

**Safety Data Sheet according to Regulation (EC)
No. 1907/2006 (REACH)**

Printed 06.12.2017
revision 30.11.2017 (GB) Version 16.0

Sulphur dioxide
0800 - 0805, 70080



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

1.1. Product identifier

Name of product	Sulphur dioxide Art-Nr(n): 0800 - 0805, 70080
Name of substance	sulphur dioxide
Index No	016-011-00-9
EC No	231-195-2
REACH registration number	01-2119485028-34
CAS No	7446-09-5

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

Identified uses

Sector of uses [SU]

SU10 - Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
SU13 - Manufacture of other non-metallic mineral products, e.g. plasters, cement
SU14 - Manufacture of basic metals, including alloys
SU15 - Manufacture of fabricated metal products, except machinery and equipment
SU22 - Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites
SU4 - Manufacture of food products
SU6b - Manufacture of pulp, paper and paper products
SU8 - Manufacture of bulk, large scale chemicals (including petroleum products)
SU9 - Manufacture of fine chemicals

Product categories [PC]

PC14 - Metal surface treatment products, including galvanic and electroplating products
PC15 - Non-metal-surface treatment products
PC16 - Heat transfer fluids
PC19 - Intermediate
PC20 - Products such as ph-regulators, flocculants, precipitants, neutralisation agents
PC21 - Laboratory chemicals
PC26 - Paper and board dye, finishing and impregnation products: including bleaches and other processing aids
PC29 - Pharmaceuticals
PC37 - Water treatment chemicals

Process categories [PROC]

PROC1 - Use in closed process, no likelihood of exposure
PROC2 - Use in closed, continuous process with occasional controlled exposure
PROC3 - Use in closed batch process (synthesis or formulation)
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5 - Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC22 - Potentially closed processing operations with minerals/metals at elevated temperature; industrial setting
PROC23 - Open processing and transfer operations with minerals/metals at elevated temperature
PROC19 - Hand-mixing with intimate contact and only PPE available

Environmental release categories [ERC]

ERC7 - Industrial use of substances in closed systems
ERC2 - Formulation of preparations (mixtures)
ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles
ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates)

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ERC6b - Industrial use of reactive processing aids

ERC6d - Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers

Recommended intended purpose(s)

Basic substance.

Food additive.

1.3. Details of the supplier of the safety data sheet

Manufacturer/distributor

GHC Gerling, Holz & Co. Handels GmbH
Ruhrstraße 113, D-22761 Hamburg
Phone +49 40 853 123-0, Fax +49 40 853 123-66
E-Mail hamburg@ghc.de
Internet www.ghc.com

Advice

GHC Gerling, Holz & Co. Handels GmbH
Phone +49 40 853 123-0
Fax +49 40 853 123-66
E-mail (competent person):
msds@ghc.de

1.4. Emergency telephone number

Emergency advice

Giftinformationszentrum (Poison Control Centre) Mainz
Phone +49 6131 19240

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [CLP/GHS]

Hazard classes and Hazard categories	Hazard Statements	Classification procedure
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Liquef. Gas	H280
Acute Tox. 3	H331
Skin Corr. 1B	H314

Hazard statements for physical hazards

H280 Contains gas under pressure; may explode if heated.

Hazard statements for health hazards

H314 Causes severe skin burns and eye damage.

H331 Toxic if inhaled.

Additional hints

Listed substance (Regulation (EC) No 1272/2008, Annex VI, part 3).

2.2. Label elements

Labelling according to Regulation (EC) No 1272/2008 [CLP/GHS]



GHS05



GHS06

Signal word

Danger

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Hazard statements for physical hazards

H280 Contains gas under pressure; may explode if heated.

Hazard statements for health hazards

H314 Causes severe skin burns and eye damage.

H331 Toxic if inhaled.

Precautionary Statements

Prevention

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

Response

P303 + P361 + P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P315 Get immediate medical advice/attention.

Storage

P403 Store in a well-ventilated place.

P405 Store locked up.

Supplemental Hazard information (EU)

Health properties

Corrosive to the respiratory tract.

Special rules for supplemental label elements for certain mixtures

In case of use as a food additive: 'E 220', 'for food' and 'not for retail sale'.

2.3. Other hazards

Adverse human health effects and symptoms

Contact with liquid may cause cold burns/frostbite.

Information pertaining to special dangers for human and environment

Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

Results of PBT and vPvB assessment

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

! SECTION 3: Composition/ information on ingredients

3.1. Substances

! Description

Content: > 99 %

CAS No 7446-09-5

sulphur dioxide

EC No 231-195-2

Index No 016-011-00-9

REACH registration number 01-2119485028-34

3.2. Mixtures

not applicable

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! SECTION 4: First aid measures

4.1. Description of first aid measures

General information

Remove contaminated soaked clothing immediately.
Adhere to personal protective measures when giving first aid.
Seek medical advice immediately.

In case of inhalation

Remove the casualty into fresh air and keep him immobile.
In case of breathing difficulties give oxygen.
In the event of pulmonary irritation treat initially with corticoid spray, e.g. Ventolair- or Pulmicort- metered-dose aerosol (Ventolair and Pulmicort are registered trademarks).
Seek medical treatment immediately.
In case of respiratory standstill give artificial respiration by respiratory bag (Ambu bag) or respirator. Send for a doctor.

! In case of skin contact

In case of contact with skin wash off with warm water.
In case of frostbite spray with lukewarm (not hot) water for at least 15 minutes. Do not remove clothing frozen to the skin. Thaw it with lukewarm water. Apply a sterile dressing. Obtain medical assistance.

In case of eye contact

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Call for a doctor immediately.

In case of ingestion

Ingestion is not considered a potential route of exposure.

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

! Physician's information / possible symptoms

Coughing
Respiratory depression

Physician's information / possible dangers

Risk of pulmonary oedema

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

Treatment (Advice to doctor)

Continue to monitor for pneumonia and pulmonary oedema.
Symptoms may not occur until several hours.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media

Product does not burn, fire-extinguishing activities according to surrounding.
Foam
Dry powder
Carbon dioxide
Water spray jet

Unsuitable extinguishing media

Full water jet

5.2. Special hazards arising from the substance or mixture

In case of fire formation of dangerous gases possible.
In the event of fire the following can be released:
Sulfur oxide

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5.3. Advice for firefighters

Special protective equipment for fire-fighters

Use breathing apparatus with independent air supply (isolated).
Wear full protective clothing.

Additional information

Cool endangered containers with water spray jet.
Exposure to fire may cause containers to rupture / explode.
Fire residues and contaminated firefighting water must be disposed of in accordance with the local regulations.
Collect contaminated firefighting water separately, must not be discharged into the drains.

! SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

! For non-emergency personnel

Evacuate area.
Keep people away and stay on the upwind side.

! For emergency responders

Remove persons to safety.
Personal protection by wearing close-fitting protective clothing and breathing apparatus.

6.2. Environmental precautions

Do not discharge into the drains or bodies of water..
Collect contaminated water / firefighting water separately.
If possible, stop flow of product.
Prevent spread over a wide area (e.g. by containment or oil barriers).
If necessary, secure leaky pressure receptacles in a salvage packaging.
Suppress gases/vapours/mists with water spray jet
Do not discharge into the subsoil/soil.

6.3. Methods and material for containment and cleaning up

Ensure adequate air ventilation.
Flush away residues with water.
Dispose of contaminated material in accordance with regulations.

Additional Information

No water on the leaks.

6.4. Reference to other sections

Safe handling: see section 7
Personal protection equipment: see section 8

! SECTION 7: Handling and storage

7.1. Precautions for safe handling

! Advice on safe handling

Use only in thoroughly ventilated areas.
Transfer and handle only in enclosed systems.
Containers' temperature may not be increased above 50 °C.
Do not heat with open flames.
The working pressure in the receptacle must not exceed 2/3 of the test pressure of the pressure receptacle.
Provide good room ventilation even at ground level (vapours are heavier than air).
Prevent cylinders from falling over.
Ensure valve outlet cap nut or plug is correctly fitted.
Ensure valve protection device is correctly fitted.
Open valve slowly to avoid pressure shock.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature.

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Do not allow backfeed into the container.
Suck back of water into the container must be prevented.
Keep valves and fittings free from oil and grease.
No water to valves, flanges and other fittings.
Purging of pipes and valves with inert gases - to avoid: water, solvents.

General protective measures

Do not inhale gases/vapours/aerosols.

Hygiene measures

At work do not eat, drink, smoke or take drugs.
Wash hands before breaks and after work.

! Advice on protection against fire and explosion

The product is not combustible.
Pay attention to general rules of internal fire prevention.

7.2. Conditions for safe storage, including any incompatibilities

! Requirements for storage rooms and vessels

Keep in closed original container.
Ventilate store-rooms thoroughly.
Use transportable pressure equipment.
Suitable materials: Normalised carbon steel, tempered alloy steel, aluminium alloys, austenitic stainless steels.
Valve: Suitable materials: Brass, copper alloys, carbon steels, aluminium alloys, austenitic stainless steels.
Other material details see ISO 11114.
All regulations and local requirements for the storage of containers have to be respected.

! Advice on storage compatibility

Do not store with spontaneously flammable materials.
Do not store together with combustible liquids or combustible solids.
Do not store together with animal feedstuffs.
Do not store together with explosives.
Do not store together with infectious substances.
Do not store together with radioactive material.
Do not store together with toxic liquids or toxic solids.
Do not store together with food.
Do not store together with oxidizing liquids or oxidizing solids.

! Further information on storage conditions

Ensure valve protection device is correctly fitted.
Store closed container at cool and aired place.
Store only in original container at temperature of 50 °C maximum (=122 °F).
Prevent cylinders from falling over.
Protect of heat.

7.3. Specific end use(s)

! Recommendation(s) for intended use

Exposure scenarios (ES) see annex to this safety data sheet.
Use in foods in accordance with regulation (EC) No 178/2002 laying down the general principles and requirements of food law and regulation (EC) No 1333/2008 on food additives.

! SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ingredients with occupational exposure limits to be monitored

CAS No	Name	Code	[mg/m3]	[ppm]	Remark
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**Ingredients with occupational exposure limits to be monitored (continued)**

CAS No	Name	Code	[mg/m3]	[ppm]	Remark
7446-09-5	Sulfur dioxide	PEL, 8 hours	13	5	OSHA (USA)
7446-09-5	Sulfur dioxide	REL, 8 hours	5	2	NIOSH (USA)
		Short-term	13	5	
7446-09-5	Sulfur dioxide	TLV, 8 hours		2	ACGIH (USA)
		Short-term		5	

DNEL-/PNEC-values**DNEL worker**

CAS No	Substance name	Value	Code	Remark
7446-09-5	sulphur dioxide	1,3 mg/m3	DNEL long-term inhalative (local)	
		2,7 mg/m3	DNEL acute inhalative (local)	

DNEL Consumer

CAS No	Substance name	Value	Code	Remark
7446-09-5	sulphur dioxide	0,53 mg/m3	DNEL long-term inhalative (local)	

8.2. Exposure controls**Respiratory protection**

Short term: filter apparatus, filter E

Breathing apparatus in the event of high concentrations.

Keep self contained breathing apparatus readily available for emergency use.

In case of rescue and maintenance activities in storage containers use environment-independent breathing apparatus because of risk of suffocation by edging out of air oxygen

Hand protection

Leather gloves

Protective gloves complying with EN 374.

In case of increased risk: Protective gloves made of CR.

Eye protection

Safety goggles complying with EN 166, in case of increased risk add protective face shield

Safety goggles with side protection complying with EN 166.

! Other protection measures

Safety shoes with steel toe.

Body covering work clothing, or chemical resistant suit at increased risk.

Limitation and surveillance of the environment

PNEC: not required, because the substance is gaseous.

Appropriate engineering controls

Transfer and handle only in enclosed systems.

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

compressed liquified gas

Colour

colourless

Odour

pungent

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Odour threshold

0,75 - 8 mg/m³

Important health, safety and environmental information

	Value	Temperature	at	Method	Remark
pH value	not applicable				
Acid number	not applicable				
boiling point	-10,05 °C		1013 hPa		
melting point	-75,5 °C				
Flash point	no				
Vapourisation rate	not determined				
Flammable (solid)	not applicable				
Flammability (gas)	no				
Ignition temperature	no				
Self ignition temperature	no				
Lower explosion limit	no				
Upper explosion limit	no				
Vapour pressure	3271 hPa	20 °C			
Relative density	1,46 g/cm ³	-10 °C			liquid phase
Bulk density	not applicable				
Vapour density	2,27	20 °C			air = 1
Solubility in water	114 g/l	20 °C			hydrolyses
Solubility/other	not determined				
Partition coefficient n-octanol/water (log P O/W)	not applicable				
Decomposition temperature	> 2000 °C				
Viscosity dynamic	0,304 mPa*s	20 °C			liquid phase

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	Value	Temperature	at	Method	Remark
Solvent content	not applicable				

Oxidising properties

no

Explosive properties

no

9.2. Other information

Product effects hygroscopic.

Vapours are heavier than air.

! SECTION 10: Stability and reactivity**10.1. Reactivity**

See section "Possibility of hazardous reactions".

10.2. Chemical stability

Gases/vapours, toxic

Stable under recommended conditions of use and storage (see section 7).

10.3. Possibility of hazardous reactions

Risk of explosion in contact with fluorine.

Reactions with alkalis.

Reactions with strong oxidising agents.

Violent reactions with ammonia.

Reactions with amines.

10.4. Conditions to avoid

Heat sources / heat - risk of bursting.

Humidity.

10.5. Incompatible materials**! Substances to avoid**

Amines

Fluorine

Strong oxidizing agents.

Water / moisture.

Alkalis.

Ammonia.

10.6. Hazardous decomposition productsSulphurous oxides (SO_x)

Oxygen

Thermal decomposition

Remark

Above 2000 °C.

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! SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity/Irritation/Sensitization

	Value/Validation	Species	Method	Remark
LD50 acute oral	not applicable			Study technically not feasible.
LD50 acute dermal	not applicable			Study technically not feasible.
LC50 acute inhalation	2520 ppm (1 h)	rat		
Skin irritation	strong corrosive			experiences
Eye irritation	strong corrosive			experiences
Skin sensitization				Study technically not feasible.
Sensitization respiratory system	non-sensitizing	Guinea pig		

Subacute Toxicity - Carcinogenicity

	Value	Species	Method	Validation
Subacute Toxicity	NOAEL 5 ppm (24 d) Sub-acute inhalation toxicity 2 h/d, 5 d/w	rat (male / female)		
Subchronic Toxicity	LOAEC 10 ppm (0,4 a) Inhalation 6 h/d, 5 d/w	Rat		
Chronic Toxicity	NOAEL 1 ppm (0,33 - 0,66 a) Inhalation 5 h/d, 5 d/w	Rat		
Mutagenicity		Mouse	OECD 474	No experimental information on genotoxicity in vitro and in vivo available.
Reproduction-Toxicity	NOAEL 30 ppm Inhalation.	Mouse	Directive 86/509/EEC	Indications of toxic effects are available from reproduction studies in animals.
Carcinogenicity				No indications of carcinogenic effects are available from long-term trials.

Specific target organ toxicity (single exposure)
no

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Specific target organ toxicity (repeated exposure)

no

Aspiration hazard

not applicable

Experiences made from practice

May cause frostbite.

! SECTION 12: Ecological information**12.1. Toxicity****Ecotoxicological effects**

Value	Species	Method	Validation
Fish			Study technically not feasible.
Daphnia			Study technically not feasible.
Algae			Study technically not feasible.

12.2. Persistence and degradability

Elimination rate	Method of analysis	Method	Validation
Physico-chemical degradability			no
Biological degradability	not applicable Inorganic product, cannot be eliminated from the water by biological purification processes.		
Biological eliminability	no Inorganic product, cannot be eliminated from the water by biological purification processes.		

12.3. Bioaccumulative potential

Bioaccumulation improbable.

Study not feasible for scientific reasons.

12.4. Mobility in soil

High mobility

Adsorption in the soil is not likely.

12.5. Results of PBT and vPvB assessment

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

12.6. Other adverse effects

Not known.

Behaviour in sewage plant

When low concentrations are discharged correctly into adapted biological sewage treatment plants, interference with the degradation activity of activated sludge is not likely.

Treat by state-of-the-art technology before discharging into drains.

Additional ecological information

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	Value	Method	Remark
COD	250 mg/l	calculated	
BOD	not determined		

General regulation

Do not allow uncontrolled leakage of product into the environment.
Product is not allowed to be discharged into the ground water or aquatic environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste code No.

16 05 04*

Name of waste

gases in pressure containers (including halons) containing hazardous substances

Wastes marked with an asterisk are considered to be hazardous waste pursuant to Directive 2008/98/EC on hazardous waste.

Recommendations for the product

Dispose of as hazardous waste.

Recommendations for packaging

Transportable pressure equipment (empty, residual pressure): Return to supplier / manufacturer.

SECTION 14: Transport information

	ADR/RID	IMDG	IATA-DGR
14.1. UN number	1079	1079	1079
14.2. UN proper shipping name	SULPHUR DIOXIDE	SULPHUR DIOXIDE	Sulphur dioxide
14.3. Transport hazard class(es)	2.3 (8)	2.3 (8)	2.3 (8)
14.4. Packing group	-	-	-
14.5. Environmental hazards	No	No	No

14.6. Special precautions for user

The protective measures listed in Sections 6, 7 and 8 of the Safety Data Sheet have to be considered.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

not applicable

No transport as bulk according IBC - Code.

Land and inland navigation transport ADR/RID

Hazard label(s) 2.3+8
tunnel restriction code C/D
Classification code 2TC

Marine transport IMDG

Ems: F-C, S-U

Air transport ICAO/IATA-DGR

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! SECTION 15: Regulatory information

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

Other regulations (EU)

Regulation (EC) No 1333/2008 on food additives.

Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances.

15.2. Chemical Safety Assessment

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

Exposure scenarios (ES) see annex to this safety data sheet.

! SECTION 16: Other information

Recommended uses and restrictions

National and local regulations concerning chemicals shall be observed.

Further information

All declarations of safety-data-sheet refer to pure substance.

The information contained herein is based on the state of our knowledge. It characterizes the product with regard to the appropriate safety precautions. It does not represent a guarantee of the properties of the product.

Indication of changes: "!" = Data changed compared with the previous version. Previous version: 15.1

! Sources of key data used

For the preparation of this safety data sheet, information from our suppliers as well as data from the "database of registered substances" of the European Chemicals Agency (ECHA) were used.

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**GERLING
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Exposure Scenario Format (1) addressing uses carried out by workers				
1. Title				
Free short title	Discharging and filling operations for trading and distributing purposes of sulphur dioxide (SO ₂)			
Systematic title based on use descriptor	SU3 (Industrial uses), SU10 PC19, PC21 (appropriate PROCs and ERCs are given in Section 2 below)			
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.			
2. Operational conditions and risk management measures				
Workplace	Involved tasks	Involved PROCs		
Connecting and disconnecting of flasks/barrels	discharging and filling operations (including formulation steps in closed systems)	1, 8a, 8b, 9		
Discharging and filling of road/rail tank cars	discharging and filling operations (including formulation steps in closed systems)	1, 8a, 8b, 9		
ERC 2	Formulation of preparations			
2.1 Control of workers exposure				
Product characteristic				
According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with liquid or gaseous substances the fugacity is based on the vapour pressure of that substance.				
Workplace	Use in preparation	Content in preparation	Physical form	Emission potential
All relevant workplaces	not restricted		liquefied gas	high
Amounts used				
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.				
Frequency and duration of use/exposure				
The exposure duration is not restricted for all applicable processes in this scenario.				
Human factors not influenced by risk management				
The safe use of the substance has been demonstrated by assuming a standard breathing volume of 10 m ³ /shift for workers. If doubts exist that the actual breathing volume exceeds this value on a regular basis, a refined exposure scenario may be required.				
Other given operational conditions affecting workers exposure				
Workplace	Room volume	Outdoors or indoors	Process temperature	Process pressure
All relevant workplaces	not considered relevant for occupational exposure assessment of the conducted processes		ambient	< 4,000 hPa
Technical conditions and measures at process level (source) to prevent release				
Workplace	Level of containment		Level of segregation	
All relevant workplaces	extracted (< 100 mbar) and tight fitting connections, closed system		For pre-cautionary reasons, it is suggested that workers leave the workplace after connecting/disconnecting if appropriate according the mode of operation. As far as technically feasible, use should be made of automated discharging respectively filling stations.	
Technical conditions and measures to control dispersion from source towards the worker				
Workplace	Level of separation	Localised controls (LC)	Specification of LC	Further information
All relevant workplaces	separation of workers is generally not required in the processes	integrated extraction devices	< 100 mbar	-

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Annex: Exposure scenarios

Organisational measures to prevent/limit releases, dispersion and exposure				
Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal hygiene practices, no eating and smoking at the workplace, unless otherwise stated below the wearing of standard working clothes and shoes.				
Conditions and measures related to personal protection, hygiene and health evaluation				
Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. Since sulphur dioxide has corrosive properties, the use of protective gloves is mandatory for all process steps. Respiratory equipment is only required if workers may be exposed to sulphur dioxide during "Discharging and filling of road/rail tank cars". For such situations an ABEK1 mask offering an assigned protection factor of 30 is required. Reference is given to the section "Selection of appropriate respiratory equipment" for a more detailed description of the requirements of personal protective equipment.				
2.2 Control of environmental exposure				
Product characteristics				
Gas				
Amounts used				
86,472 tonnes/year local downstream use volume (local worst-case tonnage is set equal to regional tonnage, regional tonnage = 10% of total EU production because it can reasonably be assumed that the downstream use industrial sites using SO ₂ are numerous and wide-spread throughout the EU)				
Frequency and duration of use				
365 days				
Technical conditions and measures at process level (source) to prevent release				
All processes are strictly closed.				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
None if emission to air < 7 tonnes/year. If emission to air > 7 tonnes/year, air emission abatement system should be used (e.g. wet or dry scrubber...) No emissions to water. In case of emissions to water, pH impact on the receiving water should be avoided, e.g. by neutralizing the effluent.				
Conditions and measures related to municipal sewage treatment plant				
Not applicable				
Conditions and measures related to external treatment of waste for disposal				
No solid waste				
Conditions and measures related to external recovery of waste				
No solid waste				
3. Exposure estimation and reference to its source				
Occupational exposure				
For the assessment of inhalation exposure, analogous data from the production of SO ₂ were used. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for sulphur dioxide of 0.5 ppm (1.3 mg/m ³).				
Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Connecting and disconnecting of flasks/barrels	analogous data	0.2 ppm (0.4)	Since sulphur dioxide has corrosive properties, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.	
Discharging and filling of road/rail tank cars	analogous data	0.03 ppm (0.07)		
Environmental emissions				
The predicted no effect concentration PNEC of SO ₂ in air is 6.65 µg/m ³ . Following a PEC _{regional air} of 1.035 µg/m ³ and a maximum RCR of 0.95, 7 tonnes/year (PEC 5.28 µg/m ³) is the maximum amount of SO ₂ that can be released. Consequently safe use can be demonstrated when emissions to air of SO ₂ do not exceed 7 tonnes/year.				

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Annex: Exposure scenarios

4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Occupational exposure

The downstream user (DU) works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the DU can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ehrc.de/mease.html) to estimate the associated exposure. It is noted that any given RPE and corresponding APFs in MEASE are related to their efficiency for protection against particles. Thus, for the current scenarios, the specific protection factor of an ABEK1 respiratory mask of 30 has to be applied manually by the user.

DNEL_{inhalation}: 0.5 ppm (1.3 mg/m³)

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 1 ppm (2.7 mg/m³). By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration may not be reduced.

Environmental emissions

The downstream user (DU) works inside the boundaries set by the ES if emission to air < 7 tonnes/year. If emission to air > 7 tonnes/year, air emission abatement system should be used (wet or dry scrubber...)

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Annex: Exposure scenarios

IU3: Industrial use of sulphur dioxide in the production of foundry cores (semi-closed process)

<i>Exposure Scenario Format (I) addressing uses carried out by workers</i>				
1. Title				
Free short title	Industrial use of sulphur dioxide (SO ₂) in the production of foundry cores (semi-closed process)			
Systematic title based on use descriptor	SU3 (Industrial uses), SU14 PC19 (appropriate PROCs and ERCs are given in Section 2 below)			
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.			
2. Operational conditions and risk management measures				
Workplace	Involved tasks		Involved PROCs	
Connecting and disconnecting of flasks/barrels	discharging operations (including formulation and processing steps in closed systems)		1, 8a, 8b, 9	
Discharging of road/rail tank cars	discharging operations (including formulation and processing steps in closed systems)		1, 8a, 8b, 9	
Manufacture of foundry cores (semi-closed process)	manual operations at core shooting machines, and finishing of foundry cores		2, 3, 8b	
ERC 2 ERC 6d	Formulation of preparation Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers			
2.1 Control of workers exposure				
Product characteristic				
According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with liquid or gaseous substances the fugacity is based on the vapour pressure of that substance.				
Workplace	Use in preparation	Content in preparation	Physical form	Emission potential
Connecting and disconnecting of flasks/barrels	not restricted		liquefied gas	high
Discharging of road/rail tank cars			liquefied gas	
Manufacture of foundry cores (semi-closed process)			liquefied gas / gaseous	
Amounts used				
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.				
Frequency and duration of use/exposure				
The exposure duration is not restricted for all applicable processes in this scenario.				
Human factors not influenced by risk management				
The safe use of the substance has been demonstrated by assuming a standard breathing volume of 10 m ³ /shift for workers. If doubts exist that the actual breathing volume exceeds this value on a regular basis, a refined exposure scenario may be required.				

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Other given operational conditions affecting workers exposure				
Workplace	Room volume	Outdoors or indoors	Process temperature	Process pressure
Connecting and disconnecting of flasks/barrels	not considered relevant for occupational exposure assessment of the conducted processes		ambient	< 4,000 hPa
Discharging of road/rail tank cars			ambient	< 4,000 hPa
Manufacture of foundry cores (semi-closed process)			not restricted	ambient
Technical conditions and measures at process level (source) to prevent release				
Workplace	Level of containment		Level of segregation	
Connecting and disconnecting of flasks/barrels	extracted (< 100 mbar) and tight fitting connections, closed system		For pre-cautionary reasons, it is suggested that workers leave the workplace after connecting/disconnecting if appropriate according the mode of operation. As far as technically feasible, use should be made of automated discharging respectively filling stations.	
Discharging of road/rail tank cars				
Manufacture of foundry cores (semi-closed process)	not required		segregation of the emission source is not required at this workplace	
Technical conditions and measures to control dispersion from source towards the worker				
Workplace	Level of separation	Localised controls (LC)	Specification / Efficiency of LC	Further information
Connecting and disconnecting of flasks/barrels	separation of workers is generally not required in the processes	integrated extraction devices	< 100 mbar	
Discharging of road/rail tank cars		integrated extraction devices	< 100 mbar	
Manufacture of foundry cores (semi-closed process)		local exhaust ventilation	90 % (ECETOC efficiency for PROC 2 & PROC 3)	
Organisational measures to prevent /limit releases, dispersion and exposure				
Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal hygiene practices, no eating and smoking at the workplace, unless otherwise stated below the wearing of standard working clothes and shoes.				
Conditions and measures related to personal protection, hygiene and health evaluation				
Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. Since sulphur dioxide has corrosive properties, the use of protective gloves is mandatory for all process steps. Respiratory equipment is required if workers may be exposed to sulfur dioxide during "Discharging of road/rail tank cars" and "Manufacture of foundry cores (semi-closed process)". For such situations an ABEK1 mask offering an assigned protection factor of 30 is required. Reference is given to the section "Selection of appropriate respiratory equipment" for a more detailed description of the requirements of personal protective equipment.				
2.2 Control of environmental exposure				
Product characteristics				
Gas				
Amounts used				
86,472 tonnes/year local downstream use volume (local worst-case tonnage is set equal to regional tonnage, regional tonnage = 10% of total EU production because it can reasonably be assumed that the downstream use industrial sites using SO2 are numerous and wide-spread throughout the EU)				
Frequency and duration of use				
365 days				
Technical conditions and measures at process level (source) to prevent release				
All processes are strictly closed.				

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Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
None if emission to air < 7 tonnes/year. If emission to air > 7 tonnes/year, air emission abatement system should be used (e.g. wet or dry scrubber...)				
No emissions to water. In case of emissions to water, pH impact on the receiving water should be avoided, e.g. by neutralizing the effluent.				
Conditions and measures related to municipal sewage treatment plant				
Not applicable				
Conditions and measures related to external treatment of waste for disposal				
No solid waste				
Conditions and measures related to external recovery of waste				
No solid waste				
3. Exposure estimation and reference to its source				
Occupational exposure				
For the assessment of inhalation exposure, measured data from the manufacture of foundry cores (semi-closed process) and analogous data from the production of SO ₂ were used. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for sulphur dioxide of 0.5 ppm (1.3 mg/m ³).				
Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Connecting and disconnecting of flasks/barrels	analogous data	0.2 ppm (0.4)	Since sulphur dioxide has corrosive properties, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.	
Discharging of road/rail tank cars	analogous data	0.03 ppm (0.07)		
Manufacture of foundry cores (semi-closed process)	measured data	0.41 ppm (0.82)		
Environmental emissions				
The predicted no effect concentration PNEC of SO ₂ in air is 6.65 µg/m ³ . Following a PEC regional air of 1.035 µg/m ³ and a maximum RCR of 0.95, 7 tonnes/year (PEC 5.28 µg/m ³) is the maximum amount of SO ₂ that can be released. Consequently safe use can be demonstrated when emissions to air of SO ₂ do not exceed 7 tonnes/year.				
4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES				
Occupational exposure				
The downstream user (DU) works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the DU can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. It is noted that any given RPE and corresponding APFs in MEASE are related to their efficiency for protection against particles. Thus, for the current scenarios, the specific protection factor of an ABEK1 respiratory mask of 30 has to be applied manually by the user. DNEL _{inhalation} : 0.5 ppm (1.3 mg/m ³) <u>Important note:</u> The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 1 ppm (2.7 mg/m ³). By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration may not be reduced.				
Environmental emissions				
The downstream user (DU) works inside the boundaries set by the ES if emission to air < 7 tonnes/year. If emission to air > 7 tonnes/year, air emission abatement system should be used (wet or dry scrubber...)				

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Exposure Scenario Format (I) addressing uses carried out by workers				
1. Title				
Free short title	Industrial use of sulphur dioxide (SO ₂) in the paper, sugar and starch industry, the production of pharmaceutical products, in industrial water treatment, glass coating/lubricate rollers in glass manufacture, in metal casting/mining/purification and as refrigerant agent			
Systematic title based on use descriptor	SU3 (Industrial uses), SU4, SU6b, SU8, SU9, SU10, SU13, SU14, SU15 PC14, PC15, PC19, PC20, PC26, PC29, PC37 (appropriate PROCs and ERCs are given in Section 2 below)			
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.			
2. Operational conditions and risk management measures				
Workplace	Involved tasks		Involved PROCs	
Connecting and disconnecting of flasks/barrels	discharging operations		1, 8a, 8b, 9	
Discharging of road/rail tank cars	discharging operations		1, 8a, 8b, 9	
Use of sulphur dioxide in closed processes	maintenance and supervision activities at closed systems		1	
Use of sulphur dioxide in semi-closed processes	such as: manual operations (e.g. sampling, additional dosing of fine chemicals), maintenance and use of sulphur dioxide as inert gas in metal alloy production and casting		2, 3, 4, 5, 8b, 22, 23	
ERC 2 ERC 4 ERC 6a ERC 6b	Formulation of preparation Industrial use of processing aids in processes and products, not becoming part of articles Industrial use resulting in manufacture of another substance (use of intermediates) Industrial use of reactive processing aids			
2.1 Control of workers exposure				
Product characteristic				
According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with liquid or gaseous substances the fugacity is based on the vapour pressure of that substance.				
Workplace	Use in preparation	Content in preparation	Physical form	Emission potential
Connecting and disconnecting of flasks/barrels	not restricted		liquefied gas	high
Discharging of road/rail tank cars			liquefied gas	
Use of sulphur dioxide in closed processes			liquefied gas / gaseous	
Use of sulphur dioxide in semi-closed processes			liquefied gas / gaseous	
Amounts used				
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.				
Frequency and duration of use/exposure				
The exposure duration is not restricted for all applicable processes in this scenario.				
Human factors not influenced by risk management				
The safe use of the substance has been demonstrated by assuming a standard breathing volume of 10 m ³ /shift for workers. If doubts exist that the actual breathing volume exceeds this value on a regular basis, a refined exposure scenario may be required.				

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Other given operational conditions affecting workers exposure				
Workplace	Room volume	Outdoors or indoors	Process temperature	Process pressure
Connecting and disconnecting of flasks/barrels	not considered relevant for occupational exposure assessment of the conducted processes		ambient	< 4,000 hPa
Discharging of road/rail tank cars			ambient	< 4,000 hPa
Use of sulphur dioxide in closed processes			not restricted	not restricted
Use of sulphur dioxide in semi-closed processes			not restricted	ambient
Technical conditions and measures at process level (source) to prevent release				
Workplace	Level of containment		Level of segregation	
Connecting and disconnecting of flasks/barrels	extracted (< 100 mbar) and tight fitting connections		For pre-cautionary reasons, it is suggested that workers leave the workplace after connecting/disconnecting if appropriate according the mode of operation. As far as technically feasible, use should be made of automated discharging respectively filling stations.	
Discharging of road/rail tank cars				
Use of sulphur dioxide in closed processes	closed system		not required	
Use of sulphur dioxide in semi-closed processes	not required		not required	
Technical conditions and measures to control dispersion from source towards the worker				
Workplace	Level of separation	Localised controls (LC)	Specification / Efficiency of LC	Further information
Connecting and disconnecting of flasks/barrels	separation of workers is generally not required in the processes	integrated extraction devices	< 100 mbar	
Discharging of road/rail tank cars		integrated extraction devices	< 100 mbar	
Use of sulphur dioxide in closed processes		not required	na	
Use of sulphur dioxide in semi-closed processes		local exhaust ventilation	90 % (ECETOC efficiency for PROC 2 & PROC 3)	
Organisational measures to prevent /limit releases, dispersion and exposure				
Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal hygiene practices, no eating and smoking at the workplace, unless otherwise stated below the wearing of standard working clothes and shoes.				
Conditions and measures related to personal protection, hygiene and health evaluation				
Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. Since sulphur dioxide has corrosive properties, the use of protective gloves is mandatory for all process steps. Respiratory equipment is required if workers may be exposed to sulphur dioxide during "Discharging of road/rail tank cars" and "Use of sulphur dioxide in semi-closed processes". For such situations an ABEK1 mask offering an assigned protection factor of 30 is required. Reference is given to the section "Selection of appropriate respiratory equipment" for a more detailed description of the requirements of personal protective equipment.				
2.2 Control of environmental exposure				
Product characteristics				
Gas, aqueous solution				
Amounts used				
86,472 tonnes/year local downstream use volume (local worst-case tonnage is set equal to regional tonnage, regional tonnage = 10% of total EU production because it can reasonably be assumed that the downstream use industrial sites using SO2 are numerous and wide-spread throughout the EU)				
Frequency and duration of use				
365 days				

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Technical conditions and measures at process level (source) to prevent release				
All processes are strictly closed.				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
None if emission to air < 7 tonnes/year. If emission to air > 7 tonnes/year, air emission abatement system should be used (e.g. wet or dry scrubber...) No emissions to water. In case of emissions to water, pH impact on the receiving water should be avoided, e.g. by neutralizing the effluent.				
Conditions and measures related to municipal sewage treatment plant				
Not applicable				
Conditions and measures related to external treatment of waste for disposal				
No solid waste				
Conditions and measures related to external recovery of waste				
No solid waste				
3. Exposure estimation and reference to its source				
Occupational exposure				
For the assessment of inhalation exposure, analogous data from the manufacture of foundry cores (semi-closed process), analogous data from the production of SO ₂ , and MEASE were used. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for sulphur dioxide of 0.5 ppm (1.3 mg/m ³).				
Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Connecting and disconnecting of flasks/barrels	analogous data	0.2 ppm (0.4)	Since sulphur dioxide has corrosive properties, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.	
Discharging of road/rail tank cars	analogous data	0.03 ppm (0.07)		
Use of sulphur dioxide in closed processes	MEASE	0.01 ppm (0.02)		
Use of sulphur dioxide in semi-closed processes	analogous data	0.41 ppm (0.82)		
Environmental emissions				
The predicted no effect concentration PNEC of SO ₂ in air is 6.65 µg/m ³ . Following a PEC _{regional} air of 1.035 µg/m ³ and a maximum RCR of 0.95, 7 tonnes/year (PEC 5.28 µg/m ³) is the maximum amount of SO ₂ that can be released. Consequently safe use can be demonstrated when emissions to air of SO ₂ do not exceed 7 tonnes/year.				
4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES				
Occupational exposure				
The downstream user (DU) works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the DU can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ehrt.de/mease.html) to estimate the associated exposure. It is noted that any given RPE and corresponding APFs in MEASE are related to their efficiency for protection against particles. Thus, for the current scenarios, the specific protection factor of an ABEK1 respiratory mask of 30 has to be applied manually by the user. DNEL _{inhalation} : 0.5 ppm (1.3 mg/m ³) Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 1 ppm (2.7 mg/m ³). By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration <u>may not</u> be reduced.				
Environmental emissions				
The downstream user (DU) works inside the boundaries set by the ES if emission to air < 7 tonnes/year. If emission to air > 7 tonnes/year, air emission abatement system should be used (wet or dry scrubber...)				

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Annex: Exposure scenarios

*Professional IU1 & IU2: Professional use of sulphur dioxide in
winemaking/refilling of refrigeration equipment*

Exposure Scenario Format (1) addressing uses carried out by workers				
1. Title				
Free short title	Professional use of sulphur dioxide (SO ₂) in winemaking/refilling of refrigeration equipment			
Systematic title based on use descriptor	SU22 (Professional uses) PC16, PC19 (appropriate PROCs and ERCs are given in Section 2 below)			
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.			
2. Operational conditions and risk management measures				
Workplace/Involved tasks	Involved PROCs			
Connecting and disconnecting of flasks/barrels	8a, 8b, 9			
Manual dosing of sulfur dioxide from flasks into wine casks/refrigeration equipment	8a, 8b, 9, 19 (dosing by the use of special sulphur dioxide dosing tools)			
ERC 6a ERC 7	Industrial use resulting in manufacture of another substance (use of intermediates) Industrial use of substances in closed systems			
2.1 Control of workers exposure				
Product characteristic				
According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with liquid or gaseous substances the fugacity is based on the vapour pressure of that substance.				
Workplace/Involved tasks	Use in preparation	Content in preparation	Physical form	Emission potential
All relevant workplaces	not restricted		liquefied gas	high
Amounts used				
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.				
Frequency and duration of use/exposure				
Workplace/Involved tasks	Duration of exposure			
Connecting and disconnecting of flasks/barrels	480 minutes (not restricted)			
Manual dosing of sulphur dioxide from flasks into wine casks/refrigeration equipment	< 15 minutes (not considered during exposure assessment because of existing acute effects of sulphur dioxide but pre-scribed for pre-cautionary reasons)			
Human factors not influenced by risk management				
The safe use of the substance has been demonstrated by assuming a standard breathing volume of 10 m ³ /shift for workers. If doubts exist that the actual breathing volume exceeds this value on a regular basis, a refined exposure scenario may be required.				
Other given operational conditions affecting workers exposure				
Workplace/Involved tasks	Room volume	Outdoors or indoors	Process temperature	Process pressure
Connecting and disconnecting of flasks/barrels	not considered relevant for occupational exposure assessment of the conducted processes		ambient	< 4,000 hPa
Manual dosing of sulphur dioxide from flasks into wine casks/refrigeration equipment	wine cellars/refrigerating facilities	not restricted		

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Technical conditions and measures at process level (source) to prevent release				
Workplace/Involved tasks	Level of containment		Level of segregation	
Connecting and disconnecting of flasks/barrels	extracted (< 100 mbar) and tight fitting connections		For pre-cautionary reasons, it is suggested that workers leave the workplace after connecting/disconnecting if appropriate according the mode of operation. As far as technically feasible, use should be made of automated discharging respectively filling stations.	
Manual dosing of sulphur dioxide from flasks into wine casks/refrigeration equipment	not required		When not used, flasks should be safely stored (preferably in a separate room) according to manufacturer's instructions.	
Technical conditions and measures to control dispersion from source towards the worker				
Workplace/Involved tasks	Level of separation	Localised controls (LC)	Specification of LC	Further information
Connecting and disconnecting of flasks/barrels	separation of workers is generally not required in the processes	integrated extraction devices	< 100 mbar	-
Manual dosing of sulphur dioxide from flasks into wine casks/refrigeration equipment		not required	na	
Organisational measures to prevent /limit releases, dispersion and exposure				
Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal hygiene practices, no eating and smoking at the workplace, unless otherwise stated below the wearing of standard working clothes and shoes.				
Conditions and measures related to personal protection, hygiene and health evaluation				
Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. Since sulphur dioxide has corrosive properties, the use of protective gloves is mandatory for all process steps. Respiratory equipment is not required for the workplaces defined in this exposure scenario. Reference is given to the section "Selection of appropriate respiratory equipment" for a more detailed description of the requirements of personal protective equipment.				
2.2 Control of environmental exposure				
Product characteristics				
Gas, aqueous solution				
Amounts used				
86,472 tonnes/year local downstream use volume (local worst-case tonnage is set equal to regional tonnage, regional tonnage = 10% of total EU production because it can reasonably be assumed that the downstream use industrial sites using SO2 are numerous and wide-spread throughout the EU)				
Frequency and duration of use				
365 days				
Technical conditions and measures at process level (source) to prevent release				
All processes are strictly closed.				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
None if emission to air < 7 tonnes/year. If emission to air > 7 tonnes/year, air emission abatement system should be used (e.g. wet or dry scrubber...) No emissions to water. In case of emissions to water, pH impact on the receiving water should be avoided, e.g. by neutralizing the effluent.				
Conditions and measures related to municipal sewage treatment plant				
Not applicable				
Conditions and measures related to external treatment of waste for disposal				
No solid waste				

**Safety Data Sheet according to Regulation (EC)
No. 1907/2006 (REACH)**

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Sulphur dioxide
0800 – 0805, 70080

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Annex: Exposure scenarios

Conditions and measures related to external recovery of waste				
No solid waste				
3. Exposure estimation and reference to its source				
Occupational exposure				
For the assessment of inhalation exposure, analogous data from the production of SO ₂ were used and doubled for pre-cautionary reasons. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for sulfur dioxide of 0.5 ppm (1.3 mg/m ³).				
Workplace/Involved tasks	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Connecting and disconnecting of flasks/barrels	analogous data	0.4 ppm (0.8)	Since sulphur dioxide has corrosive properties, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.	
Manual dosing of sulphur dioxide from flasks into wine casks/refrigeration equipment	analogous data	0.4 ppm (0.8)		
Environmental emissions				
The predicted no effect concentration PNEC of SO ₂ in air is 6.65 µg/m ³ . Following a PEC regional air of 1.035 µg/m ³ and a maximum RCR of 0.95, 7 tonnes/year (PEC 5.28 µg/m ³) is the maximum amount of SO ₂ that can be released. Consequently safe use can be demonstrated when emissions to air of SO ₂ do not exceed 7 tonnes/year.				
4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES				
Occupational exposure				
The downstream user (DU) works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the DU can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ehrc.de/mease.html) to estimate the associated exposure. It is noted that any given RPE and corresponding APFs in MEASE are related to their efficiency for protection against particles. Thus, for the current scenarios, the specific protection factor of an ABEK1 respiratory mask of 30 has to be applied manually by the user. DNEL_{inhalation}: 0.5 ppm (1.3 mg/m ³) Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 1 ppm (2.7 mg/m ³). By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration <u>may not</u> be reduced.				
Environmental emissions				
The downstream user (DU) works inside the boundaries set by the ES if emission to air < 7 tonnes/year. If emission to air > 7 tonnes/year, air emission abatement system should be used (wet or dry scrubber...)				