SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name : Hydrogen sulphide , HYDROGEN SULPHIDE (N18, N25, E.G.)

SDS Nr : 073

Chemical description : Hydrogen sulphide
CAS No :7783-06-4
EC No :231-977-3
Index No :016-001-00-4

Registration-No. : Registration deadline not expired.

Chemical formula : H2S

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

Relevant identified uses : Industrial and professional. Perform risk assessment prior to use.
Test gas / Calibration gas. Chemical reaction / Synthesis. Laboratory use.
Contact supplier for more uses information.
Use for manufacture of electronic/photovoltaic components.

Uses advised against : Consumer use

1.3. Details of the supplier of the safety data sheet

Company identification : AIR LIQUIDE Deutschland GmbH
Hans-Günther-Sohl-Straße 5
D-40235 Düsseldorf GERMANY
Telefon: +49 (0)211 6699-0 - Fax: +49 (0)211 6699-222

E-Mail address (competent person) : Info.SDB@AirLiquide.de

1.4. Emergency telephone number

Emergency telephone number : +49 (0)2151 398668

- Availability : (24 / 7)

SECTION 2. Hazards identification

2.1. Classification of the substance or mixture

Hazard Class and Category Code(s), Regulation (EC) No 1272/2008 (CLP)

• Health hazards : Specific Target Organ Toxicity - Single exposure - Respiratory tract irritation - Category 3 - Warning - (CLP : STOT SE 3) - H335
Acute toxicity, Inhalation - Category 2 - Danger - (CLP : Acute Tox. 2) - H330

• Physical hazards : Flammable gases - Category 1 - Danger - (CLP : Flam. Gas 1) - H220
Gases under pressure - Liquefied gas - Warning - (CLP : Press. Gas) - H280

• Environmental hazards : Hazardous to the aquatic environment - Acute hazard - Category 1 - Warning - (CLP : Aquatic Acute 1) - H400

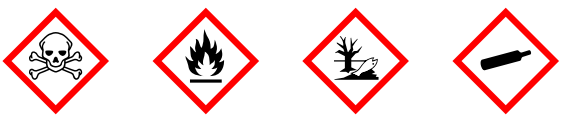
Classification EC 67/548 or EC 1999/45

Classification : F+; R12
T+; R26
N; R50

2.2. Label elements

Labelling Regulation EC 1272/2008 (CLP)

• Hazard pictograms



SECTION 2. Hazards identification (continued)

- **Hazard pictograms code** : GHS06 - GHS02 - GHS09 - GHS04
- **Signal words** : Danger
- **Hazard statements** : 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**
  - **Prevention** : P260 - Do not breathe gas, vapours.
    P210 - Keep away from heat, sparks, open flames or hot surfaces. – No smoking.
    P273 - Avoid release to the environment.
  - **Response** : P304+P340+P315 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice / attention.
    P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
    P381 - Eliminate all ignition sources if safe to do so.
  - **Storage** : P403 - Store in a well-ventilated place.
    P405 - Store locked up.

2.3. Other hazards

Other hazards : Contact with liquid may cause cold burns/frostbite.

SECTION 3. Composition/information on ingredients

3.1. Substance / 3.2. Mixture

Substance.

Substance name		Content [Vol-%]	CAS No EC No Index No Registration no.	Classification(DSD)	Classification(CLP)
Hydrogen sulphide	:	100 %	7783-06-4 231-977-3 016-001-00-4 * 2	F+; R12 T+; R26 N; R50	Acute Tox. 2 (H330) Flam. Gas 1 (H220) STOT SE 3 (H335) Liq. Gas (H280) Aquatic Acute 1 (H400)

Contains no other components or impurities which will influence the classification of the product.
* 1: Listed in Annex IV / V REACH, exempted from registration.
* 2: Registration deadline not expired.
* 3: Registration not required: Substance manufactured or imported < 1t/y
Full text of R-phrases see chapter 16. Full text of H-statements see chapter 16

SECTION 4. First aid measures

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.
- **Skin contact** : Adverse effects not expected from this product.
- **Eye contact** : Adverse effects not expected from this product.
- **Ingestion** : Ingestion is not considered a potential route of exposure.

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

: May cause damaging effects to central nervous system, metabolism and gastrointestinal tract. Prolonged exposure to small concentrations may result in pulmonary oedema.
Refer to section 11.

SECTION 4. First aid measures (continued)

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

: Obtain medical assistance.
None.

SECTION 5. Fire-fighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Dry powder.
Water spray or fog.

- Unsuitable extinguishing media : Carbon dioxide.
Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

Specific hazards : Exposure to fire may cause containers to rupture/explode.

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

5.3. Advice for firefighters

Specific methods : Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
If possible, stop flow of product.
Use fire control measures appropriate to the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.
Use water spray or fog to knock down fire fumes if possible.

Special protective equipment for fire fighters : Gas tight chemically protective clothing in combination with self contained breathing apparatus.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams.

SECTION 6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

: Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Ensure adequate air ventilation.
Eliminate ignition sources.
Evacuate area.
Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Try to stop release.
Consider the risk of potentially explosive atmospheres.
Monitor concentration of released product.

6.2. Environmental precautions

: Try to stop release.

6.3. Methods and material for containment and cleaning up

: Hose down area with water.
Ventilate area.

SECTION 6. Accidental release measures (continued)

6.4. Reference to other sections

Reference to other sections : See also sections 8 and 13.

SECTION 7. Handling and storage

7.1. Precautions for safe handling

Safe use of the product :
Take precautionary measures against static discharge.
Keep away from ignition sources (including static discharges).
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
Purge air from system before introducing gas.
Avoid exposure, obtain special instructions before use.
Do not smoke while handling product.
Avoid suck back of water, acid and alkalis.
Only experienced and properly instructed persons should handle gases under pressure.
Ensure the complete gas system was (or is regularily) checked for leaks before use.
Installation of a cross purge assembly between the cylinder and the regulator is recommended.
Assess the risk of potentially explosive atmosphere and the need for explosion-proof equipment.
Consider the use only non-sparking tools.
The product must be handled in accordance with good industrial hygiene and safety procedures.
Consider pressure relief device(s) in gas installations.

Safe handling of the gas receptacle :
Refer to supplier's container handling instructions.
Do not allow backfeed into the container.
Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
Protect cylinders 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 cylinder contents.
When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders.
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.
If user experiences any difficulty operating cylinder valve discontinue use and contact 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.
Keep container valve outlets clean and free from contaminants particularly oil and water.
Never attempt to transfer gases from one cylinder/container to another.
Never use direct flame or electrical heating devices to raise the pressure of a container.
Damaged valves should be reported immediately to the supplier.

7.2. Conditions for safe storage, including any incompatibilities

Storage :
Keep container below 50°C in a well ventilated place.
Segregate from oxidant gases and other oxidants in store. Store containers in location free from fire risk and away from sources of heat and ignition. Stored containers should be periodically checked for general condition and leakage.
Observe all regulations and local requirements regarding storage of containers.
Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. Container valve guards or caps should be in place. All electrical equipment in the storage areas should be compatible with the risk of potentially explosive atmosphere. Keep away from combustible materials.

SECTION 7. Handling and storage (continued)

7.3. Specific end use(s)

: None.

SECTION 8. Exposure controls/personal protection

8.1. Control parameters

Occupational Exposure Limits

Hydrogen sulphide

: ILV (EU) - 8 H - [mg/m³] : 7
: ILV (EU) - 8 H - [ppm] : 5
: ILV (EU) - 15 min - [mg/m³] : 14
: ILV (EU) - 15 min - [ppm] : 10
: AGW (8h) - Germany [mg/m³] TRGS 900 : 7.1
: AGW (8h) - Germany [ppm] TRGS 900 : 5
: Exceeding factor AGW - Germany TRGS 900 : 2

DNEL: Derived no effect level (Workers) : None available.

PNEC: Predicted no effect concentration : None available.

8.2. Exposure controls

8.2.1. Appropriate engineering controls : Provide adequate general and local exhaust ventilation.
Alarm detectors should be used when toxic gases may be released.
Systems under pressure shoud be regularily checked for leakages.
Product to be handled in a closed system and under strictly controlled conditions.
Ensure exposure is below occupational exposure limits (where available).
Consider work permit system e.g. for maintenance activities.
Preferably use only permanent leak-tight installations (e.g. welded pipes).

8.2.2. Individual protection measures, e.g. personal protective equipment : 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.
PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection : Wear safety glasses with side shields or goggles when transfilling or breaking transfer connections
Wear safety glasses with side shields
Standard EN 166 - Personal eye-protection.

- Hand protection : Standard EN 374 - Protective gloves against chemicals.
Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.
Wear chemically resistant protective gloves.
Permeation time: minimum >480min long term exposure; material / thickness [mm]:
Consult glove manufacturer´s product information on material suitability and material thickness.
The breakthrough time of the selected gloves must be greater than the intended use period.
Nitrile rubber (NBR) / 0,7

- Other : Keep suitable chemically resistant protective clothing readily available for emergency use.
Consider the use of flame resistant anti-static safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
Standard EN ISO 1149-5 - Protective clothing: Electrostatic properties.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection : Keep self contained breathing apparatus readily available for emergency use.
Use gas filters and full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers.
Gas filters do not protect against oxygen deficiency.

SECTION 8. Exposure controls/personal protection (continued)

Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known.
Standard EN 14387 - Gas filter(s), combined filter(s) and full face mask - EN 136.
Consult respiratory device supplier´s product information for the selection of the appropriate device.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
Recommended: Filter B (grey).

• Thermal hazards : None necessary.

8.2.3. Environmental exposure controls : Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	
Physical state at 20°C / 101.3kPa	: Gas.
Colour	: Colourless.
Odour	: Rotten eggs. Poor warning properties at low concentrations. Odour can persist.
Odour threshold	: Odour threshold is subjective and inadequate to warn for overexposure.
Molar mass [g/mol]	: 34
Melting point [°C]	: -86
Boiling point [°C]	: -60.2
Critical temperature [°C]	: 100
Flash point [°C]	: Not applicable for gases and gas-mixtures.
Evaporation rate (ether=1)	: Not applicable for gases and gas-mixtures.
Flammability range [vol% in air]	: 3.9 to 45.5
Vapour pressure [20°C]	: 18.8 bar
Relative density, gas (air=1)	: 1.2
Relative density, liquid (water=1)	: 0.92
Solubility in water [mg/l]	: 3980
Partition coefficient n-octanol/water [log Pow]	: Not applicable for inorganic gases.
Auto-ignition temperature [°C]	: 270

9.2. Other information

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

SECTION 10. Stability and reactivity

10.1. Reactivity

: No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

: Stable under normal conditions.

10.3. Possibility of hazardous reactions

: Can form explosive mixture with air.
May react violently with oxidants.

10.4. Conditions to avoid

: Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Avoid moisture in installation systems.

10.5. Incompatible materials

: With water causes rapid corrosion of some metals.
Moisture.
Air, Oxidiser.
For additional information on compatibility refer to ISO 11114

10.6. Hazardous decomposition products

: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11. Toxicological information

11.1. Information on toxicological effects

Acute toxicity

Rat inhalation LC50 [ppm/4h]	: 356
Skin corrosion/irritation	: No known effects from this product.
Serious eye damage/irritation	: No known effects from this product.
Respiratory or skin sensitisation	: No known effects from this product.
Carcinogenicity	: No known effects from this product.
Germ cell mutagenicity	: No known effects from this product.
Reproductive toxicity	: No known effects from this product.
STOT-single exposure	: Damage to central nervous system.
STOT-repeated exposure	: Damage to central nervous system.
Aspiration hazard	: Not applicable for gases and gas-mixtures.

SECTION 12. Ecological information

12.1. Toxicity

: Very toxic to aquatic life.

EC50 48h - Daphnia magna [mg/l]	: 0.12
EC50 72h - Algae [mg/l]	: 1.87
LC50-96h - fish [mg/l]	: 0.007 to 0.019

12.2. Persistence and degradability

: Not applicable for inorganic gases.

SECTION 12. Ecological information (continued)

12.3. Bioaccumulative potential

: No data available.

12.4. Mobility in soil

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

12.5. Results of PBT and vPvB assessment

: Not classified as PBT or vPvB.

12.6. Other adverse effects

:
May cause pH changes in aqueous ecological systems.

Effect on ozone layer : None.

Effect on the global warming : No known effects from this product.

SECTION 13. Disposal considerations

13.1. Waste treatment methods

: Gas may be scrubbed in alkaline solution under controlled conditions to avoid violent reaction.
Must not be discharged to atmosphere.
Toxic and corrosive gases formed during combustion should be scrubbed before discharge to atmosphere.
Refer to the code of practice of EIGA (Doc. 30/10 “Disposal of Gases, downloadable at http://www.eiga.org) for more guidance on suitable disposal methods

List of hazardous waste : 16 05 04: Gases in pressure containers (including halons) containing dangerous substances.

13.2. Additional information

: None.

SECTION 14. Transport information

UN number : 1053

Labelling ADR, IMDG, IATA

: 2.1 : flammable gas.
2.3 : Toxic gas.
Environmentally hazardous substance

Land transport (ADR/RID)

H.I. nr : 263

UN proper shipping name : HYDROGEN SULPHIDE

Transport hazard class(es) : 2

Classification code : 2 TF

Packing Instruction(s) : P200

Tunnel Restriction : B/D Tank carriage: Passage forbidden through tunnels of category B, C, D

Environmental hazards : Environmentally hazardous substance / mixture.

Sea transport (IMDG)

SECTION 14. Transport information (continued)

Proper shipping name	:	HYDROGEN SULPHIDE
Class	:	2.3
Emergency Schedule (EmS) - Fire	:	F-D
Emergency Schedule (EmS) - Spillage	:	S-U
Packing instruction	:	P200
IMDG-Marine pollutant	:	Yes
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	:	Not applicable.

Air transport (ICAO-TI / IATA-DGR)

Proper shipping name (IATA)	:	HYDROGEN SULPHIDE
Class	:	2.3
Passenger and Cargo Aircraft	:	DO NOT LOAD IN PASSENGER AIRCRAFT.
Cargo Aircraft only	:	FORBIDDEN.

Special precautions for user

: - Ensure there is adequate ventilation.
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 containers are firmly secured.
- Ensure cylinder valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.
Avoid transport on vehicles where the load space is not separated from the driver's compartment.

SECTION 15. Regulatory information

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

EU legislation

Restrictions on use	:	None.
Seveso directive 96/82/EC	:	Listed.

National legislation

	:	Ensure all national/local regulations are observed.
- 4. BImschV (Germany)	:	Listed.
- Water hazard class (WGK)	:	WGK Germany: 2 - Hazard to waters.
- Other regulations and technical rules (not complete)	:	[German regulations] BetriebssicherheitsV mit TRBSen insbesondere TRBS 3145 / TRGS 725 "Ortsbewegliche Druckgasbehälter", TRGS 2141, BGRegel 500 Teil 2.33: "Umgang mit Gasen", GefahrstoffV mit Technischen Regeln Gefährliche Stoffe TRGS insbesondere TRGS 407 "Tätigkeiten mit Gasen - Gefährdungsbeurteilung", TRGS 400, 500, 510, 900. BGR 104, TRBS 2152.

15.2. Chemical safety assessment

: This product is either exempt from REACH, does not meet the minimum volume threshold for a CSR or the CSA has not yet been carried out.

SECTION 16. Other information

Indication of changes	:	Revised safety data sheet in accordance with commisssion regulation (EU) No 453/2010
Training advice	:	Ensure operators understand the flammability hazard. Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard.
List of full text of R-phrases in section 3.	:	R12 : Extremely flammable. R26 : Very toxic by inhalation. R50 : Very toxic to aquatic organisms.
List of full text of H-statements in section 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.
Note	:	This Safety Data Sheet has been established in accordance with the applicable European Union legislation.
DISCLAIMER OF LIABILITY	:	Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Details given in this document are believed to be correct at the time of going to press. 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.

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