HYDROGEN SULFIDE
Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	HYDROGEN SULFIDE
Product Code(s)	G-94
UN-Number	UN1053
Recommended Use	Compressed gas.
Synonyms	Dihydrogen Sulfide; Sulfur Hydride
Supplier Address*	Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC 575 Mountain Ave. Murray Hill, NJ 07974 Phone: 908-464-8100 www.lindeus.com Linde Gas Puerto Rico, Inc. Las Palmas Village Road No. 869, Street No. 7 Catano, Puerto Rico 00962 Phone: 787-641-7445 www.pr.lindegas.com Linde Canada Limited 5860 Chedworth Way Mississauga, Ontario L5R 0A2 Phone: 905-501-1700 www.lindecanada.com * May include subsidiaries or affiliate companies / divisions. For additional product information contact your local customer service.
Chemical Emergency Phone Number	Chemtrec: 1-800-424-9300 for US / 703-527-3887 outside US

2. HAZARDS IDENTIFICATION

DANGER!

Emergency Overview

Extremely flammable
Fatal if inhaled
Irritating to eyes, respiratory system and skin
Contents under pressure
Keep at temperatures below 52°C / 125°F

Appearance Colorless | Physical State Gas. | Odor Rotten-egg like

Potential Health Effects

Principle Routes of Exposure	Inhalation. Eye contact. Skin contact.

Acute Toxicity

Inhalation	Fatal if inhaled. May cause central nervous system effects such as headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure and death. Hydrogen sulfide gas between 15 and 500 ppm can cause headache, nausea and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. Hydrogen sulfide, present in trace amounts, is a poisonous gas with the smell of rotten eggs. After a period of exposure, the smell disappears due to olfactory fatigue.
Eyes	Irritating to eyes. Contact with rapidly expanding gas near the point of release may cause frostbite.
Skin	Irritating to skin. Contact with rapidly expanding gas near the point of release may cause frostbite.
Skin Absorption Hazard	No known effect based on information supplied.
Ingestion	Not an expected route of exposure. Ingestion may cause irritation to mucous membranes.
Chronic Effects	No known effect based on information supplied
Aggravated Medical Conditions	Respiratory disorders. Central nervous system. Skin disorders. Pre-existing eye disorders.
Environmental Hazard	See Section 12 for additional Ecological Information.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Volume %	Chemical Formula
Hydrogen sulfide	7783-06-4	>99	H_2S

4. FIRST AID MEASURES

General Advice	Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If symptoms persist, call a physician.
Skin Contact	Wash off immediately with plenty of water. If symptoms persist, call a physician.
Inhalation	PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.
Ingestion	Not an expected route of exposure.
Notes to Physician	Acute hydrogen sulfide poisoning can be treated by induction of methemoglobinemia through parenteral injection of methemoglobin generating agents (sodium nitrile). This acts an antidote by restoring the normal activity of the sulfide inhibited enzyme.
Protection of First-aiders	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Flammable Properties	Extremely flammable.
Suitable Extinguishing Media	Water spray. Carbon dioxide (CO_2). Foam. Dry chemical. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
Hazardous Combustion Products	Sulfur oxides.

Explosion Data

Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	Yes.
Specific Hazards Arising from the Chemical	Continue to cool fire exposed cylinders until flames are extinguished. Cylinders may rupture under extreme heat. Damaged cylinders should be handled only by specialists.
Protective Equipment and Precautions for Firefighters	If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves. Vapors may travel to source of ignition and flash back. Vapors may accumulate in confined areas (basement, tanks, hopper / tank cars, etc.). For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Vapors from liquefied gas are initially heavier than air and spread along ground. Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA / NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Keep people away from and upwind of spill / leak. All equipment used when handling the product must be grounded. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Environmental Precautions	Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas. Prevent spreading of vapors through sewers, ventilation systems and confined areas.
Methods for Containment	Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.
Methods for Cleaning Up	Return cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Handling

Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Use only in ventilated areas. "NO SMOKING" signs should be posted in storage and use areas.

Do not rely on the olfactory sense to detect the presence of hydrogen sulfide. Analytical devices and instrumentation are readily available for this purpose. Perform frequent tests to be certain that the exposure limits are not exceeded. Many metals corrode rapidly with wet hydrogen sulfide. Anhydrous hydrogen sulfide can be handled in carbon steel, aluminum Inconel®, Stellite®, and 304 nd 316 stainless steels. Avoid hard steels which are highly stressed since they may be susceptible to hydrogen embrittlement from hydrogen sulfide. Automated multi-point air samplers with alarms for plant production units should be provided to constantly monitor the air in and around units.

Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use backflow preventive device in piping.

Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. Never insert an object (e.g. wrench, screwdriver, pry bar,etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

For additional recommendations, consult Compressed Gas Associataion's Pamphlet G-12.

Storage

Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregrated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Hydrogen sulfide 7783-06-4	STEL: 5 ppm TWA: 1 ppm	(vacated) TWA: 10 ppm (vacated) TWA: 14 mg / m^3 (vacated) STEL: 15 ppm (vacated) STEL: 21 mg / m^3 Ceiling: 20 ppm	IDLH: 100 ppm Ceiling: 10 ppm 10 min Ceiling: 15 mg / m^3 10 min

Immediately Dangerous to Life or Health.

Other Exposure Guidelines

Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Engineering Measures

Showers. Eyewash stations. Explosion proof ventilation systems. Exhaust gas should be vented to a gas treatment system.

Ventilation

Use ventilation adequate to keep exposures below recommended exposure limits.

Personal Protective Equipment

Eye / Face Protection	Tightly fitting safety goggles. Face-shield.
Skin and Body Protection	Appropriate protective and chemical resistant gloves, clothing and splash protection, or fully encapsulating vapor protective clothing to prevent exposure. For materials of construction consult protective clothing manufacturer's specifications.
Respiratory Protection	
General Use	If exposure limits are exceeded or irritation is experienced, NIOSH / MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
Emergency Use	Use positive pressure air line respirator or self-contained breathing apparatus for exposure over exposure limits or emergency use. For exposures above IDLH, an additional escape bottle is required.
Hygiene Measures	When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless.	Odor	Rotten-egg like.
Odor Threshold	No information available	Physical State	Gas
Flash Point	No information available.	Autoignition Temperature	290 °C / 554 °F
Decomposition Temperature	No information available.	Boiling Point / Boiling Range	-60 °C / -76 °F
Freezing Point	-82.2 °C / -117.8 °F	Molecular Weight	34.08
Water Solubility	Soluble in water	Evaporation Rate	No information available
Vapor Pressure	267 psia (1840 kPa)@22°C	Vapor Density	1.21 (air = 1)
VOC Content (%)	Not applicable.	Flammability Limits in Air	
		Upper	44%
		Lower	4%

10. STABILITY AND REACTIVITY

Stability	Stable under recommended storage conditions.
Incompatible Products	Oxidizing agents. Nitric acid.
Conditions to Avoid	Ignitions sources - heat, sparks and open flames. Vapors will ignite spontaneously when mixed with vapors or chlorine, oxygen difluoride or nitrogen trifluoride.
Hazardous Decomposition Products	Sulfur oxides.
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

LD50 Oral:	No information available.

LD50 Dermal:	No information available.
LC50 Inhalation:	Per CGA P-20: LC50: 712 ppm / 1 hr. (Rat)
Eye Contact	Ocular toxicity has been reported at hydrogen sulfide concentrations ranging from 5-30 ppm.
Repeated Dose Toxicity	No information available.

Chronic Toxicity

Chronic Toxicity	None known.
Carcinogenicity	Contains no ingredient listed as a carcinogen.

Irritation	Concentrations of 50-500 ppm cause eye and respiratory irritation.
Sensitization	No information available.
Reproductive Toxicity	No information available.
Developmental Toxicity	No information available.
Synergistic Materials	None known.
Target Organ Effects	Central nervous system (CNS). Eyes. Respiratory system.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Very toxic to aquatic organisms.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Hydrogen sulfide		LC50 96 h: = 0.016 mg / L flow-through (Pimephales promelas) LC50 96 h: = 0.0448 mg / L flow-through (Lepomis macrochirus)		LC50 96 h: = 0.022 mg / L (Gammarus pseudolimnaeus)

Chemical Name	Log Pow
Hydrogen sulfide	0.45

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods	Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Linde for proper disposal.
Contaminated Packaging	Do not re-use empty containers.

14. TRANSPORT INFORMATION

DOT

Proper shipping name	Hydrogen sulfide
Hazard Class	2.3
Subsidiary Class	2.1
UN-Number	UN1053
Special Provisions	This material is toxic by inhalation in Hazard Zone B.
Description	UN1053,Hydrogen sulfide,2.3,(2.1),Marine Pollutant
Additional Description:	"Toxic-Inhalation Hazard Zone B". If net weight of product is greater than or equal to 100 lbs., the shipping description must also contain the letters "RQ".
Additional Marking Requirements:	"Inhalation Hazard". If net weight of product is greater than or equal to 100 lbs., the container must also be marked with the letters "RQ".
Emergency Response Guide Number	117

TDG

Proper Shipping Name	Hydrogen sulfide
Hazard Class	2.3
Subsidiary Class	(2.1)
UN-Number	UN1053
Description	UN1053,HYDROGEN SULFIDE,2.3(2.1),Marine Pollutant

MEX

Proper Shipping Name	Hydrogen sulfide
Hazard Class	2.3
Subsidiary Class	2.1
UN-Number	UN1053
Description	UN1053 Hydrogen sulfide,2.3

IATA

UN-Number	UN1053
Proper Shipping Name	Hydrogen sulphide
Hazard Class	2.3
Subsidiary Class	2.1
ERG Code	10P
Description	UN1053,Hydrogen sulphide,2.3(2.1)
Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	Forbidden
Limited Quantity	No information available.

IMDG / IMO

Proper Shipping Name	Hydrogen sulphide
Hazard Class	2.3
Subsidiary Class	2.1
UN-Number	UN1053
EmS No.	F-D, S-U
Description	UN1053, Hydrogen sulphide,2.3(2.1),Marine Pollutant

ADR

Proper Shipping Name	Hydrogen sulphide
Hazard Class	2.3

UN-Number	UN1053
Classification Code	2TF
Description	UN1053 Hydrogen sulphide,2.3,
ADR / RID-Labels	.1

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL	Complies
EINECS / ELINCS	Complies

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL / NDSL - Canadian Domestic Substances List / Non-Domestic Substances List
EINECS / ELINCS - European Inventory of Existing Commercial Chemical Substances / EU List of Notified Chemical Substances

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311 / 312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	No

Clean Water Act

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42):

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Hydrogen sulfide	100 lb			X

Risk and Process Safety Management Programs

This material, as supplied, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Hydrogen sulfide	10000 lbs		1500 lb

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)

This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CERCLA / SARA

This material, as supplied, contains one or more substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355):

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs	TPQ
Hydrogen sulfide	100 lb	100 lb	500 lb TPQ

U.S. State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Hydrogen sulfide	X	X	X		X

International Regulations

Chemical Name	Carcinogen Status	Exposure Limits
Hydrogen sulfide		Mexico: TWA 10 ppm Mexico: TWA 14 mg / m^3 Mexico: STEL 15 ppm Mexico: STEL 21 mg / m^3

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
A Compressed gases
B1 Flammable gas
D1A Very toxic materials
D2B Toxic materials

Chemical Name	NPRI
Hydrogen sulfide	X

Legend
NPRI - National Pollutant Release Inventory

Prepared By	Product Stewardship 23 British American Blvd. Latham, NY 12110 1-800-572-6501
Issuing Date	17-Mar-2010
Revision Date	27-Sep-2013
Revision Number	2
Revision Note	Not applicable.

NFPA	Health Hazard 4	Flammability 4	Stability 0	Physical and Chemical Hazards -
HMIS	Health Hazard 2	Flammability 4	Physical Hazard 2	Personal Protection -

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

End of Safety Data Sheet