="list-style-type: none"> ▪ 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 municipal sewage treatment plant
<p><i>Size of municipal sewage system/treatment plant (m³/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m³/d) will be rarely changeable for downstream uses.</i></p> <p>In cases where applicable: default size, unless specified otherwise.</p>
Conditions and measures related to external treatment of waste for disposal
<p><i>Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by work-ers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment;</i></p> <ul style="list-style-type: none"> • 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
<i>Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;</i>
All residues are recycled or handled and conveyed according to waste legislation. .
9.1.6.2 Contributing scenario (2) controlling worker exposure for the industrial use of ZnSO₄ or ZnSO₄-formulations as component for the manufacture of dispersions, pastes or other viscous or polymerized matrices.
Product characteristic
<i>Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure)</i>
<ul style="list-style-type: none"> The concentration of ZnSO₄ in the mixtures can be >25%, depending on the application. A particle size distribution for the ZnSO₄ - heptahydrate shows a very coarse product (mean diameter > 500 µ, 99% > 100 µ), while the monohydrate has a broad particle size distribution with a mean diameter of 170 µ, 14% < 10 µ and 6% < 5 µ (RA ZnSO₄). A study of dustiness, using the modified Heubach method, that includes a multi-stage impactor to separate different aerosol fractions, shows a total dustiness of 26.7 mg/g for monohydrate and 0.25 for hexahydrate. For monohydrate 92.11 % of the generated dust is larger than 8.13 µm and 79.85 % larger than 15.8 µm. For hexahydrate 97.02 % of the generated dust is larger than 8.13 µm and 85.01 % larger than 15.8 µm. For comparison, the total dustiness of zinc oxide is 30 mg/g with 84.53% larger than 8.13 µm and 73.92 % larger than 15.8 µm (Deutsche Montan Technologie GmbH, 2000) 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
Amounts used
<i>Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's expo-sure</i>
Max 5000T/y = 20 T/d = 7 T/shift depending of application.
Frequency and duration of use/exposure
<i>Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure</i>
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
<i>Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity</i>
Uncovered body parts: (potentially) face
Other given operational conditions affecting workers exposure
<i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.</i>
<ul style="list-style-type: none"> Wet processes All indoor processes in confined area.
Technical conditions and measures at process level (source) to prevent release
<i>Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)</i>
<ul style="list-style-type: none"> Local exhaust ventilation on mixing tanks, furnaces and other work areas with potential dust

<p>generation, dust capturing and removal techniques</p> <ul style="list-style-type: none"> • Process enclosures where appropriate
<p>Technical conditions and measures to control dispersion from source towards the worker</p>
<p><i>Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure</i></p> <ul style="list-style-type: none"> • 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: generic LEV (efficiency 84%) is considered worst case; higher efficiencies are usual.
<p>Organisational measures to prevent /limit releases, dispersion and exposure</p>
<p><i>Specific organisational measures or measures needed to support the functioning of particular technical measures (e.g. training and supervision). Those measures need to be reported in particular for demonstrating strictly controlled conditions (to justify exposure based waiving).</i></p> <p>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.</p> <p>Such management system would include general industrial hygiene practice e.g.:</p> <ul style="list-style-type: none"> ○ 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)
<p>Conditions and measures related to personal protection, hygiene and health evaluation</p>
<p><i>Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)</i></p> <p>Wearing of gloves and protective clothing is compulsory (efficiency $\geq 90\%$).</p> <p>With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:</p> <ul style="list-style-type: none"> -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%) <p>In particular, when PROC 7, 11, 19 are involved, respiratory protection is recommended</p> <p>Eyes: safety glasses are optional</p>

9.1.7. GES ZnSO₄- 6 : Industrial and professional use of solid substrates containing less than 25%w/w of ZnSO₄.

Table 1. GES ZnSO₄-6

<i>Exposure Scenario Format (1) addressing uses carried out by workers</i>
9.1.7. Title of Exposure Scenario number GES ZnSO₄ - 6 : Industrial and professional use of solid substrates containing less than 25%w/w of ZnSO₄.
<i>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;</i> SU: 3, 5, 6b, 9, 10, 22 PROC: 4, 5, 6, 8b, 9, 10, 11, 13, 19 PC: 1, 8, 9a, 9b, 9c, 14, 15, 18, 20, 21, 28, 29, 35, 39 AC: 0 (coatings for art and creative items) ERC: 8a, 8d, 10a, 11a
9.1.7 Exposure Scenario
9.1.7.1 Contributing scenario (1) controlling environmental exposure for the Industrial and professional use of solid substrates containing less than 25%w/w of ZnSO₄.
<i>Further specification:</i> This scenario covers both the industrial scale processes and professional use. In the described process, the ZnSO ₄ containing preparation/mixture is further processed, involving potentially the following steps: <ul style="list-style-type: none"> • Reception/unpacking of material • Final application, embedding, or shaping to produce the end product or article.
Product characteristics
<i>Product related conditions:</i> ZnSO ₄ (or Zn compound) in the article is < 25%
Amounts used
<i>Daily and annual amount per site:</i> <ul style="list-style-type: none"> • 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. Usually, use is not continuous; this has to be considered when estimating exposure.
Environment factors not influenced by risk management
<i>Flow rate of receiving surface water:</i> default for generic scenario: 18,000 m ³ /d, unless specified otherwise
Other given operational conditions affecting environmental exposure
<i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air;</i> <ul style="list-style-type: none"> • Solid, so in principle 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) • In industrial and professional setting, all processes are performed indoor in a confined area. All

residues containing zinc are recycled.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR);</i></p> <ul style="list-style-type: none"> • In industrial and professional setting the following applies: <ul style="list-style-type: none"> ○ Local exhaust ventilation on furnaces and other work areas with potential dust generation. ○ Dust capturing and removal techniques are applied. ○ Process enclosures where relevant and possible.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
<p><i>Technical measures, e.g. on-site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m3/d), degradation effectiveness and sludge treatment (if applicable);</i></p> <ul style="list-style-type: none"> • In industrial and professional setting, the following applies: <ul style="list-style-type: none"> ○ No process waters, so possible emissions to water are limited and non-process related. ○ 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%). <ul style="list-style-type: none"> ▪ 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.
Organizational measures to prevent/limit release from site
<p><i>Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.</i></p> <p>In general, emissions are controlled and prevented by implementing an appropriate management system. This would involve:</p> <ul style="list-style-type: none"> • 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, according to national regulation. • SEVESO 2 compliance, if applicable.
Conditions and measures related to municipal sewage treatment plant
<p><i>Size of municipal sewage system/treatment plant (m3/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m3/d) will be rarely changeable for downstream uses.</i></p> <p>In cases where applicable: default size, unless specified otherwise.</p>
Conditions and measures related to external treatment of waste for disposal
<p><i>Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by work-ers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment;</i></p> <ul style="list-style-type: none"> • 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

<ul style="list-style-type: none"> 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
<p><i>Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;</i></p> <ul style="list-style-type: none"> All residues are recycled or handled and conveyed according to waste legislation.
9.1.7.2 Contributing scenario (2) controlling worker exposure for the Industrial and professional use of solid substrates containg less than 25%w/w of ZnSO₄.
Product characteristic
<p><i>Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure)</i></p> <p>The concentration of ZnSO₄ (or Zn compound) in the mixture is < 25%</p> <ul style="list-style-type: none"> The mixture is in the solid state, with a low level of dustiness; however, powder forms can occur, the medium dustiness is therefore applied as a worst case.
Amounts used
<p><i>Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's exposure</i></p> <ul style="list-style-type: none"> 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/exposure
<p><i>Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure</i></p> <p>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.</p>
Human factors not influenced by risk management
<p><i>Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity</i></p> <p>Uncovered body parts: (potentially) face</p>
Other given operational conditions affecting workers exposure
<p><i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.</i></p> <ul style="list-style-type: none"> Industrial / Professional: <ul style="list-style-type: none"> Dry processes: dry operational conditions throughout the process; no process waters; indoor processes in confined area.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)</i></p> <ul style="list-style-type: none"> Industrial /professional <ul style="list-style-type: none"> Local exhaust ventilation on work areas with potential dust generation, dust capturing and removal techniques Process enclosures where appropriate
Technical conditions and measures to control dispersion from source towards the worker

Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure

- 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

Specific organisational measures or measures needed to support the functioning of particular technical measures (e.g. training and supervision). Those measures need to be reported in particular for demonstrating strictly controlled conditions (to justify exposure based waiving).

In general, management systems are implemented; They 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

Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)

Wearing of gloves and protective clothing is compulsory (efficiency $\geq 90\%$).

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

9.1.8. GES ZnSO₄-7 : Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of ZnSO₄.

Table 1. GES ZnSO₄-7

<i>Exposure Scenario Format (1) addressing uses carried out by workers</i>
9.1.8 Title of Exposure Scenario number GES ZnSO₄ - 7 : Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of ZnSO₄.
<i>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;</i> SU: 9, 20,22 PROC: 8b, 9, 10, 11, 13, PC: 8, 20, 21,28, 29, 35, 39 AC: na ERC: 8a
9.1.8 Exposure Scenario
9.1.8.1 Contributing scenario (1) controlling environmental exposure for the Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of ZnSO₄.
<i>Further specification:</i> This scenario covers both the industrial scale processes and professional use. In the described process, the ZnSO ₄ containing preparation/mixture is further processed, involving potentially the following steps: <ul style="list-style-type: none"> • Reception/unpacking of material • Final application, spraying, embedding or to produce the end product or article.
Product characteristics
<i>Product related conditions:</i> ZnSO ₄ (or Zn compound) in the article is < 25%
Amounts used
<i>Daily and annual amount per site:</i> <ul style="list-style-type: none"> • 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. Usually, use is not continuous; this has to be considered when estimating exposure.
Environment factors not influenced by risk management
<i>Flow rate of receiving surface water:</i> default for generic scenario: 18,000 m ³ /d, unless specified otherwise
Other given operational conditions affecting environmental exposure
<i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air;</i> <ul style="list-style-type: none"> • 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.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR);</i></p> <ul style="list-style-type: none"> • In industrial and professional setting the following applies: <ul style="list-style-type: none"> • Process enclosures where relevant and possible • 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
<p><i>Technical measures, e.g. on-site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m3/d), degradation effectiveness and sludge treatment (if applicable);</i></p> <ul style="list-style-type: none"> • In industrial and professional setting, the following applies: <ul style="list-style-type: none"> ○ 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%). <ul style="list-style-type: none"> ▪ 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.
Organizational measures to prevent/limit release from site
<p><i>Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.</i></p> <p>In general, emissions are controlled and prevented by implementing an appropriate management system. This would involve:</p> <ul style="list-style-type: none"> • 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, according to national regulation. • SEVESO 2 compliance, if applicable.
Conditions and measures related to municipal sewage treatment plant
<p><i>Size of municipal sewage system/treatment plant (m3/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m3/d) will be rarely changeable for downstream uses.</i></p> <p>In cases where applicable: default size, unless specified otherwise.</p>
Conditions and measures related to external treatment of waste for disposal
<p><i>Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by work-ers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment;</i></p> <ul style="list-style-type: none"> • If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.

<ul style="list-style-type: none"> • 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
<p><i>Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slags, heat recovery out-side waste incinerators; specify effectiveness of measure;</i></p> <ul style="list-style-type: none"> • All residues are recycled or handled and conveyed according to waste legislation.
9.1.8.2 Contributing scenario (2) controlling worker exposure for the Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of ZnSO₄.
Product characteristic
<p><i>Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure)</i></p> <p>The concentration of ZnSO₄ (or Zn compound) in the mixture is < 25%</p> <ul style="list-style-type: none"> • Particles can occur sporadically, the low level of dustiness is basically applied. • Most of the processes imply the use of solutions or pastes; the “solution status” is therefore taken as the worst case.
Amounts used
<p><i>Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's expo-sure</i></p> <ul style="list-style-type: none"> • The quantities involved in this scenario are 10-50 times smaller than in blending (GES 5-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/exposure
<p><i>Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure</i></p> <p>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.</p>
Human factors not influenced by risk management
<p><i>Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity</i></p> <p>Uncovered body parts: (potentially) face</p>
Other given operational conditions affecting workers exposure
<p><i>Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.</i></p> <ul style="list-style-type: none"> • Industrial / Professional: <ul style="list-style-type: none"> ○ Wet processes, all indoor in confined area.
Technical conditions and measures at process level (source) to prevent release
<p><i>Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)</i></p> <ul style="list-style-type: none"> • Industrial /professional <ul style="list-style-type: none"> ○ Local exhaust ventilation on work areas with potential dust generation, dust capturing and removal techniques

<ul style="list-style-type: none"> ○ Process enclosures where appropriate
<ul style="list-style-type: none"> •
Technical conditions and measures to control dispersion from source towards the worker
<i>Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure</i>
<ul style="list-style-type: none"> • Industrial /professional: <ul style="list-style-type: none"> ○ 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
<i>Specific organisational measures or measures needed to support the functioning of particular technical measures (e.g. training and supervision). Those measures need to be reported in particular for demonstrating strictly controlled conditions (to justify exposure based waiving).</i>
<p>In general, management systems are implemented; They include general industrial hygiene practice e.g.:</p> <ul style="list-style-type: none"> ○ 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
<i>Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)</i>
<p>Wearing of gloves and protective clothing is compulsory (efficiency $\geq 90\%$).</p> <p>With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:</p> <ul style="list-style-type: none"> -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%) <p>Eyes: safety glasses are optional</p>