



SIKKERHEDSDATABLAD

i overensstemmelse med Forordning (EF) nr. 1907/2006 (REACH) og Forordning (EU) nr. 2015/830

Redigeret: 14-5-2019
Version: 8
Sprog: da-DK
Trykt: 27-5-2019

Zinkoxid

Materialenummer Z004

Side: 1 af 10

PUNKT 1: Identifikation af stoffet/blandingen og af selskabet/virksomheden

1.1 Produktidentifikator

Produktnavn: Zinkoxid
REACH registreringsnr.: 01-2119463881-32-0043

Dette sikkerhedsdatablad gælder for følgende produkter:

Zinc Oxide Red Seal, Zinc Oxide Green Seal, Zinc Oxide White Seal, Zinc Oxide White Seal DR, Zinc Oxide White Seal Special, Zinc Oxide G6, Zinc Oxide G9, Zinc Oxide 2011, Zinc Oxide 2011 Extra, Zinc Oxide F80, Zinc Oxide F72, Zinc Oxide Pharma 4 API, Zinc Oxide Pharma 6 API, Zinc Oxide Pharma 8 API, Zinc Oxide Pharma 4 Excipient, Zinc Oxide Pharma 6 Excipient, Zinc Oxide Pharma 8 Excipient, Zinc Oxide 4 High Purity Technical Application, Zinc Oxide 6 High Purity Technical Application, Zinc Oxide 8 High Purity Technical Application, Zinc Oxide Pharma 10, Zinc Oxide Pharma FCC, Zinc Oxide Grillo NANOTec, Zinc Oxide Grillo ACTITec, Zinc Oxide Grillo UVProTec, Zinc Oxide Grillo UV 8+

CAS-nr.: 1314-13-2
EF-nummer: 215-222-5
EU-indeksnummer: 030-013-00-7

1.2 Relevante identificerede anvendelser for stoffet eller blandingen samt anvendelser, der frarådes

Generel anvendelse: Kemisk grundstof
Kun til industrielle formål

1.3 Nærmere oplysninger om leverandøren af sikkerhedsdatabladet

Firmabetegnelse: Grillo Zinkoxid GmbH
Adresse/postboks: Halberstädter Str. 15
Postnr., By: 38644 Goslar
WWW: grillo-zno.de
E-mail: info@grillo-zno.de
Telefonnr.: +49 (0)5321-681-0
Faxnr.: +49 (0)5321-681-2067

Ansvarshavende for information:

e-mail: Reach@grillo-zno.de
Telefonnr.: +49 (0)5321-681-0

1.4 Nødtelefon

Toksikologisk informationscenter,
Telefonnr.: +45 35 31 35 31

PUNKT 2: Fareidentifikation

2.1 Klassificering af stoffet eller blandingen

Klassificering i henhold til EF-forordning 1272/2008 (CLP)

Aquatic Acute 1; H400 Meget giftig for vandlevende organismer. M-faktor = 1
Aquatic Chronic 1; H410 Meget giftig med langvarige virkninger for vandlevende organismer. M-faktor = 1

2.2 Mærkningselementer

Mærkning (CLP)



Signalord:

Advarsel

Faresætninger: H410 Meget giftig med langvarige virkninger for vandlevende organismer.

Sikkerhedssætninger: P273 Undgå udledning til miljøet.

P391 Udslip opsamles.

P501 Indhold/holder tilføres et indsamlingssted for problemaffald.

2.3 Andre farer

Støv: Kan fremkalde irritation.

Resultater af PBT- og vPvB-vurdering:

Dette stof opfylder ikke PBT/vPvB-kriterierne i REACH, bilag XIII.

PUNKT 3: Sammensætning af / oplysning om indholdsstoffer

3.1 Stoffer

Kemisk karakteristik: O Zn = ZnO
Zinkoxid > 98,5 %

CAS-nr.: 1314-13-2
EF-nummer: 215-222-5
EU-indeksnummer: 030-013-00-7
RTECS-nr.: ZH4810000

PUNKT 4: Førstehjælpsforanstaltninger

4.1 Beskrivelse af førstehjælpsforanstaltninger

Ved indånding: Sørg for frisk luft. Søg læge i tilfælde af gener.

Ved hudkontakt: De angrebene dele vaskes med vand. Tilsmudset tøj skal skiftes.

Ved øjenkontakt: Skyl straks det åbne øje 10 til 15 minutter under rindende vand. Fjern eventuelle kontaktlinser, hvis dette kan gøres let. Fortsæt skylning. I tilfælde af øjenirritation skal der opsøges en øjenlæge.

Ved indtagelse: Skyl straks munden og drik derefter rigeligt vand. Ved ildebefindende kontakt læge.

4.2 Vigtigste symptomer og virkninger, både akutte og forsinkede

Håndteringen hhv. forarbejdningen af dette materiale kan fremkalde støv, som kan medføre en mekanisk irritation af øjnene, huden, næsen og ganen.

4.3 Angivelse af om øjeblikkelig lægehjælp og særlig behandling er nødvendig

Symptomatisk behandling.

PUNKT 5: Brandbekæmpelse

5.1 Slukningsmiddel

Egnede slukningsmidler: Produktet er ikke brandfarligt. Slukningsmidlet bestemmes efter omgivelsernes art.

Af sikkerhedshensyn uegnet som slukningsmiddel:

Hel vandstråle

5.2 Særlige farer i forbindelse med stoffet eller blandingen

intet

5.3 Anvisninger for brandmandskab

Særlig beskyttelsesudrustning ved brandbekæmpelse:

Bær selvstændig lukket åndedrætsværn og kemibeskyttelsesdragt.

Yderligere oplysninger:

Truede beholdere køles med vand i spredt stråle. Ungå at slukke vand trænger ind i overfladevand eller ned i grundvandet.

PUNKT 6: Forholdsregler over for udslip ved uheld

6.1 Personlige sikkerhedsforanstaltninger, personlige værnemidler og nødprocedurer

Undgå udvikling af støv. Undgå indånding af støv. Sørg for tilstrækkelig udluftning. Brug personlig beskyttelsesudrustning. Fjern alle personer, som ikke er nødvendige, fra farezonen.

6.2 Miljøsikkerhedsforanstaltninger

Forurening af jorden, vandmiljøet eller i kloaksystemet bør forhindres.

6.3 Metoder og udstyr til inddæmning og oprensning

Skal optages i tør tilstand og i egnede beholdere afleveres til affaldsbehandling. Undgå udvikling af støv.

6.4 Henvisning til andre punkter

Se punkt 8 og 13 ang. nærmere detaljer.

PUNKT 7: Håndtering og opbevaring

7.1 Forholdsregler for sikker håndtering

Henvisning til sikker omgang:

Undgå udvikling af støv. Ved støvdannelse: Sørg for god ventilation ved lager og arbejdsplads. Undgå indånding af støv.

Bær egnet beskyttelsesudstyr.

7.2 Betingelser for sikker opbevaring, herunder eventuel uforenelighed

Krav om lagerrum og beholdere:

Beholder skal lagres tæt lukket, tørt og koligt.

Information om fælleslagring:

Må ikke lagres sammen med: stærke syrer, stærke baser, reduktionsmidler, oxidationsmidler

7.3 Særlige anvendelser

Der foreligger ingen oplysninger.

PUNKT 8: Eksponeringskontrol/personlige værnemidler

8.1 Kontrolparametre

Grænseværdier for arbejdsplads:

Type	Grænseværdi
Danmark: Langsigtet	10 mg/m ³ (Støv, mineralsk, inhalerbar fraktion)
Danmark: Langsigtet	3 mg/m ³ (Støv, organisk inhalerbar fraktion)
Danmark: Langsigtet	4 mg/m ³
Danmark: Langsigtet	5 mg/m ³ (Støv, mineralsk, alveol fraktion)

DNEL/DMEL: DNEL arbejdere, systemisk, langvarig, inhalativ: 5 mg/m³
DNEL arbejdere, lokal, langvarig, inhalativ: 0,5 mg/m³
DNEL arbejdere, systemisk, langvarig, dermal: 83 mg/kg bw/d
DNEL forbrugere, systemisk, langvarig, inhalativ: 2,5 mg/m³
DNEL forbrugere, systemisk, langvarig, dermal: 83 mg/kg bw/d
DNEL forbrugere, systemisk, langvarig, oral: 0,83 mg/kg bw/d

PNEC: PNEC vand (ferskvand): 20,6 µg/L
PNEC vand (havvand): 6,1 µg/L
PNEC spildevandsrensingsanlægget: 100 µg/L
PNEC sediment (ferskvand): 117,8 mg/kg dw
PNEC sediment (havvand): 56,5 mg/kg dw
PNEC jord: 35,6 mg/kg dw

8.2 Eksponeringskontrol

Ved støvudvikling: Udsugning påkrævet.

Personlige værnemidler

Foranstaltninger til kontrol af erhvervsmæssig eksponering

Andedrætsværn: Ved støvdannelse: Partikelfiltermaske P2 i overensstemmelse med EN 143.

Beskyttelse af hænder: Beskyttelseshandsker ifølge EN 374.
Handskemateriale: Nitrikkautsjuk - Lagtykkelse: 0,11 mm
gennembrudstid: >480 min.
Vær opmærksom på producenten af beskyttelseshandskernes oplysninger om gennemtrængelighed og gennemtrængstider.

Beskyttelse af øjne: Tætsluttende beskyttelsesbriller i overensstemmelse med EN 166.

Beskyttelse af kroppen: Brug særligt arbejdstøj.

Forholdsregler for beskyttelse og hygiejne:
Undgå udvikling af støv. Undgå indånding af støv. Tilsmudset tøj skal skiftes. Vask hænder og ansigt efter endt arbejde.

PUNKT 9: Fysisk-kemiske egenskaber

9.1 Oplysninger om grundlæggende fysiske og kemiske egenskaber

Udseende: Fysisk tilstand ved 20 °C og 101,3 kPa: fast
Form: pulver eller krystalinsk
Farve: hvid til lysegul

Zinkoxid

Materialenummer Z004

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Lugt:	lugtfri
Lugtgrænse:	Ingen data disponible
pH-værdi:	(Suspension) 7 - 8 g/mol (ISO 787/9)
Smeltepunkt/frysepunkt:	1970 - 1975 °C
Begyndelseskogepunkt og kogepunktsinterval:	ikke relevant
Brændepunkt/brændeområde:	ikke relevant
Fordampningshastighed:	Ingen data disponible
Brændbarhed:	ikke brændbar
Eksplisionsgrænser:	Ingen data disponible
Damptryk:	Ingen data disponible
Damptæthed:	Ingen data disponible
Massefylde:	hos 20 °C: 5,4 - 5,7 g/cm ³
Opløselighed:	opløselig i syrer (anorganisk)
Opløselighed i vand:	praktisk uopløselig
Fordeleskoefficient: n-oktanol/vand:	ikke relevant
Selvantændelsestemperatur:	ikke relevant
Dekomponeringstemperatur:	Ingen data disponible
Viskositet, kinematisk:	Ingen data disponible
Eksplorative egenskaber:	Produktet er ikke eksplosionsfarlig.
Antændelsesstimulerende egenskaber:	Ingen data disponible

9.2 Andre oplysninger

Vægtfylde:	300 - 2000 kg/m ³
Molekylær vægt	81,38 g/mol
Yderligere oplysninger:	Sublimationspunkt: ca. 1800 °C

PUNKT 10: Stabilitet og reaktivitet**10.1 Reaktivitet**

Reagerer voldsomt med: brintoverilte, magnesium

10.2 Kemisk stabilitet

Stabil under angivne lagerforhold.

10.3 Risiko for farlige reaktioner

Ved hensigtsmæssig håndtering og lagring optræder der ingen farlige reaktioner.

10.4 Forhold, der skal undgås

Skal beskyttes mod varme og direkte sollys. Skal beskyttes mod frost.

10.5 Materialer, der skal undgås

Stærke syrer, stærke baser, brintoverilte, magnesium

10.6 Farlige nedbrydningsprodukter

Termisk nedbrydning:	intet Ingen data disponible
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PUNKT 11: Toksikologiske oplysninger

11.1 Oplysninger om toksikologiske virkninger

Akut toxicitet: LD50 Rotte, oral: > 5000 mg/kg
LDLo menneske, oral: 500 mg/kg (RTECS)
LC50 Rotte, inhalativ: > 5,7 mg/L/4h

Toksikologiske effekter: Akut toxicitet (oral): Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Akut toxicitet (dermal): Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Akut toxicitet (inhalativ): Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Hudætsning/-irritation: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Kanin: ikke irriterende (OECD 404)
Alvorlig øjenskade/øjenirritation: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Kanin: ikke irriterende (OECD 405)
Respiratorisk sensibilisering: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Hudsensibilisering: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Marsvin: ikke sensibiliserende
Kimcellemutagenitet/Genotoksicitet: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Kræftfremkaldende egenskaber: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Reproduktionstoksicitet: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Effekter på og via modermelken: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Specifik målorgantoksicitet (enkelt eksponering): Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
Specifik målorgantoksicitet (gentagen eksponering): Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.
NOAEL: 50 mg Zn/d
Aspirationsfare: Kriterierne for klassificering kan på grundlag af de foreliggende data ikke anses for at være opfyldt.

Symptomer

Håndteringen hhv. forarbejdningen af dette materiale kan fremkalde støv, som kan medføre en mekanisk irritation af øjnene, huden, næsen og ganen.

PUNKT 12: Miljøoplysninger

12.1 Toksicitet

Akvatoksicitet: Meget giftig med langvarige virkninger for vandlevende organismer.

Daphnientoksicitet:

EC50 Ceriodaphnia dubia, pH <7: 0,413 mg Zn⁺⁺/L/48h

EC50 Ceriodaphnia dubia, pH <7: 0,67 mg ZnO/L/48h

Algetoksicitet:

ErC50 Selenastrum capricornutum, pH >7-8,5: 0,136 mg Zn⁺⁺/L/72h

ErC50 Selenastrum capricornutum, pH >7-8,5: 0,21 mg ZnO/L/72h

12.2 Persistens og nedbrydelighed

Andre oplysninger: Metoder til bestemmelse af nedbrydningsevnen kan ikke anvendes på uorganiske stoffer.

12.3 Bioakkumulationspotentiale

Ingen tegn på bioakkumulationspotentiale.

Fordeleskoefficient: n-oktanol/vand:

ikke relevant

12.4 Mobilitet i jord

Ingen data disponible

12.5 Resultater af PBT- og vPvB-vurdering

Dette stof opfylder ikke PBT/vPvB-kriterierne i REACH, bilag XIII.

12.6 Andre negative virkninger

Almene oplysninger: Undgå udslip i grundvandet, i vandmiljøet eller i kloaksystemet.

PUNKT 13: Forhold vedrørende bortskaffelse

13.1 Metoder til affaldsbehandling

Produkt

Anbefaling: Destrueres efter gældende bestemmelser.

Embalering

Anbefaling: Destrueres efter gældende bestemmelser.

Ikke fuldstændigt tomme beholdere bortskaffes som problemaffald. Ikke forurenede og færdigtømte emballager kan afleveres til en genbrugsvirksomhed.

PUNKT 14: Transportoplysninger

14.1 UN-nummer

ADR/RID, IMDG, IATA-DGR:

UN 3077

Zinkoxid

Materialenummer Z004

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14.2 UN-forsendelsesbetegnelse (UN proper shipping name)

ADR/RID: FN 3077, MILJØFARLIGT FAST STOF, N.O.S. (Zinkoxid)

IMDG, IATA-DGR: UN 3077, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc oxide)

14.3 Transportfareklasse(r)

ADR/RID: Klasse 9, Kode: M7

IMDG: Class 9, Subrisk -

IATA-DGR: Class 9

**14.4 Emballagegruppe**

ADR/RID, IMDG, IATA-DGR:

III

**14.5 Miljøfarer**

Havforureningsfaktor: ja

14.6 Særlige forsigtighedsregler for brugeren**Vejtransport (ADR/RID)**

Advarselsskilt: ADR/RID: Fareklasse 90, UN-nummer UN 3077
fareseddel: 9
Særlige forskrifter: 274 335 375 601
Begrænsede mængder: 5 kg
EQ: E1
Embalering - Instructions: P002 IBC08 LP02 R001
Embalering - Særlige forskrifter: PP12 B3
Special provisions for packing together: MP10
Portable Tanks - Instructions: T1 BK1 BK2 BK3
Portable Tanks - Særlige forskrifter: TP33
Tank coding: SGAV LGBV
Tunnelrestriktionskode: -

Søfart (IMDG)

Ems-nr.: F-A, S-F
Særlige forskrifter: 274, 335, 966, 967, 969
Begrænsede mængder: 5 kg
Excepted quantities: E1
Embalering - Instructions: P002, LP02
Embalering - Provisions: PP12
IBC - Instructions: IBC08
IBC - Provisions: B3
Tank instructions - IMO: -
Tank instructions - UN: T1, BK2, BK2, BK3
Tank instructions - Provisions: TP33
Stuvning og håndtering: Category A. SW23
Egenskaber og bemærkninger: -
Segregationsgruppe: none

Luffart (IATA)

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

14.7 Bulktransport i henhold til bilag II til MARPOL og IBC-koden

Ingen data disponible

PUNKT 15: Oplysninger om regulering**15.1 Særlige bestemmelser/særlig lovgivning for stoffet eller blandingen med hensyn til sikkerhed, sundhed og miljø****Nationale bestemmelser - Danmark**

Ingen data disponible

Nationale bestemmelser - EF-medlemslande

Indhold af flygtige organiske forbindelser (VOC):

0 vægt %

Mærkning af emballage ved indhold <= 125mLSignalord: **Advarsel**

Faresætninger: udelades

Sikkerhedssætninger: udelades

Nationale bestemmelser - Tyskland

Lagerklasse: 13 = Ikke brændbare faste stoffer

Fareklasse for vand: 2 = skadeligt for vand (WGK-Katalognummer 2187)

Regler ved ulykkestilfælde:

1.3.1: E1

Nationale bestemmelser - Storbritannien

Hazchemkode: 2Z

15.2 Kemikaliesikkerhedsvurdering

En kemikaliesikkerhedsvurdering udførtes for dette stof.

PUNKT 16: Andre oplysninger**Yderligere information**

Årsag til de sidste ændringer:

Ændring i afsnit 1: Ansvarshavende for information

Første oplag:

24-2-2016



SIKKERHEDSDATABLAD

i overensstemmelse med Forordning (EF) nr. 1907/2006 (REACH) og Forordning (EU) nr. 2015/830

Zinkoxid

Materialenummer Z004

Redigeret: 14-5-2019

Version: 8

Sprog: da-DK

Trykt: 27-5-2019

Side: 10 af 10

Ansvarlig for udgivelse af sikkerhedsblad

Kontaktperson: se punkt 1: Ansvarshavende for information

For forkortelser og akronymer se ECHA: Vejledning om oplysningskrav og kemikaliesikkerhedsvurderinger, kapitel R.20 (fortegnelse over begreber og forkortelser).

Oplysningerne i dette sikkerhedsblad er sammensat efter højeste kendskab til produkterne i dag. De sikrer dog ikke overholdelse af bestemte egenskaber i retslig henseende.

According to 1907/2006/EC (REACH-Directive)
REACH reg no: 01-2119463881-32-0043

SAFETY DATA SHEET Zinc Oxide

Date of Issue: 22/07/03 revised: 30/09/13 version: 1 replaces: MSDS-E-ZnO-R-13-K1

APPENDIX (eSDS):

Data basis taken from Risk assessment Report Zinc Oxide, Chemical Substance Bureau, 3720 Bilthoven, The Netherlands (Health Part Final Report, May 2003, Environmental Part Final Draft, May 2006).

Issued and revised by: Grillo Zinkoxid GmbH (Tech. Dept.)

Generic exposure scenarios (GES) for ZnO (ref : CSR zinc oxide, version Nov 2010)

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

Identified uses for ZnO and corresponding Generic Exposure Scenario (GES) (ref: CSR zinc oxide, version Nov 2010)

IU number	Identified Use (IU) name	GES code
1	Zinc oxide production-Direct	GESZnO 0
2	Zinc oxide production-Indirect	GESZnO 0
3	Zinc oxide production-Wet	GESZnO 0
9	Component for production of inorganic zinc compounds	GESZnO 2
10	Electrogalvanizing	GESZnO 2
11	Electroplating	GESZnO 2
12	Zinc production by electrowinning	GESZnO 2
13	Laboratory reagent	GESZnO 3
14	Zinc production by pyrometallurgy	GESZnO 2
15	Zinc oxide production & refining	GESZnO 0
16	Component for production of organic zinc compounds	GESZnO 2
17	Component for production of inorganic pigments	GESZnO 1, GESZnO 4
18	Component for production of coatings / paints, inks,	GESZnO 1, GESZnO 4

According to 1907/2006/EC (REACH-Directive)
REACH reg no: 01-2119463881-32-0043
SAFETY DATA SHEET Zinc Oxide

Date of Issue: 22/07/03 revised: 30/09/13 version: 1 replaces: MSDS-E-ZnO-R-13-K1

IU number	Identified Use (IU) name	GES code
	enamels, varnishes	
19	Use of ZnO-containing paints & coatings	GESZnO 7
20	Artists supply: Use of ZnO-containing paints & coatings	Generic consumer/environment
21	Component for paper coating	GESZnO 1, GESZnO 5
22	Use of ZnO-containing paper coatings	GESZnO 6
23	Component for textile & leather coating / treatment	GESZnO 1, GESZnO 5
24	Use of ZnO-containing textile & leather coatings	GESZnO 6
25	Additive / component for production of ceramics	GESZnO 1, GESZnO 4
26	Additive /component for production of frits	GESZnO 1, GESZnO 4
27	Use of ZnO-containing glazes and glassy thin film coatings	GESZnO 6
28	Additive for the production of friction agents	GESZnO 1, GESZnO 4
29	Use of ZnO-containing friction agents: Brake pads	GESZnO 6
30	Additive / component for production of glass	GESZnO 1, GESZnO 4
31	Surface treatment of flat glass	GESZnO 1, GESZnO 4
32	Use of ZnO-containing glass & ceramics in dinnerware	GESZnO 6
33	Use of ZnO-containing glass in displays	GESZnO 6
34	Use of ZnO-containing glassy thin film coatings	GESZnO 6
35	Additive in the manufacturing of electronic components	GESZnO 1, GESZnO 4
36	Additive in the manufacturing of ferrites	GESZnO 1, GESZnO 4
37	Additive in the manufacturing of varistors	GESZnO 1, GESZnO 4
38	ZnO in electrotechnical contact material	GESZnO 1, GESZnO 4
39	Batteries/Fuel cells	GESZnO 1, GESZnO 4, GESZnO 5
40	Component for production of rubber, resins and related preparations	GESZnO 1, GESZnO 5
41	Use of ZnO-containing rubber for tires	GESZnO 7
42	Use of ZnO-containing rubber and other resins for medical devices and applications	GESZnO 7
43	Component for polymer-matrices, plastics and related preparations	GESZnO 1, GESZnO 5
44	Use of ZnO-containing polymers for floor, wall coverings	GESZnO 7

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REACH reg no: 01-2119463881-32-0043
SAFETY DATA SHEET Zinc Oxide

Date of Issue: 22/07/03 revised: 30/09/13 version: 1 replaces: MSDS-E-ZnO-R-13-K1

IU number	Identified Use (IU) name	GES code
	and similar preparations	
45	Use of ZnO-containing polymers for cable protecting & isolating coatings	GESZnO 7
46	Use of ZnO-containing polymers for tube & sheet articles	GESZnO 7
47	Use of ZnO-containing polymers for molded articles	GESZnO 7
48	Use of ZnO-containing plastic thin films coatings	Generic consumer/environment
49	Additive for the production of sealants / adhesives / Mastics	GESZnO 1, GESZnO 5
50	Use of ZnO-containing sealants / adhesives / mastics	Generic consumer/environment
51	Additive for the production of lubricants / Grease / Metal working fluids	GESZnO 1, GESZnO 5
52	Use of ZnO-containing Lubricants / grease / metal working fluids	Generic consumer/environment
53	Additive for the production of polishes / wax blends	GESZnO 1, GESZnO 5
54	Use of ZnO-containing polishes/ wax blends	Generic consumer/environment
55	Use of ZnO-containing catalysts	GESZnO 1, GESZnO 5
56	Use of ZnO-containing adsorbents	GESZnO 1, GESZnO 5
57	Additive for production of de-icing products	GESZnO 1, GESZnO 5
58	Use of ZnO-containing de-icing products	Generic consumer/environment
59	Additive for the production of pyrotechnic products	GESZnO 1, GESZnO 4
60	Use of ZnO-containing pyrotechnic products	Generic consumer/environment
61	Additive for the formulation of nutrition additives	GESZnO 1, GESZnO 4, GESZnO 5
62	Additive for the formulation of animal feedstuffs	GESZnO 1, GESZnO 4, GESZnO 5
63	Additive for the formulation of biocidal products	GESZnO 1, GESZnO 4, GESZnO 5
64	Use of ZnO-containing biocidal products	GESZnO 6, GESZnO 7, Generic consumer/environment
65	Additive for the formulation of cleaning products	GESZnO 1, GESZnO 4, GESZnO 5
66	Use of ZnO-containing cleaning products	GESZnO 6, GESZnO 7, Generic consumer/environment
67	Additive for the formulation of fertilizers	GESZnO 1, GESZnO 4,

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IU number	Identified Use (IU) name	GES code
		GESZnO 5
68	Use of ZnO-containing fertilizer's formulations	Generic consumer/environment
69	Additive in the formulation of cosmetics	GESZnO 1, GESZnO 4, GESZnO 5
70	Use of cosmetics	GESZnO 6, GESZnO 7, Generic consumer/environment
71	Additive in dentistry products	GESZnO 1, GESZnO 4, GESZnO 5
72	Additive in the formulation of pharma / veterinary products	GESZnO 1, GESZnO 4, GESZnO 5
73	Use of pharma / veterinary products	GESZnO 6, GESZnO 7, Generic consumer/environment
74	Use of ZnO-containing antifouling paints	GESZnO 7, Generic consumer/environment
75	Substrate preparation: sanding of surfaces between application of coatings	GESZnO 6

GES ZnO-0: Industrial use of primary or secondary zinc bearing material in the manufacture of ZnO by several pyro-or hydrometallurgical processes.

SU: 3, 8, 9

PROC: 1, 2, 3, 4,5 , 8b, 9, 22, 26

PC: 19, 20

AC: not applicable

ERC: 1, 6a

Description of activities and processes covered in the exposure scenario:

There are 3 production processes for ZnO:

- **the indirect process**

In this process, the starting material is zinc metal (with a purity of 92 – 99.995 %), refined metal, metallic residues and scrap.

The zinc metal is melted, vaporised by boiling and oxidised in the vapour state to zinc oxide with excess of air.

Afterwards, the zinc vapour is burned (oxidised) to produce zinc oxide, which is quenched in excess of air, precipitated from the ZnO/air mixture in settling chambers, in which the fractionation of the zinc oxide particles takes place according to their size.

- **the direct process**

In this process, the starting material is zinc oxide containing residue.

The material is blended with reducing agent (coke breeze) and fed to a furnace. At elevated temperature (~1000°C); the ZnO is reduced to Zinc which vaporises by boiling at that temperature. Air is blown above the surface and oxidises Zinc in the vapour state to Zinc oxide which is entrained in the exhaust airflow.

The entrained Zinc oxide is quenched in excess of air, precipitated from that ZnO/air mixture in settling chambers, in which the fractionation of the zinc oxide particles takes place according to their size.

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- **the wet process**

In this process, the starting material is a purified zinc salt solution (predominantly dithionate, sulphate or chloride).

Zinc hydroxide and/or carbonate are subsequently precipitated by the addition of alkalines and filtered from the solutions.

Finally, zinc oxide is generated by calcination (dehydration, de-carboxylation) of the Zinc hydroxide or Zinc carbonate or a mixture of both.

The resulting zinc oxide is subsequently collected in bag filters after cooling the exhaust air, and is then packed, as such in powdery form, into paper sacks or big bags, or further granulated before packaging

Contributing scenario (1) controlling environmental exposure

Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS

ZnO is produced in minimum 80% purity

Amounts used: maximum 50000 T/y

Frequency and duration of use: Continuous production

Environment factors not influenced by risk management:

Flow rate receiving waters default for generic scenario: 18,000 m³/d, unless specified otherwise

Other given operational conditions affecting environmental exposure:

- In the wet process, most of the operations are in wet phase.
- In the direct and indirect dry process, all operational conditions are dry throughout the process; there are no process waters; high temperature steps;
- Even when no process waters (e.g. when dry process throughout), some non-process water can be generated containing zinc (e.g. from cleaning)
- All 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 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, acid solutions are treated with alkali. There is high temperature in the surroundings of the calcinations furnaces.

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

- 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%).
- 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:

- 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.

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<ul style="list-style-type: none"> SEVESO 2 compliance, if applicable
<p>Conditions and measures related to municipal sewage treatment plant: In cases where applicable: default size of the municipal STP (2000 m3/d), unless specified otherwise.</p>
<p>Conditions and measures related to external treatment of waste for disposal: If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Release to the floor, water and soil are to be prevented. If the zinc content of the waste is elevated enough, internal or external recovery/recycling might be considered. Fraction of daily/annual use expected in waste: zinc producers = 3.1% / zinc compound producers = 0.056% / downstream users = 0.30%</p>
<p>Conditions and measures related to external recovery of waste:</p> <ul style="list-style-type: none"> 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 recycled in the system or handled further according the waste legislation. Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.
<p>Contributing scenario (2) controlling worker exposure</p>
<p>Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS ZnO (100%) as solid (dry powder) The manufactured zinc oxide is collected in bag filters after cooling the exhaust air, and is then packed, as such in powdery form, into paper sacks or big bags, or further granulated before packaging. Water solubility: < 1.6 mg/L, soluble in acid / relative density: 5.6 g/cm³ / bulk density: 300 to 900 g/L (typical value/grade) / specific surface: min 1.0 to 100.0 m²/g [typical value/grade, BET method] / granulometry: d₅₀ = 2 to 125µm (typical value/grade) / typical for catalysts – manufactured ZnO is collected into containers and further processed and/or pelleted before packaging.</p>
<p>Amounts used: Maximum 96 T/day, 32T/shift</p>
<p>Frequency and duration of use/exposure: 8hrs shift</p>
<p>Human factors not influenced by risk management: Uncovered body parts, (potentially) face can be exposed due to nature of activity</p>
<p>Other given operational conditions affecting workers exposure: All processes are carried out indoor in confined areas.</p>
<p>Technical conditions and measures at process level (source) to prevent release:</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. 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.
<p>Technical conditions and measures to control dispersion from source towards the worker:</p> <ul style="list-style-type: none"> Local exhaust ventilation systems (generic LEV as worst case (84%); higher efficiency up to 90-95% is 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.

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- 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 finished 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:

- Wearing of gloves and protective clothing is compulsory (efficiency >=90%).
- With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:
 - dust filter-half mask P1 (efficiency 75%)
 - dust filter-half mask P2 (efficiency 90%)
 - dust filter-half mask P3 (efficiency 95%)
 - dust filter-full mask P1 (efficiency 75%)
 - dust filter-full mask P2 (efficiency 90 %)
 - dust filter-full mask P3 (efficiency 97.5%)
- Eyes: safety glasses are optional

Exposure estimation and reference to its source: not relevant, refer to CSR

Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES

Occupational exposure/environmental emissions

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.)

ZnO GES-1: Industrial use of ZnO in the formulation of preparations by mixing thoroughly, dry or in a solvent, the starting materials with potentially pressing, pelletizing, sintering, and possibly followed by packaging.

SU: 3,8,9, 10

PROC: 1,2,3,4,5, 8b,9,13, 14, 15, 22,26

PC: Not applicable

AC: not applicable

ERC: 1,2, 6a

In the described process, the zinc oxide is optionally:

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<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 to 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.
Contributing scenario (1) controlling environmental exposure ZnO is used in the manufacture of preparations by mixing thoroughly the starting materials, followed by direct use of packaging of the preparations. Many different industrial uses are characterized by this process. Therefore these industrial are all uses covered by this generic exposure scenario.
Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS, ZnO is used in minimum 80% purity.
Amounts used: maximum 5000 T/y
Frequency and duration of use Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.
Environment factors not influenced by risk management Flow rate receiving waters default for generic scenario: 18,000 m ³ /d, unless specified otherwise
Other given operational conditions affecting environmental exposure <ul style="list-style-type: none"> All processes are performed indoor in a confined area. High temperature steps are possible. 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <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: In cases where applicable: default size of the municipal STP (2000 m ³ /d), unless specified otherwise.
Conditions and measures related to external treatment of waste for disposal:

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If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Release to the floor, water and soil are to be prevented. If the zinc content of the waste is elevated enough, internal or external recovery/recycling might be considered. Fraction of daily/annual use expected in waste: zinc producers = 3.1% / zinc compound producers = 0.056% / downstream users = 0.30%

Conditions and measures related to external recovery of waste: All residues are recycled or handled and conveyed according to the waste legislation.

Contributing scenario (2) controlling worker exposure

Product characteristic: see sections 3 (composition) & 9 (phys-chem properties) of SDS

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. The concentration of ZnO in the mixtures can be up to >25% but is usually of the order of <= 5%.

Amounts used: Max 5000T/y = 14T/d = 5T/shift depending on the application.

Frequency and duration of use/exposure:

8 hour shifts (default worst case) are assumed as starting point; it is emphasised that the real duration of exposure could be less. This has to be considered when estimating exposure.

Human factors not influenced by risk management: Uncovered body parts, (potentially) face can be exposed due to nature of activity

Other given operational conditions affecting workers exposure:

- high temperature steps can occur;
- all indoor processes in confined area.

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

- 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:

- Local exhaust ventilation systems (generic LEV as worst case (84%); higher efficiency up to 90-95% is 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 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

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- procedures for process control and maintenance,...
- personal protection measures (see below)

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

- 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

Exposure estimation and reference to its source: not relevant, refer to CSR

Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES

Occupational exposure/environmental emissions

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.)

GES ZnO-2: industrial use of zinc oxide or ZnO-formulations in the manufacturing of other inorganic or organic zinc substances through different process routes, with potentially drying, calcining and packaging.

SU: 3, 8, 9, 10, 14, 15,17, 0 (Nace C24. 4.3., E38.3, C25. 6.1)

PROC: 1, 2, 3, 4, 8b, 9, 13, 15, 21, 22, 23, 26

PC : 7, 14, 19, 20, 21

AC : 2, 7, 12

ERC : 1, 2, 4, 5, 6a, 6b, 8a, 8d

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

- Reception of the ZnO or ZnO-containing formulation, or ZnO-bearing raw material in the reaction tank
- Sequential addition of reagents for purification steps and filtration on press filter, when needed (ventilation is adapted).
- Concentration by water evaporation, under exhaust hood.
- Possible pouring on a cooling belt
- Discharge and packaging of produced zinc compounds. Workers have to place and adjust the bag or drum under the discharge pipe and to set the process in motion. Filled bags or drums are subsequently closed and carried to the storage area.
- Exposure to dust can occur during packing of the powder. Solutions are packed in intermediate bulk containers (ca. 1 m³ capacity); solids are packed in bags or drums.
- Maintenance activities

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<p>Contributing scenario (1) controlling environmental exposure</p> <p>Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS Zn-compounds are produced in their pure form e.g; >99%, or in solution.</p> <p>Amounts used: Up to 75 T/d of ZnO is transformed to equivalent Zn compound</p> <p>Frequency and duration of use: Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.</p> <p>Environment factors not influenced by risk management Flow rate of receiving surface water usually 18,000 m³/d by default, unless specified otherwise</p> <p>Other given operational conditions affecting environmental exposure</p> <ul style="list-style-type: none"> Wet processes (leaching, filtering, purification) followed by drying (possible grinding), and packaging; All indoor processes, in confined area. <p>Technical conditions and measures at process level (source) to prevent release:</p> <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 <p>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil:</p> <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. <p>Organizational measures to prevent/limit release from site:</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. 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 <p>Conditions and measures related to municipal sewage treatment plant: In cases where applicable: default size of the municipal STP (2000 m³/d), unless specified otherwise.</p> <p>Conditions and measures related to external treatment of waste for disposal: If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Release to the floor, water and soil are to be prevented. If the zinc content of the waste is elevated enough, internal or external recovery/recycling might be considered. Fraction of daily/annual use expected in waste: zinc producers = 3.1% / zinc compound producers = 0.056% / downstream users = 0.30%</p> <p>Conditions and measures related to external recovery of waste:</p> <ul style="list-style-type: none"> All residues from the wet process are recycled.
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<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 to the Waste regulation.
Contributing scenario (2) controlling worker exposure
Product characteristic: see sections 3 (composition) & 9 (phys-chem properties) of SDS <ul style="list-style-type: none"> Zinc oxide 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: Up to maximum 25T/shift
Frequency and duration of use/exposure: 8hrs shift (worst case)
Human factors not influenced by risk management: Uncovered body parts, (potentially) face can be exposed due to nature of activity
Other given operational conditions affecting workers exposure: All processes are carried out indoor in confined areas.
Technical conditions and measures at process level (source) to prevent release: <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: <ul style="list-style-type: none"> Local exhaust ventilation systems (generic LEV as worst case (84%); higher efficiency up to 90-95% is 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 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: 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: <ul style="list-style-type: none"> Wearing of gloves and protective clothing is compulsory (efficiency >=90%) With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.: <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%)

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- 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

Exposure estimation and reference to its source: not relevant, refer to CSR

Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES

Occupational exposure/environmental emissions

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.)

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

SU: 3, 10, 22, 24

PROC: 1, 2, 3, 4, 5, 8b, 9, 15

PC: 19, 21, 28, 39

AC: not applicable

ERC: 1,2, 4, 6a, 6b, 8a, 8b, 8d

Contributing scenario (1) controlling environmental exposure

The zinc oxide is used for:

Analysis: sample (solid or liquid) treatment or preparation: the substance is in the sample or in the reagent

Synthesis: manipulations are usually under ventilation (e.g. laminar flow, ventilation hood)

The substance is used at the industrial scale, in industrial installations for air control and water treatment and at the professional scale by laboratories

Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS

ZnO is used in minimum 80% purity; higher grades (>95%) are usual.

Amounts used:

- maximum 5 T/y (industrial scale)
- maximum 0.5 T/y (professional scale)

Frequency and duration of use: Use is usually intermittent but continuous use is assumed as a worst case.

Environment factors not influenced by risk management

Flow rate of receiving surface water: default for generic scenario: 18,000 m³/d, unless specified otherwise

Other given operational conditions affecting environmental exposure

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:

- Process enclosures and closed circuits where relevant.
- If relevant, dust capturing and removal techniques are applied on local exhaust ventilation (centralized treatment, scrubbers, filters,...)

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<ul style="list-style-type: none"> • Containment of liquid volumes to collect waste streams
<p>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil:</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.
<p>Organizational measures to prevent/limit release from site:</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.
<p>Conditions and measures related to municipal sewage treatment plant: In cases where applicable: default size (2000 m³/d), unless specified otherwise.</p>
<p>Conditions and measures related to external treatment of waste for disposal:</p> <p>If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Release to the floor, water and soil are to be prevented. If the zinc content of the waste is elevated enough, internal or external recovery/recycling might be considered. Fraction of daily/annual use expected in waste: zinc producers = 3.1% / zinc compound producers = 0.056% / downstream users = 0.30%</p>
<p>Conditions and measures related to external recovery of waste:</p> <p>All residues are recycled or handled and conveyed according to waste legislation.</p>
<p>Contributing scenario (2) controlling worker exposure</p>
<p>Product characteristic: see sections 3 (composition) & 9 (phys-chem properties) of SDS</p> <p>ZnO 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) powder, b) glassy or c) pelletized form. In the powder form, it can be characterized by high dustiness in a worst case situation.</p>
<p>Amounts used:</p> <ul style="list-style-type: none"> • maximum 5 T/y (industrial scale) • maximum 0.5 T/y (professional scale)
<p>Frequency and duration of use/exposure:</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>
<p>Human factors not influenced by risk management: Uncovered body parts, (potentially) face can be exposed due to nature of activity</p>
<p>Other given operational conditions affecting workers exposure:</p> <ul style="list-style-type: none"> • high temperature steps can occur in protected zones (fume cupboards);

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<ul style="list-style-type: none"> all indoor processes in confined area, including hazardous substances cabinets.
<p>Technical conditions and measures at process level (source) to prevent release:</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
<p>Technical conditions and measures to control dispersion from source towards the worker:</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.: <ul style="list-style-type: none"> Cleaning of process equipment and laboratory Storage of Zn products in dedicated zones, e.g.: hazardous substances cabinets
<p>Organisational measures to prevent /limit releases, dispersion and exposure:</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> <ul style="list-style-type: none"> 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.: <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%) Eyes: safety glasses are optional but usually taken as "normal laboratory practice"
<p>Exposure estimation and reference to its source: not relevant, refer to CSR</p>
<p>Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.</p>
<p>Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES</p>
<p>Occupational exposure/environmental emissions</p> <p>The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.).</p>

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In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.)

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

SU: 1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 16, 20, 0 (Nace C20.1.2., C20.2, C20.5.1., C23.1.1., C23.2)

PROC: 1, 2, 3, 4, 5, 6, 8b, 9, 13, 14, 15, 22, 24, 26

PC: 1, 5, 7, 9a, 9b, 9c, 11, 14, 15, 17, 18, 19, 20, 21, 29, 37, (ucnF05990, E070000, 30200)

AC: 2, 3, 4, 7, TARIC 6813.18, 854121)

ERC: 1, 2, 3, 4, 5, 6a, 6b, 7, 8a, 8b, 8d, 10a, 10b, 11a

ZnO or ZnO-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.

The ZnO (/Zn compound) containing preparation/mixture can be either

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

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

Contributing scenario (1) controlling environmental exposure

Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS. ZnO (Zn compound) in the preparation can be > 25%, usually <5%.

Amounts used: maximum 5000 T/y

Frequency and duration of use: Continuous production is assumed as a worst case

Environment factors not influenced by risk management: Flow rate of receiving surface water default for generic scenario: 18,000 m³/d, unless specified otherwise

Other given operational conditions affecting environmental exposure

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

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

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

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

- No process waters, so possible emissions to water are limited and non-process related.
- On-site waste water treatment techniques can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%).
- Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric or bag filters, wet scrubbers. This may create a general negative pressure in the building.

Organizational measures to prevent/limit release from site:

- In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000, ISO 1400X series, or alike, and, when applicable, by being IPPC-compliant.
 - Such management system should include general industrial hygiene practice e.g.:

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<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
<p>Conditions and measures related to municipal sewage treatment plant: In cases where applicable: default size STP (2000 m3/d), unless specified otherwise.</p>
<p>Conditions and measures related to external treatment of waste for disposal</p> <p>If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Release to the floor, water and soil are to be prevented. If the zinc content of the waste is elevated enough, internal or external recovery/recycling might be considered. Fraction of daily/annual use expected in waste: zinc producers = 3.1% / zinc compound producers = 0.056% / downstream users = 0.30%</p>
<p>Conditions and measures related to external recovery of waste</p> <ul style="list-style-type: none"> All residues are recycled or handled and conveyed according to waste legislation. Users of Zn and Zn-compounds have to favour the recycling channels of the end-of-life products Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according to the Waste regulation.
<p>Contributing scenario (2) controlling worker exposure</p> <p>Industrial formulation of dry preparations/mixtures by mixing thoroughly the zinc compounds with other starting materials, with possible pressing, pelletizing, sintering and packaging of the preparations/mixtures.</p>
<p>Product characteristic: see sections 3 (composition) & 9 (phys-chem properties) of SDS</p> <ul style="list-style-type: none"> Concentration of ZnO in the mixtures can be up to >25% but is usually of the order of <= 5%, depending on the application 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
<p>Amounts used: Max 5000T/y = 15T/d = 5T/shift depending on the application.</p>
<p>Frequency and duration of use/exposure: 8 hour shifts (default worst case) are assumed as starting point</p>
<p>Human factors not influenced by risk management</p> <p>Uncovered body parts, (potentially) face can be exposed due to nature of activity</p>
<p>Other given operational conditions affecting workers exposure</p> <ul style="list-style-type: none"> Dry processes: dry operational conditions throughout the process; no process waters; high temperature steps can occur; indoor processes in confined area
<p>Technical conditions and measures at process level (source) to prevent release:</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
<p>Technical conditions and measures to control dispersion from source towards the worker:</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)
<p>Organisational measures to prevent /limit releases, dispersion and exposure:</p>

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In general integrated management systems are implemented at the workplace e.g. ISO 9000, ISO-ICS 13100, or alike, and are, when appropriate, IPPC-compliant.

Such management system would include general industrial hygiene practice e.g.:

- information and training of workers on prevention of exposure/accidents,
- procedures for control of personal exposure (hygiene measures)
- regular cleaning of equipment and floors, extended workers instruction-manuals
- procedures for process control and maintenance,...
- personal protection measures (see below)

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

- Wearing of 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

Exposure estimation and reference to its source: not relevant, refer to CSR

Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES

Occupational exposure/environmental emissions

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.)

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

SU: 1, 3, 4, 5, 6b, 7, 8, 9, 10, 11, 12, 16, 18, 20,0 (Nace C20.2. C27.2)

PROC: 1, 2, 3, 4, 5, 6, 7, 8a, 8b, 9, 10, 12, 13, 14, 19, 20, 21, 22, 24, 26

PC: 1, 2, 4, 7, 8, 9a, 9b, 12, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 28, 29, 31, 32, 33, 34, 35, 37, 39, 40

AC: 1, 2, 3, 7, 10, 11, 13

ERC: 1, 2, 3, 4, 5, 6a, 6b, 6d, 7, 8a, 8b, 8c, 8d, 8f, 10a, 10b, 11a

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

- Unpacked and stored in silos
- Extracted from the silo, dosed and fed with the other reagents and/or solvents to the mixing tank, 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.

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<p>Contributing scenario (1) controlling environmental exposure</p> <p>Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS ZnO in preparation can be > 25%, usually <5%</p> <p>Amounts used: maximum 5000 T/y</p> <p>Frequency and duration of use: Continuous production is assumed as a worst case.</p> <p>Environment factors not influenced by risk management: Flow rate of receiving surface water default: 18,000 m³/d, unless specified otherwise</p> <p>Other given operational conditions affecting environmental exposure</p> <ul style="list-style-type: none"> • Even when no process waters occur, 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. <p>Technical conditions and measures at process level (source) to prevent release:</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. <p>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil:</p> <ul style="list-style-type: none"> • Some of the operations imply wet process-steps • Sump containment is provided under the tanks and the filters in order. 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. <p>Organizational measures to prevent/limit release from site:</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. ○ 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 <p>Conditions and measures related to municipal sewage treatment plant</p> <p>In cases where applicable: default size of municipal STP (2000m³/d), unless specified otherwise.</p> <p>Conditions and measures related to external treatment of waste for disposal</p> <p>If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Release to the floor, water and soil are to be prevented. If the zinc content of the waste is elevated enough, internal or external recovery/recycling might be considered. Fraction of daily/annual use expected in waste: zinc producers = 3.1% / zinc compound producers = 0.056% / downstream users = 0.30%</p> <p>Conditions and measures related to external recovery of waste</p> <ul style="list-style-type: none"> • All residues are recycled or handled and conveyed according to waste legislation.
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- 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.

Contributing scenario (2) controlling worker exposure

Product characteristic: see sections 3 (composition) & 9 (phys-chem properties) of SDS

- The concentration of ZnO in the mixtures can be up to >25% but is usually of the order of $\leq 5\%$, depending on the application.
- 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: Max 5000T/y = 20 T/d = 7T/shift depending on the application.

Frequency and duration of use/exposure: 8 hour shifts (default worst case) are assumed as starting point

Human factors not influenced by risk management

Uncovered body parts (potentially) face can be exposed as a result of the nature of the activity

Other given operational conditions affecting workers exposure

- Wet and dry processes
- All indoor processes in confined area. Reactors can be located outdoors; use of catalyst/absorbent in a closed system

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

- Local exhaust ventilation on mixing tanks, furnaces and other work areas with potential dust generation, dust capturing and removal techniques
- Process enclosures where appropriate

Technical conditions and measures to control dispersion from source towards the worker:

- Local exhaust ventilation systems and process enclosures are generally applied
- Cyclones/filters (for minimizing dust emissions): efficiency 70%-90% (cyclones); dust filters (50-80%)
- LEV in work area: efficiency 84% (generic LEV) is considered worst case; higher efficiencies are usual

Organisational measures to prevent /limit releases, dispersion and exposure:

In general integrated management systems are implemented at the workplace e.g. ISO 9000, ISO-ICS 13100, or alike, and are, when appropriate, IPPC-compliant.

Such management system would include general industrial hygiene practice e.g.:

- information and training of workers on prevention of exposure/accidents,
- procedures for control of personal exposure (hygiene measures)
- regular cleaning of equipment and floors, extended workers instruction-manuals
- procedures for process control and maintenance,...
- personal protection measures (see below)

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

- Wearing of 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 %)

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<ul style="list-style-type: none"> -dust filter-full mask P3 (efficiency 97.5%) • In particular, when PROC 7, 11, 19 are involved, respiratory protection is recommended • Eyes: safety glasses are optional
Exposure estimation and reference to its source: not relevant, refer to CSR
Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.
Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES
Occupational exposure/environmental emissions The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.). In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.)
GES ZnO-6: Industrial and professional use of solid substrates containing less than 25%w/w of ZnO.
SU: 0 (Nace C23.1., C23.4., F43.3.4.), 3, 5, 6b, 9, 10, 13, 16, 17,20, 22 PROC: 4, 5 ,6, 7, 8b, 9,10, 11, 13, 14, 19, 21, 22, 26 PC: 1, 8, 9a, 9b, 9c,14,15, 18, 19, 20, 21, 23, 28, 29, 33, 34, 35, 39, 0(UCN F40000, G15000) AC: 1, 2, 4, (Taric 6813.81, 6911), 0 (coatings for art and creative items) ERC: 2, 4, 5, 8a, 8d, 10a, 10b, 11a, 12a
This scenario covers both the industrial scale processes and professional use. In the described process, the ZnO 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.
Contributing scenario (1) controlling environmental exposure
Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS ZnO (or Zn compound) in the article is < 25%
Amounts used: Typical quantities for both Industrial and professional are 50T/y (typical), maximum 500T/y (in industrial setting). 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%).
Frequency and duration of use: Continuous production is assumed as a worst case.
Environment factors not influenced by risk management: Flow rate of receiving surface water default: 18,000 m3/d, unless specified otherwise
Other given operational conditions affecting environmental exposure <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: <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.

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

- In industrial and professional setting, the following applies:
 - 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%).
 - 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:

- In general emissions are controlled and prevented by implementing an integrated management system. This would involve:
 - 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

In cases where applicable: default size of the municipal STP (2000 m³/d), unless specified otherwise.

Conditions and measures related to external treatment of waste for disposal

If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Release to the floor, water and soil are to be prevented. If the zinc content of the waste is elevated enough, internal or external recovery/recycling might be considered. Fraction of daily/annual use expected in waste: zinc producers = 3.1% / zinc compound producers = 0.056% / downstream users = 0.30%

Conditions and measures related to external recovery of waste: All residues are recycled or handled and conveyed according to the waste legislation.

Contributing scenario (2) controlling worker exposure

Product characteristic: see sections 3 (composition) & 9 (phys-chem properties) of SDS

- The concentration of ZnO (or Zn compound) in the mixture is < 25%
- 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

- 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: 8 hour shifts (default worst case) are assumed as starting point

Human factors not influenced by risk management: Uncovered body parts (potentially) face can be exposed as a result of the nature of the activity

Other given operational conditions affecting workers exposure

Industrial / Professional:

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<ul style="list-style-type: none"> Dry processes: dry operational conditions throughout the process, no process waters; Indoor processes in confined area.
<p>Technical conditions and measures at process level (source) to prevent release</p> <p>Industrial /professional</p> <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
<p>Technical conditions and measures to control dispersion from source towards the worker</p> <p>Industrial /professional:</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)
<p>Organisational measures to prevent /limit releases, dispersion and exposure:</p> <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)
<p>Conditions and measures related to personal protection, hygiene and health evaluation:</p> <ul style="list-style-type: none"> 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.: <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%) Eyes: safety glasses are optional
<p>Exposure estimation and reference to its source: not relevant, refer to CSR</p>
<p>Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.</p>
<p>Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES</p>
<p>Occupational exposure/environmental emissions</p> <p>The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.).</p> <p>In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.)</p>

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

According to 1907/2006/EC (REACH-Directive)
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SU: 1, 3, 4, 5, 6, 9, 10, 11, 12, 13, 15, 17, 18, 19, 20, 22, 0 (Nace C22.1.1.)
 PROC: 1, 4, 5, 7, 8a, 8b, 9, 10, 11, 13, 14, 15, 17, 19, 21, 24
 PC: 1, 4, 8, 9a, 9b, 9c, 14,, 15, 18, 19, 20, 21, 24, 25, 28, 29, 31, 32, 33, 35, 39
 AC: 1, 2, 3, 5, 7, 10, 13, 0 (coatings for art and creative items)
 ERC: 5, 6d, 8a, 8c, 8d, 8f, 10a, 10b, 11a, 12a

This scenario covers both the industrial scale processes and professional use. In the described process, the ZnO containing preparation/mixture is further processed, involving potentially the following steps:

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

Contributing scenario (1) controlling environmental exposure

Product characteristics: see sections 3 (composition) & 9 (phys-chem properties) of SDS

ZnO (or Zn compound) in the article is <= 40%

Amounts used: Typical quantities for both industrial and professional are 50T/y (typical), maximum 500T/y (in industrial setting). The quantities involved in this scenario are 10-50 times smaller than in blending (GES 4 – GES 5).

Frequency and duration of use: Continuous production is assumed as a worst case

Environment factors not influenced by risk management: Flow rate of receiving surface water default: 18,000 m³/d, unless specified otherwise

Other given operational conditions affecting environmental exposure

- Wet processes. All process and non-process waters should be recycled internally to a maximal extent. Even when no process waters occur, some non-process water can be generated containing zinc (e.g. from cleaning)
- In industrial and professional setting, all processes are performed in a confined area. All residues containing zinc are recycled.

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

- In industrial and professional setting the following applies:
 - 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

- In industrial and professional setting, the following applies:
 - If zinc emissions to water, on-site waste water treatment techniques can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%).
 - By exposure modelling it is predicted that at use quantities of >100T/y, refinement of the exposure assessment to water and sediment needs to be made (exposure assessment based on real measured data and local parameters). Treatment of the emissions to water may be needed under such conditions (see “exposure estimation and risk characterisation”).
 - Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric or bag filters, wet scrubbers. This may create a general negative pressure in the building.

Organizational measures to prevent/limit release from site:

- In general, emissions are controlled and prevented by implementing an appropriate management system. This would involve:
 - information and training of workers,

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<ul style="list-style-type: none"> 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.
<p>Conditions and measures related to municipal sewage treatment plant: In cases where applicable, default size of the municipal STP (2000 m3/d), unless specified otherwise.</p>
<p>Conditions and measures related to external treatment of waste for disposal</p> <p>If any, all hazardous wastes are treated by certified contractors according to EU and national legislation. Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Release to the floor, water and soil are to be prevented. If the zinc content of the waste is elevated enough, internal or external recovery/recycling might be considered. Fraction of daily/annual use expected in waste: zinc producers = 3.1% / zinc compound producers = 0.056% / downstream users = 0.30%</p>
<p>Conditions and measures related to external recovery of waste</p> <p>All residues are recycled or handled and conveyed according to waste legislation.</p>
<p>Contributing scenario (2) controlling worker exposure</p>
<p>Product characteristic: see sections 3 (composition) & 9 (phys-chem properties) of SDS</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.
<p>Amounts used</p> <ul style="list-style-type: none"> 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. The quantities involved in this scenario are 10-50 times smaller than in blending (GES 4 – GES – 5).
<p>Frequency and duration of use/exposure: 8 hour shifts (default worst case) are assumed as starting point</p>
<p>Human factors not influenced by risk management</p> <p>Uncovered body parts, (potentially) face exposed as a result of the nature of the activity</p>
<p>Other given operational conditions affecting workers exposure</p> <p>Industrial / Professional: Wet processes, all indoor in confined area.</p>
<p>Technical conditions and measures at process level (source) to prevent release:</p> <p>Industrial /professional</p> <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
<p>Technical conditions and measures to control dispersion from source towards the worker</p> <p>Industrial /professional:</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)
<p>Organisational measures to prevent /limit releases, dispersion and exposure:</p> <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

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- procedures for process control and maintenance,...
- personal protection measures (see below)

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

- 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

Exposure estimation and reference to its source: not relevant, refer to CSR

Risks for workers and to the environment have to be assessed considering the PNECs and DNELs mentioned under SDS sections 8.1.

Guidance to DU to evaluate whether he works inside the boundaries set by the (G)ES

Occupational exposure/environmental emissions

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). Environmental and human exposure can be measured or modelled (more information on tools available in SDS section 8.1.).

In addition, bioavailability corrections can be integrated in the exposure assessment, if the environmental parameters that are needed for the calculations are documented (see SDS section 8.1.)