



SAFETY DATA SHEET

Hydrogen sulphide

Issue Date: 16.01.2013
 Last revised date: 09.12.2020

Version: 2.1

SDS No.: 000010021749
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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name: Hydrogen sulphide
Trade name: Hydrogen sulphide 1.8 Chemical; Hydrogen sulphide 2.5

Additional identification

Chemical name: Hydrogen sulphide
Chemical formula: H₂S
INDEX No. 016-001-00-4
CAS-No. 7783-06-4
EC No. 231-977-3
REACH Registration No. 01-2119445737-29

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

Identified uses: Industrial and professional. Perform risk assessment prior to use. Use for electronic component manufacture. Use for metal treatment. Use the gas as odourising agent in another gas (e.g. LPG). Using gas alone or in mixtures for the calibration of analysis equipment. Using gas as feedstock in chemical processes.
Uses advised against: Consumer use.

1.3 Details of the supplier of the safety data sheet

Supplier
 Linde Gas AS
 Postboks 13 Nydalen
 N-0409 Oslo
Telephone: +4723177200
E-mail: sds.ren@linde.com

1.4 Emergency telephone number: +47 22 59 13 00 (24h - Giftinformasjonssentralen)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 as amended.

Physical Hazards

Flammable gas
 Category 1
 H220: Extremely flammable gas.



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Gases under pressure Liquefied gas H280: Contains gas under pressure; may explode if heated.

Health Hazards

Acute toxicity (Inhalation - gas) Category 2 H330: Fatal if inhaled.
Specific Target Organ Toxicity - Single Exposure Category 3 H335: May cause respiratory irritation.

Environmental Hazards

Acute hazards to the aquatic environment Category 1 H400: Very toxic to aquatic life.

2.2 Label Elements

Contains: Hydrogen sulphide



Signal Word: Danger

Hazard Statement(s): H220: Extremely flammable gas.
H280: Contains gas under pressure; may explode if heated.
H330: Fatal if inhaled.
H335: May cause respiratory irritation.
H400: Very toxic to aquatic life.

Precautionary Statements
General

None.

Prevention:

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260: Do not breathe gas/vapors.
P273: Avoid release to the environment.

Response:

P304+P340+P315: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice/attention.
P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381: In case of leakage, eliminate all ignition sources.



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Storage: P403: Store in a well-ventilated place.
P405: Store locked up.

Disposal None.

2.3 Other hazards Contact with evaporating liquid may cause frostbite or freezing of skin.

SECTION 3: Composition/information on ingredients

3.1 Substances

Chemical name Hydrogen sulphide
INDEX No.: 016-001-00-4
CAS-No.: 7783-06-4
EC No.: 231-977-3
REACH Registration No.: 01-2119445737-29
Purity: 100%
The purity of the substance in this section is used for classification only, and does not represent the actual purity of the substance as supplied, for which other documentation should be consulted.
Trade name: Hydrogen sulphide 1.8 Chemical; Hydrogen sulphide 2.5

Chemical name	Chemical formula	Concentration	CAS-No.	REACH Registration No.	M-Factor:	Notes
Hydrogen sulphide	H2S	100%	7783-06-4	01-2119445737-29	Aquatic Toxicity (Acute): 1	#

The concentrations of the components in the SDS header, product name on page one and in section 3.2 are in mol due to regulatory requirements. All concentrations are nominal.

This substance has workplace exposure limit(s).

PBT: persistent, bioaccumulative and toxic substance.

vPvB: very persistent and very bioaccumulative substance.

SECTION 4: First aid measures

General: Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

4.1 Description of first aid measures

Inhalation: Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.



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Eye contact: Rinse the eye with water immediately. Remove contact lenses, if present and easy to do. Continue rinsing. Flush thoroughly with water for at least 15 minutes. Get immediate medical assistance. If medical assistance is not immediately available, flush an additional 15 minutes.

Skin Contact: Contact with evaporating liquid may cause frostbite or freezing of skin.

Ingestion: Ingestion is not considered a potential route of exposure.

4.2 Most important symptoms and effects, both acute and delayed: May be fatal if inhaled. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. Causes damage to organs.

4.3 Indication of any immediate medical attention and special treatment needed

Hazards: May be fatal if inhaled. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. Causes damage to organs.

Treatment: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention. Get immediate medical advice/attention.

SECTION 5: Firefighting measures

General Fire Hazards: Heat may cause the containers to explode.

5.1 Extinguishing media

Suitable extinguishing media: Use water spray to reduce vapors or divert vapor cloud drift. Water Spray or Fog. Dry powder. Foam.

Unsuitable extinguishing media: Carbon Dioxide.

5.2 Special hazards arising from the substance or mixture: Fire or excessive heat may produce hazardous decomposition products. Fire or excessive heat may produce hazardous decomposition products.

Hazardous Combustion Products: If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Sulphur dioxide



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5.3 Advice for firefighters

Special fire fighting procedures:

In case of fire: Stop leak if safe to do so. Use of water may result in the formation of very toxic aqueous solutions. Keep run-off water out of sewers and water sources. Dike for water control. Continue water spray from protected position until container stays cool. Use extinguishants to contain the fire. Isolate the source of the fire or let it burn out.

Special protective equipment for fire-fighters:

Gas tight chemically protective clothing (Type 1) in combination with self contained breathing apparatus.
 Guideline: EN 943-2 Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Performance requirements for gas-tight (Type 1) chemical protective suits for emergency teams (ET)

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Evacuate area. Provide adequate ventilation. Consider the risk of potentially explosive atmospheres. In case of leakage, eliminate all ignition sources. Monitor the concentration of the released product. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.

6.2 Environmental Precautions:

Prevent further leakage or spillage if safe to do so. Reduce vapour with fog or fine water spray. Keep run-off water out of sewers and water sources. Dike for water control.

6.3 Methods and material for containment and cleaning up:

Provide adequate ventilation. Eliminate sources of ignition. Wash contaminated equipment or sites of leaks with copious quantities of water.

6.4 Reference to other sections:

Refer to sections 8 and 13.

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SECTION 7: Handling and storage:**7.1 Precautions for safe handling:**

Only experienced and properly instructed persons should handle gases under pressure. Avoid exposure - obtain special instructions before use. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Purge air from system before introducing gas. Containers, which contain or have contained flammable or explosive substances, must not be inerted with liquid carbon dioxide. Assess the risk of a potentially explosive atmosphere and the need for suitable equipment i.e. explosion-proof. Take precautionary measures against static discharges. Keep away from ignition sources (including static discharges). Provide electrical earthing of equipment and electrical equipment usable in explosive atmospheres. Use non-sparking tools. Installation of a cross purge assembly between the container and the regulator is recommended. Excess pressure must be vented through an appropriate scrubber system. Refer to supplier's handling instructions. The substance must be handled in accordance with good industrial hygiene and safety procedures. Ensure the complete system has been (or is regularly) checked for leaks before use. Protect containers from physical damage; do not drag, roll, slide or drop. Do not remove or deface labels provided by the supplier for the identification of the container contents. When moving containers, even for short distances, use appropriate equipment eg. trolley, hand truck, fork truck etc. Secure cylinders in an upright position at all times, close all valves when not in use. Provide adequate ventilation. Suck back of water into the container must be prevented. Do not allow backfeed into the container. Avoid suckback of water, acid and alkalis. Keep container below 50°C in a well ventilated place. Observe all regulations and local requirements regarding storage of containers. When using do not eat, drink or smoke. Store in accordance with local/regional/national/international regulations. Never use direct flame or electrical heating devices to raise the pressure of a container. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Damaged valves should be reported immediately to the supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Keep container valve outlets clean and free from contaminants particularly oil and water. If user experiences any difficulty operating container valve discontinue use and contact supplier. Never attempt to transfer gases from one container to another. Container valve guards or caps should be in place.



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7.2 Conditions for safe storage, including any incompatibilities: All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere. Segregate from oxidant gases and other oxidants being stored. Containers should not be stored in conditions likely to encourage corrosion. Stored containers should be periodically checked for general conditions and leakage. Keep away from food, drink and animal feeding stuffs. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible material.

7.3 Specific end use(s): None.

SECTION 8: Exposure controls/personal protection

8.1 Control Parameters

Occupational Exposure Limits

Chemical name	Type	Exposure Limit Values	Source
Hydrogen sulphide	CEIL	10 ppm 14 mg/m3	Norway. Regulation No. 1358 on Measures and Limit Values for Physical and Chemical Factors in Work Environment and Infection Groups for Biological Factors (12 2014)
	NORMEN	5 ppm 7 mg/m3	Norway. Regulation No. 1358 on Measures and Limit Values for Physical and Chemical Factors in Work Environment and Infection Groups for Biological Factors (12 2014)
	TWA	5 ppm 7 mg/m3	EU. Indicative Occupational Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (12 2009)
	STEL	10 ppm 14 mg/m3	EU. Indicative Occupational Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (12 2009)



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DNEL-Values

Critical component	Type	Value	Remarks
Hydrogen sulphide	Workers - Inhalation, Local, long-term	7 mg/m ³	respiratory tract irritation
	Workers - Inhalation, Systemic, short-term	14 mg/m ³	-
	Workers - Inhalation, Systemic, long-term	7 mg/m ³	Repeated dose toxicity
	Workers - Inhalation, Local, short-term	14 mg/m ³	-
	Workers - Eyes, Local effect		Hazard unknown (no further information necessary)

PNEC-Values

Critical component	Type	Value	Remarks
Hydrogen sulphide	Sewage treatment plant	1,33 mg/l	-
Hydrogen sulphide	Aquatic (freshwater)	0,03 µg/l	-
Hydrogen sulphide	Aquatic (intermit. releases)	0,19 µg/l	-
Hydrogen sulphide	Aquatic (marine water)	0,003 µg/l	-
Hydrogen sulphide	Air	7 mg/m ³	-

8.2 Exposure controls

Appropriate engineering controls:

Consider a work permit system e.g. for maintenance activities. Ensure adequate air ventilation. Provide adequate general and local exhaust ventilation. Keep concentrations well below occupational exposure limits. Gas detectors should be used when toxic quantities may be released. Gas detectors should be used when quantities of flammable gases or vapours may be released. Systems under pressure should be regularly checked for leakages. Product to be handled in a closed system and under strictly controlled conditions. Only use permanent leak tight installations (e.g. welded pipes). Take precautionary measures against static discharges. Do not eat, drink or smoke when using the product.



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Individual protection measures, such as personal protective equipment

General information:

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered. Keep self contained breathing apparatus readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Protect eyes, face and skin from contact with product. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

Eye/face protection:

Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes. Wear eye protection to EN 166 when using gases. Guideline: EN 166 Personal Eye Protection.

Skin protection

Hand Protection:

Guideline: EN 388 Protective gloves against mechanical risks.
Additional Information: Wear working gloves while handling containers
Guideline: EN 374-1/2/3 Protective gloves against chemicals and micro-organisms.
Additional Information: Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Body protection:

Wear fire resistant or flame retardant clothing. Keep suitable chemically resistant protective clothing readily available for emergency use.
Guideline: ISO/TR 2801:2007 Clothing for protection against heat and flame -- General recommendations for selection, care and use of protective clothing. Guideline: EN 943 Protective clothing against liquid and gaseous chemicals, including liquid aerosols and solid particles.

Other:

Wear safety shoes while handling containers
Guideline: ISO 20345 Personal protective equipment - Safety footwear.



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Respiratory Protection:	Reference should be made to European Standard EN 689 for methods for the assessment of exposure by inhalation to chemical agents and national guidance documents for methods for the determination of hazardous substances. When allowed by a risk assessment Respiratory Protective Equipment (RPE) may be used. The selection of the Respiratory Protective Device (RPD) must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected RPD. Self-contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres. Guideline: EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.
Thermal hazards:	No precautionary measures are necessary.
Hygiene measures:	Obtain special instructions before use. Do not eat, drink or smoke when using the product.
Environmental exposure controls:	For waste disposal, see section 13 of the SDS.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state:	Gas
Form:	Liquefied gas
Color:	Colorless
Odor:	Strong odor of rotten eggs
Odor Threshold:	Odor threshold is subjective and is inadequate to warn of over exposure.
pH:	Not applicable.
Melting Point:	-86 °C Experimental result, Key study
Boiling Point:	-60,2 °C
Sublimation Point:	Not applicable.
Critical Temp. (°C):	100,0 °C
Flash Point:	Not applicable to gases and gas mixtures.
Evaporation Rate:	Not applicable to gases and gas mixtures.
Flammability (solid, gas):	Flammable Gas
Flammability Limit - Upper (%):	45,5 %(V) Experimental result, Supporting study
Flammability Limit - Lower (%):	3,9 %(V)
Vapor pressure:	20.851 hPa (25 °C) Experimental result, Key study



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Vapor density (air=1): 1,2
 Relative density: 0,92
 Solubility(ies)
 Solubility in Water: 3,98 g/l
 Partition coefficient (n-octanol/water): Not known.
 Autoignition Temperature: 270 °C Experimental result, Key study
 Decomposition Temperature: When heated to decomp, emits highly toxic fumes of sulfoxides.
 Viscosity
 Kinematic viscosity: No data available.
 Dynamic viscosity: 0,013 mPa.s (25 °C)
 Explosive properties: Not applicable.
 Oxidizing properties: Not applicable.

9.2 Other information: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.
 Molecular weight: 34,08 g/mol (H₂S)
 Minimum ignition temperature: 270 °C

SECTION 10: Stability and reactivity

10.1 Reactivity: No reactivity hazard other than the effects described in sub-section below.
 10.2 Chemical Stability: Stable under normal conditions.
 10.3 Possibility of hazardous reactions: Can form a potentially explosive atmosphere in air. May react violently with oxidants.
 10.4 Conditions to avoid: Avoid moisture in the installation. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
 10.5 Incompatible Materials: Air and oxidizers. Moisture. For material compatibility see latest version of ISO-11114. With water causes rapid corrosion of some metals.
 10.6 Hazardous Decomposition Products: Under normal conditions of storage and use, hazardous decomposition products should not be produced. If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Sulphur dioxide



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SECTION 11: Toxicological information

General information: None.

11.1 Information on toxicological effects

Acute toxicity - Oral Product Based on available data, the classification criteria are not met.

Acute toxicity - Dermal Product Based on available data, the classification criteria are not met.

Acute toxicity - Inhalation Product Fatal if inhaled.

Hydrogen sulphide LC 50 (Rat, 4 h): 356 ppm

Repeated dose toxicity Hydrogen sulphide LOAEL (Rat(Female, Male), Inhalation, 90 d): 30,5 ppm(m) Inhalation
Experimental result, Key study

Skin Corrosion/Irritation Product Based on available data, the classification criteria are not met.

Serious Eye Damage/Eye Irritation Product Based on available data, the classification criteria are not met.

Respiratory or Skin Sensitization Product Based on available data, the classification criteria are not met.

Germ Cell Mutagenicity Product Based on available data, the classification criteria are not met.

In vitro Ames test in vitro: (OECD Guideline 471 (Bacterial Reverse Mutation Test)): Negative.



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Carcinogenicity Product	Based on available data, the classification criteria are not met.
Reproductive toxicity Product	Based on available data, the classification criteria are not met.
Reproductive toxicity (Fertility)	Fertility: Rat NOAEC: 80 ppm
Specific Target Organ Toxicity - Single Exposure Product	Route of Exposure: Inhalation Causes irritation to the respiratory tract May cause respiratory irritation.
Specific Target Organ Toxicity - Repeated Exposure Product	Route of Exposure: Inhalation Causes damage to the central nervous system.
Aspiration Hazard Product	Not applicable to gases and gas mixtures..

SECTION 12: Ecological information

General information: Very toxic to aquatic organisms. Endangering to drinking water.

12.1 Toxicity

**Acute toxicity
Product** Toxic to aquatic organisms. Very toxic to aquatic life.

**Acute toxicity - Fish
Hydrogen sulphide** LC 50 (Oncorhynchus mykiss, 96 h): 0,01275 mg/l (flow-through) Remarks: Experimental result, Weight of Evidence study

**Acute toxicity - Aquatic Invertebrates
Hydrogen sulphide** EC 50 (Daphnia sp., 48 h): 0,12 mg/l (Static) Remarks: Experimental result, Key study

**12.2 Persistence and Degradability
Product**

Not applicable to gases and gas mixtures..



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Biodegradation

Hydrogen sulphide

76 % (2 d) Detected in water. Not specified, Not specified

12.3 Bioaccumulative potential

Product

The subject product is expected to biodegrade and is not expected to persist for long periods in an aquatic environment.

12.4 Mobility in soil

Product

Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5 Results of PBT and vPvB assessment

Product

Not classified as PBT or vPvB.

12.6 Other adverse effects:

No ecological damage caused by this product.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information:

Must not be discharged to atmosphere. Consult supplier for specific recommendations.

Disposal methods:

Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", downloadable at <http://www.eiga.org>) for more guidance on suitable disposal methods. Dispose of container via supplier only. Discharge, treatment, or disposal may be subject to national, state, or local laws.

European Waste Codes

Container:

16 05 04*: Gases in pressure containers (including halons) containing dangerous substances.



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SECTION 14: Transport information

ADR

14.1 UN Number: UN 1053
14.2 UN Proper Shipping Name: HYDROGEN SULPHIDE
14.3 Transport Hazard Class(es)
Class: 2
Label(s): 2.3, 2.1
Hazard No. (ADR): 263
Tunnel restriction code: (B/D)
14.4 Packing Group: -
14.5 Environmental hazards: Environmentally Hazardous
14.6 Special precautions for user: -

RID

14.1 UN Number: UN 1053
14.2 UN Proper Shipping Name: HYDROGEN SULPHIDE
14.3 Transport Hazard Class(es)
Class: 2
Label(s): 2.3, 2.1
14.4 Packing Group: -
14.5 Environmental hazards: Environmentally Hazardous
14.6 Special precautions for user: -

IMDG

14.1 UN Number: UN 1053
14.2 UN Proper Shipping Name: HYDROGEN SULPHIDE
14.3 Transport Hazard Class(es)
Class: 2.3
Label(s): 2.3, 2.1
EmS No.: F-D, S-U
14.4 Packing Group: -
14.5 Environmental hazards: Not applicable
14.6 Special precautions for user: -



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IATA

14.1 UN Number: UN 1053
14.2 Proper Shipping Name: Hydrogen sulphide
14.3 Transport Hazard Class(es):
Class: 2.3
Label(s): -
14.4 Packing Group: -
14.5 Environmental hazards: Environmentally Hazardous
14.6 Special precautions for user: -
Other information
Passenger and cargo aircraft: Forbidden.
Cargo aircraft only: Forbidden.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code: Not applicable

Additional identification: Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers ensure that they are firmly secured. Ensure that the container valve is closed and not leaking. Container valve guards or caps should be in place. Ensure adequate air ventilation.

SECTION 15: Regulatory information

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

EU Regulations

Regulation (EC) No. 1907/2006 Annex XVII Substances subject to restriction on marketing and use:

Chemical name	CAS-No.	Concentration
Hydrogen sulphide	7783-06-4	100%

EU. Directive 2012/18/EU (SEVESO III) on major accident hazards involving dangerous substances, as amended.:

Chemical	CAS-No.	Lower-tier Requirements	Upper-tier Requirements
Hydrogen sulphide	7783-06-4	5 t	20 t



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Directive 98/24/EC on the protection of workers from the risks related to chemical agents at work:

Chemical name	CAS-No.	Concentration
Hydrogen sulphide	7783-06-4	100%

National Regulations

Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work Directive 89/686/EEC on personal protective equipment Directive 2014/34/EU on equipment and protective systems intended for use in potentially explosive atmospheres (ATEX) Only products that comply with the food regulations (EC) No. 1333/2008 and (EU) No. 231/2012 and are labelled as such may be used as food additives.
This Safety Data Sheet has been produced to comply with Regulation (EU) 2015/830.

15.2 Chemical safety assessment: Chemical Safety Assessment has been carried out.

SECTION 16: Other information

Revision Information: Not relevant.



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Key literature references and sources for data:

Various sources of data have been used in the compilation of this SDS, they include but are not exclusive to:
 Agency for Toxic Substances and Diseases Registry (ATSDR) (<http://www.atsdr.cdc.gov/>).
 European Chemical Agency: Guidance on the Compilation of Safety Data Sheets.
 European Chemical Agency: Information on Registered Substances <http://apps.echa.europa.eu/registered/registered-sub.aspx#search>
 European Industrial Gases Association (EIGA) Doc. 169 "Classification and Labelling guide", as amended.
 International Programme on Chemical Safety (<http://www.inchem.org/>)
 ISO 10156:2010 Gases and gas mixtures - Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets.
 Matheson Gas Data Book, 7th Edition.
 National Institute for Standards and Technology (NIST) Standard Reference Database Number 69.
 The ESIS (European chemical Substances Information System) platform of the former European Chemicals Bureau (ECB) ESIS (<http://ecb.jrc.ec.europa.eu/esis/>).
 The European Chemical Industry Council (CEFIC) ERICards.
 United States of America's National Library of Medicine's toxicology data network TOXNET (<http://toxnet.nlm.nih.gov/index.html>)
 Threshold Limit Values (TLV) from the American Conference of Governmental Industrial Hygienists (ACGIH).
 Substance specific information from suppliers.
 Details given in this document are believed to be correct at the time of publication.

Wording of the H-statements in section 2 and 3

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.

Training information:

Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard. Ensure operators understand the flammability hazard. Ensure operators understand the hazards.



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Flam. Gas 1, H220
Press. Gas Liq. Gas, H280
Acute Tox. 2, H330
STOT SE 3, H335
Aquatic Acute 1, H400

Other information:

Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Ensure adequate air ventilation. Ensure all national/local regulations are observed. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

Last revised date:

09.12.2020

Disclaimer:

This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.



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Annex to the extended Safety Data Sheet (eSDS)

Content

Exposure Scenario 1.	Industrial use, Formulation of mixtures with gas in pressure receptacles, Transfilling gas or liquid., Use the gas as odorising agent in another gas (e.g. LPG)., Using gas for metal treatment., Use for electronic component manufacture., Using gas as feedstock in chemical processes.
Exposure Scenario 2.	Professional use, Using gas alone or in mixtures for the calibration of analysis equipment.

Exposure Scenario 1.

Exposure Scenario worker

1. Industrial use, Formulation of mixtures with gas in pressure receptacles, Transfilling gas or liquid., Use the gas as odorising agent in another gas (e.g. LPG)., Using gas for metal treatment., Use for electronic component manufacture., Using gas as feedstock in chemical processes.

List of use descriptors	
Sector(s) of use	SU0: Other SU4: Manufacture of food products SU8: Manufacture of bulk, large scale chemicals (including petroleum products) SU9: Manufacture of fine chemicals SU11: Manufacture of rubber products SU15: Manufacture of fabricated metal products, except machinery and equipment SU16: Manufacture of computer, electronic and optical products, electrical equipment
Product categories [PC]:	PC2: Adsorbents PC14: Metal surface treatment products PC21: Laboratory chemicals



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	PC33: Semiconductors
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Name of contributing environmental scenario and corresponding ERC	<p><u>Industrial use:</u> ERC2: Formulation into mixture</p> <p>ERC6a: Use of intermediate</p> <p>ERC6b: Use of reactive processing aid at industrial site (no inclusion into or onto article)</p> <p>ERC7: Use of functional fluid at industrial site</p>
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Contributing Scenarios	<p><u>Industrial use:</u> PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions</p> <p>PROC3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition</p> <p>PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities</p> <p>PROC9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)</p> <p>PROC16: Use of fuels</p>
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2.1. Contributing exposure scenario controlling environmental exposure for: Industrial use

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.
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Physical form of the product	See section 9 of the SDS.
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Viscosity:	
Kinematic viscosity:	No data available.



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Dynamic viscosity:	0,013 mPa.s (25 °C)
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Amounts used

Annual amount per site	50 t
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Frequency and duration of use

Batch process:	not relevant
Continuous process:	260 Emission days

Environment factors not influenced by risk management

Flow rate of receiving surface water (m ³ /d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m ³ /d	not relevant	not relevant	Assumed on-site sewage treatment plant flow (m ³ /d):	Estimated 2000 m ³ /day

Other given operational conditions affecting environmental exposure

type	Emission days	Emission factors			Remarks
		Air	Soil	Water	
Continuous release	260	95 %	-	-	Closed systems are used in order to prevent unintended emissions

Other relevant operational conditions	not relevant
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Risk management measures (RMM)

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

See section 8 of the safety data sheet (Environmental exposure controls).

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

Air	Closed systems are used in order to prevent unintended emissions, Exhaust air purification with scrubber
Soil	Soil emission controls are not applicable as there is no direct release



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	to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report



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Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.
Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Industrial use

Process Categories:	PROC1: Chemical production or refinery in closed process without likelihood of 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 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) PROC16: Use of fuels
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Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.
Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	20851 hPa
Process temperature:	25 °C
Remarks	not relevant

Amounts used

Daily amount per site	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.
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Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC1, PROC3, PROC8b, PROC9, PROC16

Human factors not influenced by risk management



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This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions, Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition, Transfer of substance or mixture (charging and discharging) at dedicated facilities, Transfer of substance or mixture into small containers (dedicated filling line, including weighing), Use of fuels

Other relevant operational conditions: . See section 8 of the SDS.

Risk management measures (RMM)

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

See section 8 of the safety data sheet

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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
See section 8 of the safety data sheet				Undertake operation under enclosed conditions.

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.



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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system Drain down and flush system prior to equipment break-in or maintenance. Apply a good standard of general or controlled ventilation when maintenance activities are carried out.

3. Exposure estimation

Environment:
Industrial use:
ERC2, ERC6a, ERC6b, ERC7:

Compartment	PEC	RCR	Method	Remarks
Air	No data available.	< 1	Qualitative approach used to conclude safe use.	Check that RMMs and OCs are as described above or of equivalent efficiency

Health:
Industrial use:
PROC1, PROC3, PROC8b, PROC9, PROC16:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalation exposure	Indoor/Outdoor use.	No data available.	< 1	Qualitative approach used to conclude safe use.	Check that RMMs and OCs are as described above or of equivalent efficiency

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

Check that RMMs and OCs are as described above or of equivalent efficiency Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see <http://www.ecetoc.org/tra>



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Exposure Scenario 2.

Exposure Scenario worker

1. Professional use, Using gas alone or in mixtures for the calibration of analysis equipment.

List of use descriptors	
Sector(s) of use	SU0: Other
Product categories [PC]:	PC21: Laboratory chemicals

Name of contributing environmental scenario and corresponding ERC	<u>Using gas alone or in mixtures for the calibration of analysis equipment.:</u> ERC8b: Widespread use of reactive processing aid (no inclusion into or onto article, indoor)
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Contributing Scenarios	<u>Using gas alone or in mixtures for the calibration of analysis equipment.:</u> PROC15: Use as laboratory reagent
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2.1. Contributing exposure scenario controlling environmental exposure for: Using gas alone or in mixtures for the calibration of analysis equipment.

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.
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Physical form of the product	See section 9 of the SDS.
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Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,013 mPa.s (25 °C)

Amounts used

Annual amount per site	10 kg
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Frequency and duration of use



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Batch process:	260 Emission days
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water (m ³ /d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m ³ /d	not relevant	not relevant	Assumed on-site sewage treatment plant flow (m ³ /d):	Estimated 2000 m ³ /day

Other given operational conditions affecting environmental exposure

type	Emission days	Emission factors			Remarks
		Air	Soil	Water	
Intermittent release	260	95 %	-	-	Closed systems are used in order to prevent unintended emissions

Other relevant operational conditions	not relevant
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Risk management measures (RMM)

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

See section 8 of the safety data sheet (Environmental exposure controls).

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

Air	Closed systems are used in order to prevent unintended emissions, Exhaust air purification with scrubber
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant



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Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.
Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Using gas alone or in mixtures for the calibration of analysis equipment.

Process Categories: PROC15: Use as laboratory reagent



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Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.
Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	20851 hPa
Process temperature:	25 °C
Remarks	not relevant

Amounts used

Daily amount per site	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.
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Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC15

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor use				Use as laboratory reagent

Other relevant operational conditions: . See section 8 of the SDS.

Risk management measures (RMM)

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

See section 8 of the safety data sheet



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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
See section 8 of the safety data sheet				Undertake operation under enclosed conditions.

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.

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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system Drain down and flush system prior to equipment break-in or maintenance. Apply a good standard of general or controlled ventilation when maintenance activities are carried out.

3. Exposure estimation

Environment:

Using gas alone or in mixtures for the calibration of analysis equipment.:

ERC8b:

Compartment	PEC	RCR	Method	Remarks
Air	No data available.	< 1	Qualitative approach used to conclude safe use.	Check that RMMs and OCs are as described above or of equivalent efficiency

Health:

Using gas alone or in mixtures for the calibration of analysis equipment.:

PROC15:



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Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalation exposure	Indoor use	No data available.	< 1	Qualitative approach used to conclude safe use.	Check that RMMs and OCs are as described above or of equivalent efficiency

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

Check that RMMs and OCs are as described above or of equivalent efficiency Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see <http://www.ecetoc.org/tra>