

LIQUID SULPHUR

Compilation date: 15.09.1999 / Revision: 22.09.2025

Version: 3

SAFETY DATA SHEET

in accordance with EU regulation REACH

Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. PRODUCT IDENTIFIER

EC name	SULPHUR
Index No	016-094-00-1
Registration No	01-2119487295-27-0009
Trade name	Liquid sulphur
EC No	231-722-6
CAS No	7704-34-9

1.2. RELEVANT IDENTIFIED USES OF THE SUBSTANCE OR MIXTURE AND USES ADVISED AGAINST

Industrial uses

Identified use	Process Category [PROC]	Product category [PC]	Sector of use [SU]	Article category [AC]	Environmental release category [ERC]
Industrial					
01 – Manufacture of the substance	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15, PROC28	–	–	–	ERC1
01b – Use of intermediate	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15, PROC22, PROC23, PROC28	–	SU8, SU9	–	ERC6a
02 – Formulation & (re)packing of substances and mixtures	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15, PROC23, PROC24, PROC28	–	–	–	ERC2
10a – Use as antiadhesive or sealant (industrial)	PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC10, PROC13, PROC14, PROC28	PC9a, PC9b, PC9c, PC14, PC15, PC20, PC24	–	–	ERC4
19 – Manufacture and processing of rubber (industrial)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC15, PROC21, PROC28	PC20, PC32	SU11	–	ERC4
Professional					
10b – Use as antiadhesive or sealant (professional)	PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC10, PROC13, PROC14, PROC28	PC9a, PC9b, PC9c, PC14, PC15, PC20, PC24	–	–	ERC8a, ERC8d
11a – Use in agricultural chemistry (professional)	PROC1, PROC2, PROC4, PROC8a, PROC8b, PROC11, PROC13, PROC28	PC8, PC12, PC27	–	–	ERC8a, ERC 8d,
Consumer					
11b – Use in agricultural	–	PC12,	–	–	ERC8a, ERC8d

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chemistry (consumer)		PC27			
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List of descriptors

- PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
- PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
- PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
- PROC4 Chemical production where opportunity for exposure arises
- PROC5 Mixing or blending in batch processes
- PROC6 Calendering operations
- PROC7 Industrial spraying
- PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
- PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities
- PROC9 Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
- PROC10 Roller application or brushing
- PROC11 Non industrial spraying
- PROC13 Treatment of articles by dipping and pouring
- PROC14 Tableting, compression, extrusion, pelletisation, granulation
- PROC15 Use as laboratory reagent
- PROC21 Low energy manipulation and handling of substances bound in/on materials or articles
- PROC22 Manufacturing and processing of minerals and/or metals at substantially elevated temperature
- PROC23 Open processing and transfer operations at substantially elevated temperature
- PROC24 High (mechanical) energy work-up of substances bound in /on materials and/or articles
- PROC28 Manual maintenance (cleaning and repair) of machinery
- PC8 Biocidal products
- PC9a Coatings and paints, thinners, paint removers
- PC9b Fillers, putties, plasters, modelling clay
- PC9c Finger paints
- PC12 Fertilizers
- PC14 Metal surface treatment products
- PC15 Non-metal-surface treatment products
- PC20 Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents
- PC24 Lubricants, greases, release products
- PC27 Plant protection products
- PC32 Polymer preparations and compounds
- ERC 1 Manufacture of the substance
- ERC 2 Formulation into mixture
- ERC 4 Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
- ERC 6a Use of intermediate
- ERC 8a Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor)
- ERC 8d Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)
- SU8 Manufacture of bulk, large scale chemicals (including petroleum products)
- SU9 Manufacture of fine chemicals
- SU11 Manufacture of rubber products

Uses advised against

Other uses than those listed above are not recommended, unless additional assessment is made before use to show that the use is controlled. The additional assessment is a responsibility of an individual registrant.

1.3. DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer ORLEN S.A.
09-411 Płock, ul. Chemików 7, Poland
Telephone no.: (+48 24) 365 00 00
Fax no.: (+48 24) 365 45 55
Telephone no.: (+48 24) 365 35 24
e-mail: reach@orlen.pl (an e-mail address for a competent person responsible for the safety data sheet)

1.4. EMERGENCY TELEPHONE NUMBER

Company Fire Brigade 19 998
The National Emergency Centre for the Transport of Dangerous Goods - SPOT
- Telephone no.: (+48 24) 365 70 32 and (+48 24) 365 70 33 (available 24h)
- e-mail straz.pozarna@orlen.pl

Section 2: HAZARDS IDENTIFICATION

2.1. CLASSIFICATION OF THE SUBSTANCE OR MIXTURE**According to Regulation (EC) no. 1272/2008 (CLP)**Physicochemical hazards

Not classified as hazardous.

Health hazards

Skin Irrit. 2 H315 Causes skin irritation.

Environmental hazards

Not classified as hazardous.

2.2. LABEL ELEMENTS**Hazard pictogram(s)**

GHS07

Signal word Warning**Hazard statement(s)**

H315 Causes skin irritation.

Precautionary statement(s)Prevention

P280 Wear protective gloves/protective clothing/eye protection/face protection.

Response

P302 + P352 IF ON SKIN: Wash with plenty of water and soap.

P332 + P313 If skin irritation occurs: Get medical advice/attention.

Storage

-

Disposal

-

2.3. OTHER HAZARDS

Sulphur is a combustible substance, but it does not meet classification criteria and is not classified as hazardous due to flammable properties.

Molten sulphur poses serious hazard due to its high melting point (113-120°C). Direct contact with molten sulphur causes strong thermal burns.

Sulphur has low acute toxicity. It is essential element in metabolic processes of all living organisms.

Vapour being released from molten sulphur may cause irritation of eyes and respiratory tract.

NOTE: Molten sulphur may release highly toxic hydrogen sulphide and irritating sulphur dioxide (SO₂).

Sulphur dust and air may form explosive mixtures.

PBT/vPvB assessment is not required for inorganic substances.

The product does not contain components that are included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. SUBSTANCES**Main component identification**EC name **Sulphur > 99,95 %**

Synonyms Liquid sulphur

CAS No	7704-34-9
EC No	231-722-6
Index No	016-094-00-1
IUPAC name	Sulphur
Chemical formula	S
Molecular weight	32,065
Classification	See section 2 of the safety data sheet

Impurities

Molten sulphur may contain up to 10 ppm of hydrogen sulfide

3.2. MIXTURES

Not applicable.

Section 4: FIRST AID MEASURES

4.1. DESCRIPTION OF FIRST AID MEASURES**General recommendations**

Consider your safety and health as priority – use self-contained breathing apparatus while providing first aid in places where sulphur oxide or hydrogen sulfide may potentially occur, especially in confined or poorly ventilated area; if providing first aid in a place where contact with molten sulphur may occur, use protective heat resistant clothing (overall or apron, gloves, shoes).

Do not induce vomiting and do not give anything by mouth to an unconscious person. Do not leave the victim unattended.

Inhalation

Immediately remove the victim to fresh air. In case of breathing disorders, if possible, administer oxygen. If not breathing, start artificial respiration (do not use mouth-to-mouth method). Consult a doctor, if breathing disorders persist or you feel unwell.

NOTE: If hydrogen sulfide intoxication is suspected, obtain medical aid immediately. The rescuer should wear a breathing apparatus and follow safety procedures. Immediately remove the victim to fresh air. If not breathing, apply artificial breathing, oxygen may be administered.

Contact with skin

Take off contaminated clothing and boots. Wash contaminated skin with water and soap. If irritation, swelling or redness appear, consult a doctor. If in contact with molten material, take off contaminated clothing immediately.

Do not attempt to remove molten or solidified sulphur from the skin. Hold burned skin under cool running water for at least 5 minutes or until pain subsides or, if possible, immerse in cool water until sulphur solidifies. Avoid hypothermia. Obtain medical aid immediately in order to remove solidified sulphur.

NOTE: Do not remove solidified sulphur from the skin.

Contact with eyes

Immediately rinse contaminated eyes with plenty of water for 15 minutes holding the eyelids open. Remove contact lenses, if present, and continue rinsing. Cover the eye with sterile dressing using sterile procedure. Do not rub, if dust gets into the eye as this can cause mechanical damage of the cornea. If irritation, blurred vision or swelling occurs and persists, consult an ophthalmologist.

If hot product splashes into the eye, immediately rinse eyes with plenty of cool water. Immediately consult an ophthalmologist.

Ingestion

Do not induce vomiting. Consult a doctor. When molten sulphur accidentally gets into one's mouth, flush mouth with cool water and consult a doctor.

4.2. MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Inhalation	Irritation of the upper respiratory tract.
Contact with skin	Skin irritation. Direct contact with molten sulphur causes skin redness, burning, pain, thermal burns.
Contact with eyes	It may cause eye mucosa irritation, splashing of molten sulphur into the eye may cause thermal burns and eye damage.

Ingestion It has a laxative effect. If molten sulphur gets to the mouth, it causes burns to the mouth and digestive tract.

See also Section 11 of the safety data sheet.

4.3. INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

Get immediate medical advice/attention in case of skin or eye burns or disturbing symptoms appear after exposure to dust..

Typical treatment for thermal burns and/or treat symptomatically.

Show the safety data sheet, label or packaging to a medical personnel providing first aid.

Section 5: FIREFIGHTING MEASURES

General recommendations

Inform others about fire; all persons not directly involved with the operation should remain clear of the area; order evacuation if necessary; call the rescue teams, the Fire Brigade and the State Police.

5.1. EXTINGUISHING MEDIA

Suitable Extinguishing Media: carbon dioxide, dry chemical powder, earth, sand, specifically trained personnel may use water spray, foam, inert gases.

NOTE: water spray may cause splashing of burning sulphur; simultaneous use of foam and water on the same surface should be avoided as water destroys the foam

Unsuitable Extinguishing Media: water jets.

A liquid sulfur fire can be extinguished quickly by closing the tank and cutting off the oxygen supply.

5.2. SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

Dust clouds may present an explosion hazard. They may be ignited by heat, sparks, static electricity or flames.

The flames generated by the burning product are short, dark blue coloured at night and invisible in the daylight, with the exception of the fume and the heat. The burning material acquires a dark red-black colour.

Combustion products include sulphur oxides (SO₂ and SO₃); hydrogen sulfide may be generated(H₂S). Avoid breathing combustion products, it can be hazardous to your health.

5.3. ADVICE FOR FIREFIGHTERS

Follow the guidelines for the fire extinguishment of chemicals. Extinguish large fire from a safe distance, behind shields, using a remote sprinkler system or unmanned water jets.

Keep a safe distance from a fire, stay upwind.

Cool down imperiled containers with water spray from a safe distance (risk of explosion); if **possible and safe** remove from a danger zone and continue spraying until containers are cooled down.

NOTE: Do not allow water to get inside the containers.

Prevent from entering contaminated water and other extinguishing agents into sewage system and water. Dispose of waste water in compliance with current legislation.

People should be properly trained and equipped with protective clothing and a self-contained breathing apparatus (SCBA).

Section 6: ACCIDENTAL RELEASE MEASURES

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Inform others about fire; all persons not directly involved with the operation should remain clear of the area; order evacuation if necessary; call the rescue teams, the Fire Brigade and the State Police.

Avoid direct prolonged contact with the released molten sulphur – risk of serious thermal burns. Avoid eye contamination.

Avoid breathing dust/fume/vapours. Provide adequate ventilation if released in confined area.

Avoid generation and spreading of dust that cause fire and explosion hazard.

When the presence of dangerous amounts of SO₂ or H₂S around the spilled product is suspected or proved, use additional special protection equipment, procedures and personnel training.

Observe recommended precautions, use adequate personal protective equipment: small spillages: antistatic working clothe; large spillages - full body suit of chemically resistant and antistatic material. Wear protective

gloves (Note: gloves made of PVA are not water-resistant, and are not suitable for emergency use), work helmet, antistatic, non-skid safety shoes, goggle or face shield, a half mask with dust filter, a full face respirator with filter(s) for organic vapours. If contact with molten sulphur, all PPE items should be heat-resistant and thermally insulated.

Remove all sources of ignition – sparks, electricity do not use open flame, do not smoke etc.

6.2. ENVIRONMENTAL PRECAUTIONS

Prevent molten sulphur from entering sewers, water or soil (solidified sulphur may clog drains and sewers). If possible and safe, eliminate or limit the leakage (seal the leakage, close liquid supply). Construct a dike to prevent spreading.

Inform relevant authorities, if released large quantities of the product and contamination of the environment (OHS services, rescue services, environmental protection services, administrative authorities).

6.3. METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Soil: Let molten material cool naturally. Cautiously use water fog to help the cooling. Do not use direct jets of water. If necessary dike the molten product with earth, sand or similar non-combustible material.

Spillages in water: Let molten material cool naturally. The product is heavier than water. Fine dust may float on water. Do not use solvents or dispersants, unless specifically advised by an expert.

Collect the solid product by mechanical means to a waste container. Dispose of in compliance with current legislation (refer to sections 13 and 15).

NOTE: Prevent/limit crushing of solidified sulphur to avoid formation of sulphur dust.

If necessary, obtain help from an authorized company dealing with waste transport and utilisation.

6.4. REFERENCE TO OTHER SECTIONS

Refer to Sections 8, 13 and 15 of the safety data sheet.

Section 7: HANDLING AND STORAGE

7.1. PRECAUTIONS FOR SAFE HANDLING

Provide easy access to rescue equipment (in case of fire, release, etc.) in the storage and usage area.

Recommendations for safe handling

Avoid contact with molten sulphur, avoid eye contamination, avoid breathing dust/fume/vapours.

Ensure adequate ventilation, especially in confined spaces.

Use adequate personal protective equipment as required in Section 8 of the safety data sheet.

Recommendations for fire and explosion protection

Keep away from ignition sources – sparks, hot surfaces, do not use open flame, do not smoke.

Avoid contact with oxidisers. Avoid the formation of an explosive mixture of sulfur dust with air.

See also the appendix to the safety data sheet – *Exposure scenarios*.

Recommendations for occupational health and safety

Observe all applicable occupational health and safety regulations. Observe the principles of good industrial hygiene.

Avoid contact with the product, especially molten sulphur. Avoid breathing dust/fume/vapours. Keep away from food and beverages. Do not eat, drink or smoke in the workplace. Wash hands with water and soap after work. Do not wear contaminated clothing. Take off immediately all contaminated clothing and wash it before reuse.

7.2. CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Avoid electrostatic discharge. Avoid splash filling of bulk volumes when handling hot liquid sulphur. Transfer equipment must be designed in a manner that minimizes the airborne dust. Avoid contact with skin and eyes. Do not breathe dusts/mist/vapours of hot product.

Store sulphur in appropriate closed, properly labelled and grounded storage tanks, in accordance with applicable regulations. Do not exceed the degree of filling for tanks.

Store liquid sulfur at temperatures above 120°C. Use measures to avoid uncontrolled increase of temperature. Thermal insulation of tanks should be made of non-flammable materials. Electrical installations should meet the explosion-proof requirements.

Before entering storage tanks and commencing any operation in a confined area, check the atmosphere for oxygen content, SO₂, H₂S and flammability.

Do not smoke, do not use open flame in the storage area.

Store away from oxidizing agents.

Recommended materials: liquid sulphur: carbon steel and concrete, acid-resistant internal coating
solid sulphur: carbon steel, acid-resistant internal coating.

Unsuitable materials: Some synthetic materials.

Packaging: Keep containers tightly closed and properly labelled. Keep only in the original container, or in an suitable container for this kind of product. Harmful concentrations of SO₂ and/or H₂S may also arise especially in case of prolonged storage of heated product.

ATTENTION: Emptied, non-cleaned containers may contain product residues (liquid or solidified sulphur) and may pose a fire/explosion hazard. Be careful. Do not cut, drill, grind, weld uncleaned containers or perform these activities in their vicinity.

7.3. SPECIFIC END USE(S)

See sub-section 1.2. For more information, contact the manufacturer/supplier.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. CONTROL PARAMETERS

Occupational exposure limits in the workplace

Regulation of the Minister of Family, Labour and Social Policy of 12 June 2018 on the maximum permissible concentration and intensity of harmful factors in the work environment (Journal of Laws 2018, item 1286; Journal of Laws 2020, item 61; Journal of Laws 2021, item 325, Journal of Laws 2024, item 1017)

Commission Directive 2000/39/EC with amendments

Sulphur[CAS 7704-34-9] – OELs not assigned.

If necessary, control concentration of gases that may be released from molten sulphur

Hydrogen sulfide [CAS 7783-06-4]

Poland NDS: 7 mg/m³; NDSch: 14 mg/m³; NDSP: –

Europe TWA: 5 ppm 8 hours, TWA 7 mg / m³ 8h STEL: 14 mg / m³ 15 min. STEL: 10 ppm 15 min
determination in the air: PN-Z-04015-13:1996

Sulfur dioxide [CAS 7446-09-5]

Poland NDS: 1.3 mg/m³, 0.5 ppm; NDSch: 2.7 mg/m³, 1 ppm; NDSP: –

Europe: OELs: –

determination in the air: PN-Z-04015-4:1994; PN-Z-04015-12:1996; PN-Z-04015-12:1996/Ap1:2001

Admissible concentration in biological material

Not determined.

DNEL and PNEC

- used for the environmental risk assessment

water	PNEC water has not been calculated, since the substance is highly insoluble in water (< 5 µg/l).
sediment	Due to the lack of toxicity, the PNEC was not determined.
soil	Due to the lack of toxicity, the PNEC was not determined.
STP	PNEC STP has not been calculated, since the substance is highly insoluble in water (< 5 µg/l).
oral (secondary poisoning)	Due to the lack of toxicity, the PNEC was not determined.

- used for the worker risk assessment

short-term - systemic effects

dermal / inhalation No hazard identified.

short-term – local effects

dermal No threshold effects and / or no dose-response information available.

inhalation No hazard identified.

long-term – systemic effects

dermal / inhalation No hazard identified.

long-term – local effects

dermal / inhalation No hazard identified.

- used for the general population risk assessment

short-term – systemic effects

dermal / inhalation short-term – local effects	No hazard identified.
dermal inhalation	No threshold effects and / or no dose-response information available. No hazard identified.
long-term – systemic effects dermal / inhalation / oral	No hazard identified.
long-term – local effects dermal / inhalation	No hazard identified.

8.2. EXPOSURE CONTROLS

Appropriate engineering controls

Provide general and/or local exhaust ventilation. Local exhaust ventilation is preferred, since it controls emission at its source and prevents spreading.

All equipment located in the area where sulfur is handled must meet the requirements that ensure the required level of occupational health and safety – refer also to section 7.2.

Individual protection measures

Use of PPE should depend on the type of hazard, working conditions and product handling.

Use PPE from a reputable supplier.

PPE should comply with the requirements of applicable standards and regulations.

Respiratory protection Not required when used in normal conditions (appropriate ventilation needed); when exposed to harmful concentrations of sulphur vapours, use a mask with an appropriate filter (e.g. ABEK); use self-contained breathing apparatus in case of hydrogen sulfide may be generated, in particular in confined spaces. When exposed to high dust concentration, use half-masks or masks with a P-type filter.

Use self-contained breathing apparatus in case of working in a confined area/insufficient oxygen concentration/large uncontrolled emission/ any other cases where respirator with filter does not provide adequate protection.

Hand protection Wear heat-resistant protective gloves (e.g. leather gloves). Check gloves regularly, change gloves if they are used or damaged.

Eye and face protection Tightly fitting safety glasses (goggles) and or face shield.

NOTE: Avoid wearing contact lenses during work with molten sulphur

Provide easy access to running water or equip the workplace with a eye wash fountains

Skin protection Antistatic protective clothing and work shoes. When in contact with the hot product, wear heat-resistant clothing (overalls, aprons) and shoes.

Environmental exposure controls

Prevent release of large quantities of the product to the environment.

Observe the permissible environmental pollution levels specified in the applicable regulations.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

a) Physical state	: Solid (20°C, 101,3 kPa) Liquid –molten form
b) Colour	: Yellow, Liquid: yellow to brown
c) Odour	: Odour of sulphur dioxide; smell of rotten eggs in case hydrogen sulphide is released
d) Melting point/freezing point	: >113 to <120°C at 101.3 kPa (<i>OECD 102 and EU A.1</i>)
e) Boiling point or initial boiling point and boiling range	: 444.6 °C at 101.3 kPa

f) Flammability	: Flammable substance not meeting the criteria for classification (EU Met. A.10) The substance has no pyrophoric properties and it does not emit flammable gases in contact with water (based on chemical structure)
g) Lower and upper explosion limit	: <i>According to Annex VII of the REACH Regulation (column 2) - the analysis is not required</i>
h) Flash point	: 168 °C (DIN 51 758) (Lit.)
i) Auto-ignition temperature	: Not tested (solid, melting point <160°C)
j) Decomposition temperature	: Not applicable
k) pH	: Not applicable
l) Kinematic viscosity (PN-EN ISO 3104)	: Not tested
m) Solubility	: Water: insoluble (<0.005 mg/L at 22°C) Other solvents: soluble in carbon disulphide
n) Partition coefficient n-octanol/water (log value)	: Not tested (inorganic substance)
o) Vapour pressure	: 0.00014 Pa at 20 °C (OECD 104 and EU A.4)
p) Density and/or relative density	: 2.065 kg/m ³ at 20 °C
q) Relative vapour density	: Data not available
r) Particle characteristics	: Data not available

9.2. INNE INFORMACJE

Surface tension	: Not tested (low solubility in water)
Stability in organic solvents	: Not tested (inorganic substance)
Dissociation constant	: Not tested (the substance is a neutral molecule and is not capable of dissociating into ionic species in aqueous solution)
Explosiveness factor	: K=3.67 MPa*m/s
Dust Explosion Class	: P=1 (weak to moderate explosion)
Lower explosion limit	: ~750 g/m ³

Section 10: STABILITY AND REACTIVITY

10.1. REACTIVITY

See subsection 10.5.

10.2. CHEMICAL STABILITY

The product is stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

10.3. POSSIBILITY OF HAZARDOUS REACTIONS

May react explosively with ammonia; ammonium nitrate; chlorine dioxide; bromates, chlorates, magnesium, and iodides of calcium, magnesium, potassium, sodium or zinc; chlorates in the presence of copper; chromium anhydride; silver bromate; lead dioxide; mercury nitrate; all inorganic perchlorates; phosphor trioxide; sodium nitrate; zinc.

See subsection 10.5 of the safety data sheet.

Hazardous polymerization does not occur.

10.4. CONDITIONS TO AVOID

Protect against moisture.

10.5. INCOMPATIBLE MATERIALS

Avoid contact with copper and its alloys.

Avoid contact with ammonia, nitric acid, chlorates, nitrates, perchlorates, permanganates and other oxidisers, anhydrides, metal dusts, alkaline and alkaline-earth metals, halogen-halogen compounds.

See subsection 10.3 of the safety data sheet.

10.6. HAZARDOUS DECOMPOSITION PRODUCTS

Not known. Substances generated during fire – see section 5.

Section 11: TOXICOLOGICAL INFORMATION

11.1. INFORMATION ON HAZARD CLASSES AS DEFINED IN REGULATION (EC) NO 1272/2008**General information**

Sulphur is classified as hazardous to human health.

Sulphur is an essential element in the metabolism of all living organisms. The average human body contains about 175 g of sulfur incorporated into sulfate, proteins, keratin and enzymes.

There are no quantitative data related to elementary sulphur toxicokinetics by the gastrointestinal tract, through the skin and by inhalation for animals and humans. Local sulphur use demonstrated that the substance penetrates through the skin. After entering the body through the gastrointestinal tract sulphur is probably transformed first into H₂S, by colibacilli, and then it is absorbed.

Data related to administration by the gastrointestinal tract demonstrate that elementary sulphur is transformed into soluble forms of sulphur, first into H₂S, probably by the enteric microflora, and then into sulphate. The process appears to be of the same importance for animals and for humans. Other sulphur-containing ions may also be formed. These sulphur compounds may be absorbed from the bowel and attached to molecules that contain endogenic sulphur.

The data presented in this section are based on available studies for solid sulphur

Acute toxicity

- oral (directly into the stomach)

LD₅₀ rat: > 2000 mg/kg bw (males/females); secondary clinical symptoms, no mortality (OECD 401)

- dermal (occlusive dressing)

LD₅₀ rat: > 2000 mg/kg bw (males/females); very mild clinical symptoms following local treatment, but no mortality (OECD 402)

- inhalation

LC₅₀ rat: > 5430 mg/m³ (4 h) (males/females); 8 out of 10 animals survived (method equivalent or similar to OECD 403 and EU B.2)

Based on the available data it was observed that sulphur demonstrates low acute oral, inhalation and dermal toxicity; it is not classified as hazardous for health due to acute toxicity.

See also section 11 of the safety data sheet *Additional information*

Skin corrosion/irritation

Tests of irritating effects on the rabbit skin (acc.to OECD 404), exposed to the contact with test material (mixture of 0.5 g of sulphur and 0.5 g of white petrolatum), in semiocclusive conditions, for 4 hours demonstrated that it causes moderate to severe erythema and mild oedema after 24 hours since the removal of the dressing. Lesions observed in the studies documented with use of Draize test criteria demonstrated that sulphur meets the criteria for substances irritating to the skin.

Based on the results of the studies sulphur is classified as skin irritant, category 2 (*Skin Irrit. 2, H315*).

Serious eye damage/irritation

Tests for eye irritation (acc.to OECD 405) demonstrated that introduction of sulphur (as appropriately prepared material) to the eye of a rabbit does not cause any significant changes in the conjunctiva and causes mild transient damage of the cornea.

Based on the results of the studies it was observed that sulphur does not cause eye irritation and is not classified as posing this type of hazard.

Respiratory tract irritation

Data not available. Assessment of such effect is not necessary.

Respiratory or skin sensitisationSkin

Based on the available experimental data on guinea pigs and extensive experiments in humans demonstrating lack of sensitising effects it may be stated that sulphur is not considered sensitising in contact with skin.

Respiratory tract

Data not available. Assessment of such effect is not necessary.

Repeated dose toxicity

Oral In 28-day and 90-day oral toxicity tests (acc.to OECD 407 and OECD 408) on rats no significant toxicological effects were observed up to the test dose of 1,000 mg/kg b.w./day.

Dermal In 28-day tests (acc.to OECD 410) sulphur applied to the skin as paste (moistened with deionised water), at a dose of 100, 400 and 1,000 mg/kg b.w./day no systemic changes were observed at any level of the test dose, related to local effects, at higher dose levels the increase of hyperkeratosis was observed, considered to be related to the exposure and transient.

Defined dose levels, at which no adverse effects are observed, are as follows:

NOAEL (oral, rat) : 1000 mg/kg b.w./day (subchronic)

NOAEL (dermal, rat) : 400 mg/kg b.w./day (subacute)

Results of the conducted studies allow to state that sulphur does not need to be classified by repeated dose toxicity.

Germ cell mutagenicity

In vitro Sulphur does not cause gene mutations in recurrent mutation tests in bacterial cells (Ames test) (acc. to OECD 471).

Negative result was also obtained in chromosomal aberration tests (acc. to OECD 473) with use of Chinese hamster ovarian cells (CHO).

In vitro mutagenicity tests for elementary sulphur are scientifically unjustifiable. Sulphur structure does not arouse interest due to mutagenicity or other general reactivity with genetic material. Generally, sulphur is an element essential in the metabolism of all living organisms, and therefore chronic exposure to sulphur is a natural condition. What's more, sulphur is non-reactive and insoluble. Moreover sulphur is metabolised only by intestinal bacteria; there are some signs of metabolite absorption, but those probably endogenous for humans.

In vivo Micronuclear erythrocyte tests (acc.to OECD 474), in which mice were given sulphur doses of 2,000 mg/kg b.w. directly to the stomach produced negative result.

Negative results of the conducted *in vitro* and *in vivo* mutagenicity tests demonstrated that sulphur is not genotoxic and is not classified as posing mutagenicity hazard.

Carcinogenicity

Carcinogenicity tests for elementary sulphur are scientifically unjustifiable and it is not necessary to conduct them.

In general, sulfur is an essential element in the metabolism of all living organisms, thus chronic exposure to sulfur is the natural state. More specifically, sulfur is unreactive and insoluble. From both dietary and occupational exposure to sulfur are considered to be very low because of the general knowledge of the chemical, its ubiquitous natural occurrence and its low acute toxicity as well as its long history of use including some pharmaceutical applications.

Sulphur is not mutagenic and does not cause any hypertrophic and/or precancerous lesions in subchronic repeated dose toxicity tests.

Systemic results occurred after subacute and subchronic exposure though the gastrointestinal tract, as well as after subacute exposure through the skin. Sulphur is metabolised only by intestinal bacteria; there are some signs of metabolite absorption, but those probably endogenous for humans. Expectations that carcinogenic effects do not occur as a consequence of exposure to sulphur are supported by long-term use of sulphur for local application, in pharmaceutical preparations and as a pesticide, and the lack of carcinogenic effects.

Based on the available data sulphur is not classified as carcinogenic substance.

Reproductive toxicity

Two-generation studies on reproductive toxicity are scientifically unjustifiable.

In general, sulfur is an essential element in the metabolism of all living organisms, thus chronic exposure to sulfur is the natural state. More specifically, sulfur is unreactive and insoluble. Risk for humans resulting from exposure to sulphur, both in food and due to occupational exposure, is considered as very low based on general chemical knowledge, its natural occurrence, low acute toxicity, as well as long-term and extensive use, including pharmaceutical use.

Systemic results occurred after subacute and subchronic exposure though the gastrointestinal tract, as well as after subacute exposure through the skin. Sulphur is only metabolised by intestinal bacteria; there are indications of absorption of metabolites but which are most likely endogenous to the body.

Expectations that effects on fertility and developmental toxicity do not occur as a consequence of exposure to sulphur are supported by long-term use of sulphur for local application, in pharmaceutical preparations and as a pesticide, and the lack of hazardous effects on fertility and developmental toxicity.

Based on the available data on reproduction and developmental toxicity sulphur is not classified as causing reproductive toxicity.

Specific target organ toxicity (STOT)

Data not available.

Aspiration hazard

Not applicable.

Health effects and symptoms

Acute intoxications with sulphur do not occur in practice.

Exposure to high concentrations of vapours being released from molten sulphur may cause irritation of eye and respiratory mucosa, shortness of breath, breathing disorders, headache and dizziness.

Contact with molten sulphur causes skin redness, burning, pain, thermal burns.

Liquid sulphur splashing to the eye causes thermal burns, may cause eye damage.

Symptoms of prolonged exposure to sulphur include gastrointestinal tract disorders, nervous disorders, skin lesions.

11.2. INFORMATION ON OTHER HAZARDS

Endocrine disrupting properties: None.

ADDITIONAL INFORMATION

Potential impurities of molten sulphur include highly toxic gas – hydrogen sulphide (H₂S) and irritating gas – sulphur dioxide (SO₂). In the places where hydrogen sulphide may occur/accumulate (e.g. in the upper part of storage tanks, in closed spaces, near product residue, inside uncleaned tanks) special precautions should be taken and local or personal hydrogen sulphide detectors should be used. Operations in such places should be done only by authorised and trained employees, with appropriate equipment and protection measures.

Section 12: ECOLOGICAL INFORMATION

General information

Sulphur is not classified as hazardous for the environment.

Under normal conditions sulphur is solid, at a temperature > 113 °C it is liquid. It is practically insoluble in water (< 5 µg/l) and is heavier than water.

Sulphur is an inorganic substance, it does not show considerable adsorption potential. Assessment of effects related to volatility is not required for this substance. Sulphur has low volatility and evaporation from the surface of water or soil is not to be expected.

Molten sulphur solidifies after release from the tank and thus it has no potential to spread in the environment. It creates a local hazard when hot sulfur is released and direct contact with living organisms occurs.

The data presented in this section are based on available studies for solid sulphur

12.1. TOXICITY

Aquatic compartment (including sludge)

Toxicity to aquatic organisms

Fish	LC ₀ (96 h):	> 5 µg/l <i>Oncorhynchus mykiss</i> (freshwater, semistatic method OECD 203)
	NOEC (96 h):	> 5 µg/l <i>Oncorhynchus mykiss</i> (freshwater, semistatic method OECD 203)
Crustacea	EC ₅₀ (48 h):	> 5 µg/l <i>Daphnia magna</i> – based on mobility (freshwater, semistatic method OECD 202 / EU C.2)
	NOEC (21 dni):	> 100 mg/l <i>Daphnia magna</i> – (nominal) based on reproduction (freshwater, semistatic method OECD 211)
	NOEC (21 dni):	> 2,5 µg/l <i>Daphnia magna</i> – (initial) test based on reproduction (freshwater, semistatic method OECD 211)
Algae	NOEC (72 h):	> 5 µg/l – based on growth rate and biomass (freshwater, semistatic method OECD 201)
Sediment organisms	NOEC (28 days):	608 mg/kg <i>Chironomus riparius</i> – based on developmental factor (freshwater, static method OECD 2218)

Sulphur is highly insoluble in water (< 5 µg/l) and it is unlikely to cause toxicity to the aquatic environment.

Despite of the fact that it is not necessary to conduct short-term toxicity and prolonged toxicity tests for aquatic organisms, test results are available to confirm that toxic concentrations of sulphur dust for aquatic organisms are much higher than sulphur solubility limits in water.

Terrestrial compartment

Toxicity to soil macroorganisms

In 14-day toxicity tests on earthworms (*Eisenia fetida*) (acc.to OECD 207) no mortality in any of the test groups was observed, and changes of body mass of soil organisms did not change considerably compared with control values up to the concentration of 1,000 mg sulphur/kg of soil. No behavioural effects were observed.

Values determined in the tests

LOEC (14 days): > 1000 mg of sulphur dust/kg of soil

NOEC (14 days): 1000 mg of sulphur dust/kg of soil (i.e. limit test concentration)

Toxicity to terrestrial plants

In tests conducted in a greenhouse on 6 plant species (acc.to OECD 208) no clear phytotoxic effects were observed in any of the plant species up to the sulphur level of 25.2 kg/ha. No statistically significant differences of plant mass between test plants and control plants were observed.

NOEC (14 days): 25,2 kg/ha – based on phytotoxicity

Toxicity to soil microorganisms

Laboratory test results concerning the effects of sulphur dust on the activity of soil microflora (biologically active agricultural soil: clayish soil) demonstrated that sulphur dust has no effects on the respiratory function, measured as oxygen consumption after 28-day exposure (OECD 217) and as nitrogen-NO₃ production effects after 28-day exposure (OECD 216), when using sulphur up to 400 mg/kg dry mass of soil (corresponding to maximum recommended dose level of 30 kg sulphur dust/ha).

NOEC (28 d): > 400 mg/kg of soil – based on respiration factor

Toxicity to terrestrial arthropods (other than microorganisms)

Tests concerning sulphur effects on mite (*Typhlodromus pyri*) were conducted in the area of a vineyard at 60-day exposure. The tests demonstrated that sulphur does not cause any effects when quantities of 1.4 – 1.9 kg/ha are used..

NOEC (60 d): >1400 - <1900 g/ha based on mortality

Laboratory test results for other arthropods

ER₅₀ (7 d): 197,57 g/ha (*Trichogramma cacoeciae*) based on reproductive effects

LR₅₀ (7 d): 10000 g/ha (*Typhlodromus pyri*) based on mortality

LR₅₀ (48 h): 24860 g/ha (*Aphidius rhopalosiphi*) based on mortality

NOEC (12 d): 25200 g/ha (*Aphidius rhopalosiphi*) based on reproductive effects

Atmospheric environment

Data not available. Due to sulphur physicochemical properties it is unlikely to cause toxicity to the atmospheric environment.

Toxicity to birds

The conducted acute oral toxicity tests (acc.to OECD 423) for Japanese quail demonstrated the lack of toxic symptoms and preterm deaths at sulphur dust doses of 2,000 kg S/kg b.w. in the follow-up period.

LD₅₀ (15 d): > 2000 mg/kg b.w. (*Coturnix coturnix japonica*) – based on the lack of toxic symptoms and preterm deaths and the lack of abnormalities at dissection

Toxicity to mammals

Data not available. Assessment of such effect is not necessary.

Microbiological activity in sewage treatment systems

Aquatic microorganisms

It is unnecessary to conduct sediment tests, if there are some factors showing low probability of toxicity to sediment, since sulphur is highly insoluble in water (< 5 µg/l).

12.2. PERSISTENCE AND DEGRADABILITY

Hydrolysis Not tested - sulphur is highly insoluble in water (< 5 µg/l).

Phototransformation / Photolysis

Air

Half-life in air (DT50); 80,000 lux at 25 °C:

- t 1/2: 4.25 h sulphur pure active component

- t 1/2: 3.21 h sulphur technical level of the active component

% Degradation 78,4 - 83 after 24 h (80,000 lux, sulphur pure active component)
2,8 - 3 after 24 h (incubation in a darkroom, sulphur pure active component)
78,6 - 79,5 after 24 h (80,000 lux, sulphur technical level of the active component)
0 - 2,7 after 24 h (incubation in a darkroom, sulphur technical level of the active component)

Water Assessment of such effect is unnecessary.

Soil Assessment of such effect is unnecessary.

Biodegradation

Water Assessment of such effect is unnecessary, inorganic substance, highly insoluble in water (< 5 µg/l).

Soil The study is technically not feasible, inorganic substance.

12.3. BIOACCUMULATIVE POTENTIAL

Water Bioaccumulation tests do not have to be conducted, since based on physicochemical properties it may be expected that the substance has low bioaccumulation potential.
Inorganic substance, it does not show considerable bioaccumulation potential.

Soil Assessment of such effect is unnecessary.

12.4. MOBILITY IN SOIL

Sulphur does not demonstrate the potential for mobility in soil..

12.5. RESULTS OF PBT AND vPvB ASSESSMENT

PBT and vPvB assessment is not required for inorganic substances.

12.6. ENDOCRINE DISRUPTING PROPERTIES

None.

12.7. OTHER ADVERSE EFFECTS

Data not available.

Section 13: DISPOSAL CONSIDERATIONS

General information

If possible, reduce or eliminate waste generation.

Observe the safety measures specified in section 7 and 8 of the safety data sheet.

13.1 WASTE TREATMENT METHODS

Waste classification: appropriate to the place of generation according to the criteria listed in the applicable regulations.

If the product is further used in any operations/processes, the end user should define the waste type and assign a proper waste code.

Waste disposal

Do not discharge into drains. Avoid contamination of the environment.

Avoid sulphur storage in the open space. Sulphur can be oxidised to sulphur oxides, which then form sulphurous acid or sulphuric acid when contact with water/moisture.

Consider recovery or re-use.

Recycle or dispose of waste in compliance with current legislation.

Preferred disposal method: combustion with gas absorption.

Disposal of packaging

Not applicable. The product is transported in tanks.

Empty tanks may contain sulphur residues, ensure that they are properly cleaned.

Waste disposal should be carried out by a professional, authorized incineration plant or waste treatment plants.

Additional information

Directive 2008/98/EC of the European Parliament and of the Council of the Member State

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Section 14: TRANSPORT INFORMATION



General information

Substance is classified as dangerous and is subjected to the transport of dangerous goods regulations.

Based on the knowledge about the product, necessary analysis and appropriate RID/ADR classification a sender should always prepare a guideline for the transportation.

	RID, ADR	IMDG	IATA
14.1. UN NUMBER OR ID NUMBER	UN 2448	UN 2448	UN 2448
14.2. UN PROPER SHIPPING NAME	SULPHUR, MOLTEN	SULPHUR MOLTEN	SULPHUR MOLTEN
14.3. TRANSPORT HAZARD CLASS(ES)	4.1	4.1	4.1
Classification code	F3	--	Transport forbidden
Hazard identification No.	44	--	
Labels	no 4.1	no 4.1	
14.4. PACKING GROUP	III	III	Not applicable
14.5. ENVIRONMENTAL HAZARDS	Not applicable	Not applicable	Not applicable
14.6. SPECIAL PRECAUTIONS FOR USER	Observe the provisions of applicable regulations. Observe safety precautions described in sections 7 and 8.		
14.7. MARITIME TRANSPORT IN BULK ACCORDING TO IMO INSTRUMENTS	Data not available		

	RID, ADR	IMDG	IATA
14.1. UN NUMBER OR ID NUMBER	UN 1350	UN 1350	UN 1350
14.2. UN PROPER SHIPPING NAME	SULPHUR	SULPHUR	SULPHUR
14.4. TRANSPORT HAZARD CLASS(ES)	4.1	4.1	4.1
Classification code	F3	--	Transport forbidden
Hazard identification No.	40	--	
Labels	no 4.1	no 4.1	
14.4. PACKING GROUP	III	III	Not applicable
14.5. ENVIRONMENTAL HAZARDS	Not applicable	Not applicable	Not applicable
14.6. SPECIAL PRECAUTIONS FOR USER	Observe the provisions of applicable regulations. Observe safety precautions described in sections 7 and 8.		
14.7. MARITIME TRANSPORT IN BULK ACCORDING TO IMO INSTRUMENTS	Data not available		

Section 15: REGULATORY INFORMATION

15.1. SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS/LEGISLATION SPECIFIC FOR THE SUBSTANCE OR MIXTURE

See section 13 of this Safety Data Sheet.

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (with amendments)

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (with amendments)

REACH Annex XIV: not applicable

SVHC Candidate List: not applicable

REACH Annex XVII: not applicable

15.2. CHEMICAL SAFETY ASSESSMENT

Chemical safety assessment has been carried out for sulphur.

Section 16: OTHER INFORMATION

The safety data sheet was prepared based on information included in the Chemical Safety Report, Guidance on safe use and applicable regulations.

Scope of revision: sections 1.2, 15. Version 3: section 2. Version 4: sections 8 and 15.

Revision 20.10.2021 Version 1: 1.2, 9, 11, 12, 15.

Revision 31.12.2023: Version 2: 1.2, 2.3, 8.1, 9 e,m,p, 11.2, 12.6, exposure scenarios.

Revision 22.09.2025: Version 3: 1.2, 1.3, 8.1, 15, exposure scenarios.

Information provided herein serves only as guidelines for safe transport, distribution, handling and storage. It cannot be considered as a quality certificate.

This information applies only to specific material designated and may not be suitable for such material used in combination with any other materials or in any other manner not described in this document.

The product user must observe all applicable standards and regulations and is liable for improper use of information contained in the safety data sheet and improper use of the product.

A list of relevant hazard statements and/or precautionary statements which are not written out in full under Sections 2 to 15

Not applicable.

Legend to abbreviations and acronyms used in the safety data sheet

NDS	Threshold Limit Value
NDSCh	Short Term Exposure Limit
NDSP	Threshold Limit Value-Ceiling
PNEC	Predicted No Effect Concentration
DNEL	Derived No Effect Levels
vPvB	Very persistent and very bioaccumulative (substance)
PBT	Persistent, bioaccumulative and toxic (substance)
LD ₅₀	Dose of a tested substance causing 50% lethality during a specified time interval
LC ₅₀	Lethal Concentration 50%, concentration required to kill half the members of a tested population after a specified test duration
ER ₅₀	Effective indicator where 50% of the studied population shows effects on reproductive functions
LR ₅₀	Mortality rate where 50% of the studied population dies
DT50	Half-life
NOAEL	No observed adverse effect level
LOEC	Lowest observed effect concentration
NOEC	No observed effect concentration
STOT	Specific target organ toxicity
OECD	Organisation for Economic Cooperation and Development
RID	Regulations on International Railway Carriage of Dangerous Goods
ADR	Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG	International Maritime Dangerous Goods Code
IATA	International Air Transport Association

ANNEX TO THE SAFETY DATA SHEET - EXPOSURE SCENARIOS:

Section 1	
Title	
01 - Manufacture of substance	
Use Descriptor	
Sector(s) of Use	-
Process Categories	1, 2, 3, 4, 8a, 8b, 15, 28
Environmental Release Categories	1
Specific Environmental Release Category	-
Processes, tasks, activities covered	

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Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	-
Vapour pressure	-
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless stated differently) [ESCom-11133171310 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [ESCom-11133171304 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Other Operational Conditions affecting exposure	Solid at standard temperature and pressure; Liquid at elevated operating temperature [] Assumes a good basic standard of occupational hygiene is implemented [ESCom-11133171303]
Contributing Scenarios	Specific Risk Management Measures and Operating Conditions
General measures (skin irritants) [ESCom-10133224705]	Ensure that direct skin contact is avoided. Identify potential areas for indirect skin contact. Wear suitable gloves tested to EN374. Clear spills immediately. Wash off any skin contamination immediately. For further specification, refer to section 8 of the SDS. [ESCom-10133224705 ESCom-11133170587 ESCom-15193135704 ESCom-10133224896 ESCom-9267230103 ESCom-15193135705 ESCom-12355002165]
General measures (gas release) [ESCom-19350151901]	Use area and personal gas detectors to ensure that the worker is immediately alerted to gas hazards; Ensure segregation of worker from the source; Access to work area only for authorised persons; Ensure a permit to work system is in place; Follow confined space working procedures; Provide personal escape sets; Provide awareness training. []
General measures applicable to all activities (PROC_1, PROC_9, PROC_28, PROC_15, PROC_8b, PROC_4, PROC_8a, PROC_2, PROC_3)	No other specific measures identified
Section 3 Exposure Estimation	
3.1. Health	
-	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects.; Risk management measures are based on qualitative risk characterisation. [ESCom-11133171317; ESCom-11133171322]	

Section 1	
Title	
01b - Use as an intermediate	
Use Descriptor	
Sector(s) of Use	8, 9

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Process Categories	1, 2, 3, 4, 8a, 8b, 15, 22, 23, 28
Environmental Release Categories	6a
Specific Environmental Release Category	
Processes, tasks, activities covered	
Use of substance as an intermediate (not related to Strictly Controlled Conditions). Includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	-
Vapour pressure	-
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless stated differently) [ESCom-11133171310 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [ESCom-11133171304 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Other Operational Conditions affecting exposure	Solid at standard temperature and pressure; Liquid at elevated operating temperature [] Assumes a good basic standard of occupational hygiene is implemented [ESCom-11133171303]
Contributing Scenarios	Specific Risk Management Measures and Operating Conditions
General measures (skin irritants) [ESCom-10133224705]	Ensure that direct skin contact is avoided. Identify potential areas for indirect skin contact. Wear suitable gloves tested to EN374. Clear spills immediately. Wash off any skin contamination immediately. For further specification, refer to section 8 of the SDS. [ESCom-10133224705 ESCom-11133170587 ESCom-15193135704 ESCom-10133224896 ESCom-9267230103 ESCom-15193135705 ESCom-12355002165]
General measures (gas release) [ESCom-19350151901]	Use area and personal gas detectors to ensure that the worker is immediately alerted to gas hazards; Ensure segregation of worker from the source; Access to work area only for authorised persons; Ensure a permit to work system is in place; Follow confined space working procedures; Provide personal escape sets; Provide awareness training. []
General measures applicable to all activities (PROC_1, PROC_9, PROC_28, PROC_15, PROC_22, PROC_8b, PROC_4, PROC_8a, PROC_2, PROC_23, PROC_3)	No other specific measures identified
Section 3 Exposure Estimation	
3.1. Health	
-	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects.; Risk management measures are based on qualitative risk characterisation. [ESCom-11133171317; ESCom-11133171322]	

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Section 1	
Title	
02 - Formulation & (re)packing of substances and mixtures	
Use Descriptor	
Sector(s) of Use	-
Process Categories	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15, 23, 24, 28
Environmental Release Categories	2
Specific Environmental Release Category	-
Processes, tasks, activities covered	
Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	-
Vapour pressure	-
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless stated differently) [ESCom-11133171310 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [ESCom-11133171304 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Other Operational Conditions affecting exposure	Solid at standard temperature and pressure; Liquid at elevated operating temperature [] Assumes a good basic standard of occupational hygiene is implemented [ESCom-11133171303]
Contributing Scenarios	Specific Risk Management Measures and Operating Conditions
General measures (skin irritants) [ESCom-10133224705]	Ensure that direct skin contact is avoided. Identify potential areas for indirect skin contact. Wear suitable gloves tested to EN374. Clear spills immediately. Wash off any skin contamination immediately. For further specification, refer to section 8 of the SDS. [ESCom-10133224705 ESCom-11133170587 ESCom-15193135704 ESCom-10133224896 ESCom-9267230103 ESCom-15193135705 ESCom-12355002165]
General measures (gas release) [ESCom-19350151901]	Use area and personal gas detectors to ensure that the worker is immediately alerted to gas hazards; Ensure segregation of worker from the source; Access to work area only for authorised persons; Ensure a permit to work system is in place; Follow confined space working procedures; Provide personal escape sets; Provide awareness training. []
General measures applicable to all activities (PROC_1, PROC_9, PROC_28, PROC_15, PROC_14, PROC_8b, PROC_24, PROC_4, PROC_8a, PROC_2, PROC_5, PROC_23, PROC_3)	No other specific measures identified
Section 3 Exposure Estimation	
3.1. Health	
-	

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Section 4 Guidance to check compliance with the Exposure Scenario
4.1. Health
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects.; Risk management measures are based on qualitative risk characterisation. [ESCom-11133171317; ESCom-11133171322]

Section 1	
Title	
10a - Use in binder and release agents; Industrial	
Use Descriptor	
Sector(s) of Use	-
Process Categories	1, 2, 3, 4, 6, 8a, 8b, 10, 13, 14, 28
Environmental Release Categories	4
Specific Environmental Release Category	-
Processes, tasks, activities covered	
Covers the use as binders and release agents including material transfers, mixing, application (including spraying and brushing), mould forming and casting, and handling of waste.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	-
Vapour pressure	-
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless stated differently) [ESCom-11133171310 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [ESCom-11133171304 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Other Operational Conditions affecting exposure	Solid at standard temperature and pressure; Liquid at elevated operating temperature [] Assumes a good basic standard of occupational hygiene is implemented [ESCom-11133171303]
Contributing Scenarios	Specific Risk Management Measures and Operating Conditions
General measures (skin irritants) [ESCom-10133224705]	Ensure that direct skin contact is avoided. Identify potential areas for indirect skin contact. Wear suitable gloves tested to EN374. Clear spills immediately. Wash off any skin contamination immediately. For further specification, refer to section 8 of the SDS. [ESCom-10133224705 ESCom-11133170587 ESCom-15193135704 ESCom-10133224896 ESCom-9267230103 ESCom-15193135705 ESCom-12355002165]
General measures (gas release) [ESCom-19350151901]	Use area and personal gas detectors to ensure that the worker is immediately alerted to gas hazards; Ensure segregation of worker from the source; Access to work area only for authorised persons; Ensure a permit to work system is in place; Follow confined space working procedures; Provide personal escape sets; Provide awareness training. []

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General measures applicable to all activities (PROC_1, PROC_13, PROC_28, PROC_14, PROC_10, PROC_8b, PROC_6, PROC_4, PROC_8a, PROC_2, PROC_3)	No other specific measures identified
Section 3 Exposure Estimation	
3.1. Health	
-	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects.; Risk management measures are based on qualitative risk characterisation. [ESCom-11133171317; ESCom-11133171322]	

Section 1	
Title	
10b - Use in binder and release agents; Professional	
Use Descriptor	
Sector(s) of Use	
Process Categories	1, 2, 3, 4, 6, 8a, 8b, 10, 13, 14, 28
Environmental Release Categories	8a, 8d
Specific Environmental Release Category	
Processes, tasks, activities covered	
Covers the use as binders and release agents including material transfers, mixing, application by spraying, brushing, and handling of waste.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	-
Vapour pressure	-
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless stated differently) [ESCom-11133171310 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [ESCom-11133171304 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Other Operational Conditions affecting exposure	Solid at standard temperature and pressure; Liquid at elevated operating temperature [] Assumes a good basic standard of occupational hygiene is implemented [ESCom-11133171303]
Contributing Scenarios	
Specific Risk Management Measures and Operating Conditions	
General measures (skin irritants) [ESCom-10133224705]	Ensure that direct skin contact is avoided. Identify potential areas for indirect skin contact. Wear suitable gloves tested to EN374. Clear spills immediately. Wash off any skin contamination immediately. For further specification, refer to section 8 of the SDS. [ESCom-10133224705 ESCom-11133170587 ESCom-15193135704 ESCom-10133224896 ESCom-9267230103 ESCom-15193135705 ESCom-12355002165]

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General measures (gas release) [ESCom-19350151901]	Use area and personal gas detectors to ensure that the worker is immediately alerted to gas hazards; Ensure segregation of worker from the source; Access to work area only for authorised persons; Ensure a permit to work system is in place; Follow confined space working procedures; Provide personal escape sets; Provide awareness training. []
General measures applicable to all activities (PROC_1, PROC_13, PROC_28, PROC_14, PROC_10, PROC_8b, PROC_6, PROC_4, PROC_8a, PROC_2, PROC_3)	No other specific measures identified
Section 3 Exposure Estimation	
3.1. Health	
-	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects.; Risk management measures are based on qualitative risk characterisation. [ESCom-11133171317; ESCom-11133171322]	

Section 1	
Title	
11a - Use in agrochemicals; Professional	
Use Descriptor	
Sector(s) of Use	
Process Categories	1, 2, 4, 8a, 8b, 11, 13, 28
Environmental Release Categories	8a, 8d
Specific Environmental Release Category	
Processes, tasks, activities covered	
Use as an agrochemical excipient for application by manual or machine spraying, smokes and fogging; including equipment clean-downs and disposal.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	-
Vapour pressure	-
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless stated differently) [ESCom-11133171310 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [ESCom-11133171304 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Other Operational Conditions affecting exposure	Solid at standard temperature and pressure; Liquid at elevated operating temperature [] Assumes a good basic standard of occupational hygiene is implemented [ESCom-11133171303]
Contributing Scenarios	Specific Risk Management Measures and Operating Conditions

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General measures (skin irritants) [ESCom-10133224705]	Ensure that direct skin contact is avoided. Identify potential areas for indirect skin contact. Wear suitable gloves tested to EN374. Clear spills immediately. Wash off any skin contamination immediately. For further specification, refer to section 8 of the SDS. [ESCom-10133224705 ESCom-11133170587 ESCom-15193135704 ESCom-10133224896 ESCom-9267230103 ESCom-15193135705 ESCom-12355002165]
General measures (gas release) [ESCom-19350151901]	Product may release hydrogen sulphide; Product may release sulfur dioxide; Minimise exposure by product design, such as encapsulation or pelletisation. []
General measures applicable to all activities (PROC_1, PROC_13, PROC_28, PROC_11, PROC_8b, PROC_4, PROC_8a, PROC_2)	No other specific measures identified
Section 3 Exposure Estimation	
3.1. Health	
-	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects.; Risk management measures are based on qualitative risk characterisation. [ESCom-11133171317; ESCom-11133171322]	

Section 1	
Title	
11b - Use in agrochemicals; Consumer	
Use Descriptor	
Sector(s) of Use	
Product Categories	12, 27
Environmental Release Categories	8a, 8d
Specific Environmental Release Category	
Processes, tasks, activities covered	
Covers the consumer use in agrochemicals in liquid and solid forms.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of consumer exposure	
Product characteristics	
Physical form of product	Solid at standard temperature and pressure []
Vapour pressure	-
Concentration of substance in product	Covers concentrations up to 100.0 % [ESCom-11133171519]
Frequency and duration of use/exposure	-
Other Operational Conditions affecting exposure	Outdoor use [ESCom-9313213238]
Product Category	
Specific Risk Management Measures and Operating Conditions	
General measures (skin irritants) [ESCom-10133224705]	Ensure labelling complies with regulations. Provide clear instruction of use. Use child-resistant packaging. Minimise exposure by product design, such as encapsulation or pelletisation. Wash off any skin contamination immediately. []

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Lawn and garden preparations; Fertilizers (PC_12)	No other specific measures identified
Plant protection products (PC_27)	No other specific measures identified
Section 3 Exposure Estimation	
3.1. Health	
-	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1. Health	
Available hazard data do not enable the derivation of a DNEL for dermal irritant effects.; Risk management measures are based on qualitative risk characterisation. [ESCom-11133171317; ESCom-11133171322]	

Section 1	
Title	
19 - Use in rubber production and processing; Industrial	
Use Descriptor	
Sector(s) of Use	11
Process Categories	1, 2, 3, 4, 5, 6, 7, 8a, 8b, 9, 13, 14, 15, 21, 28
Environmental Release Categories	4
Specific Environmental Release Category	
Processes, tasks, activities covered	
Manufacture of tyres and general rubber articles, including processing of raw (uncured) rubber, handling and mixing of rubber additives, vulcanising, cooling and finishing.	
Assessment Method	
See Section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product characteristics	
Physical form of product	-
Vapour pressure	-
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless stated differently) [ESCom-11133171310 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) [ESCom-11133171304 ESCom-18309152101 ESCom-16173221408 ESCom-18309152200]
Other Operational Conditions affecting exposure	Solid at standard temperature and pressure; Liquid at elevated operating temperature [] Assumes a good basic standard of occupational hygiene is implemented [ESCom-11133171303]
Contributing Scenarios	
Specific Risk Management Measures and Operating Conditions	
General measures (skin irritants) [ESCom-10133224705]	Ensure that direct skin contact is avoided. Identify potential areas for indirect skin contact. Wear suitable gloves tested to EN374. Clear spills immediately. Wash off any skin contamination immediately. For further specification, refer to section 8 of the SDS. [ESCom-10133224705 ESCom-11133170587 ESCom-15193135704 ESCom-10133224896 ESCom-9267230103 ESCom-15193135705 ESCom-12355002165]

<p>General measures (gas release) [ESCom-19350151901]</p>	<p>Use area and personal gas detectors to ensure that the worker is immediately alerted to gas hazards; Ensure segregation of worker from the source; Access to work area only for authorised persons; Ensure a permit to work system is in place; Follow confined space working procedures; Provide personal escape sets; Provide awareness training. []</p>
<p>General measures applicable to all activities (PROC_1, PROC_9, PROC_13, PROC_28, PROC_15, PROC_14, PROC_8a, PROC_2, PROC_5, PROC_21, PROC_7, PROC_8b, PROC_6, PROC_4, PROC_3)</p>	<p>No other specific measures identified</p>
<p>Section 3 Exposure Estimation</p>	
<p>3.1. Health</p>	
<p>-</p>	
<p>Section 4 Guidance to check compliance with the Exposure Scenario</p>	
<p>4.1. Health</p>	
<p>Available hazard data do not enable the derivation of a DNEL for dermal irritant effects.; Risk management measures are based on qualitative risk characterisation. [ESCom-11133171317; ESCom-11133171322]</p>	