

Ethylene oxide

Safety Data Sheet P-4798

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.
 Date of issue: 01/01/1982 Revision date: 10/24/2016 Supersedes: 10/26/2015

SECTION 1: Product and company identification

1.1. Product identifier

Name : Ethylene oxide
 CAS No : 75-21-8
 Other means of identification : Dihydrooxirine, dimethylene oxide, ethene oxide, epoxyethane, oxane, oxacyclopropane, oxidoethane, oxiran, oxirane, 1,2 epoxyethane

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

Use of the substance/mixture : Industrial use. Use as directed.

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
 10 Riverview Drive
 Danbury, CT 06810-6268 - USA
 T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week
 — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
 (collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Gas 1	H220
Liquefied gas	H280
Acute Tox. 3 (Inhalation:gas)	H331
Skin Irrit. 2	H315
Eye Irrit. 2A	H319
Skin Sens. 1B	H317
Muta. 1B	H340
Carc. 1A	H350
Repr. 1A	H360
STOT SE 3	H335
STOT RE 1	H372

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



Signal word (GHS-US) :

DANGER

Hazard statements (GHS-US) :

H220 - **EXTREMELY FLAMMABLE GAS**
 H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
 H315+H320 - CAUSES SKIN AND EYE IRRITATION
 H317 - MAY CAUSE AN ALLERGIC SKIN REACTION
 H331 - TOXIC IF INHALED
 H335 - MAY CAUSE RESPIRATORY IRRITATION
 H340 - MAY CAUSE GENETIC DEFECTS
 H350 - MAY CAUSE CANCER

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Precautionary statements (GHS-US)	<p>H360 - MAY DAMAGE FERTILITY OR THE UNBORN CHILD H372 - CAUSES DAMAGE TO ORGANS (NERVOUS SYSTEM, KIDNEYS) THROUGH PROLONGED OR REPEATED EXPOSURE CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR CGA-HG11 - SYMPTOMS MAY BE DELAYED</p> <p>: P201 - Obtain special instructions before use P202 - Do not handle until all safety precautions have been read and understood P210 - Keep away from Heat/Open flames/Sparks/Hot surfaces. - No smoking P260 - Do not breathe gas P262 - Do not get in eyes, on skin, or on clothing P271+P403 - Use and store only outdoors or in a well-ventilated place P280+P284 - Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely P381 - Eliminate all ignition sources if safe to do so P405 - Store locked up P501 - Dispose of contents/container in accordance with container Supplier/owner instructions CGA-PG05 - Use a back flow preventive device in the piping CGA-PG20+CGA-PG10 - Use only with equipment of compatible materials of construction and rated for cylinder pressure CGA-PG12 - Do not open valve until connected to equipment prepared for use CGA-PG06 - Close valve after each use and when empty CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)</p>
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2.3. Other hazards

Other hazards not contributing to the classification : Asphyxiant in high concentrations.

2.4. Unknown acute toxicity (GHS US)

No data available

SECTION 3: Composition/Information on ingredients

3.1. Substance

Name	Product identifier	%
Ethylene oxide (Main constituent)	(CAS No) 75-21-8	100

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general	: IMPORTANT In all cases of exposure, get or summon medical treatment immediately. Take the victim to a doctor or medical facility at once.
First-aid measures after inhalation	: Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.
First-aid measures after skin contact	: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash with plenty of soap and water. The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.
First-aid measures after eye contact	: Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.
First-aid measures after ingestion	: Not expected to be a primary route of exposure. . Give water to drink if victim completely conscious/alert. Do not induce vomiting. Call a physician. . Never give anything by mouth to an unconscious person.

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

No additional information available

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

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide, Dry chemical, Water spray or fog.

5.2. Special hazards arising from the substance or mixture

Fire hazard : **EXTREMELY FLAMMABLE GAS.**
Explosion hazard : **EXTREMELY FLAMMABLE GAS.** Forms explosive mixtures with air and oxidizing agents.
Reactivity : Exothermic polymerization is possible (see incompatible materials).

5.3. Advice for firefighters

Firefighting instructions : **DANGER! Cancer and reproductive hazard.**
DANGER! Toxic, flammable liquefied gas
FORMS EXPLOSIVE MIXTURES WITH AIR
Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with their provincial and local fire regulations.
Special protective equipment for fire fighters : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Other information : Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : **DANGER! Cancer and reproductive hazard. . DANGER! Toxic, flammable liquefied gas . FORMS EXPLOSIVE MIXTURES WITH AIR.** If involved in a fire, this product may emit irritating and potentially toxic fumes. Fumes and vapors may spread from leak. Vapors are heavier than air and may collect in low spots. Evacuate personnel to a safe area. Appropriate self-contained breathing apparatus may be required. Approach suspected leak area with caution. Remove all sources of ignition. if safe to do so. Reverse flow into cylinder may cause rupture. Reduce gas with fog or fine water spray. Stop flow of product if safe to do so. Ventilate area or move container to a well-ventilated area. Flammable gas may spread from leak. Before entering the area, especially a confined area, check the atmosphere with an appropriate device.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Try to stop release. Reduce vapor with fog or fine water spray. Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

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SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling

: Prevent product contamination

Water or organic contamination may cause a violent reaction

Do not breathe gas/vapor. Avoid all contact with skin, eyes, or clothing. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions

: Because of the potential for violent decomposition, containers of ethylene oxide must be properly blanketed with an inert gas and given extraordinary protection against fire exposure

Store only where temperature will not exceed 125°F (52°C). Post "No Smoking/No Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g. NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16

All equipment in storage areas must be explosion-proof. Electric installation in storage areas must meet the requirements of National Electric Code (NEC) Article 500. This material is a static accumulator. To avoid ignition of vapors by static discharge, all metal parts and equipment must be grounded. Follow NFPA 77, Recommended Practice on Static Electricity (www.nfpa.org), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

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8.2. Exposure controls

Appropriate engineering controls	: Use an explosion-proof local exhaust system. Local exhaust and general ventilation must be adequate to meet exposure standards. MECHANICAL (GENERAL): Inadequate - Use only in a closed system. Use explosion proof equipment and lighting.
Hand protection	: Butyl rubber (IIR) /.
Eye protection	: Select eye protection in accordance with OSHA 29 CFR 1910.133. Safety glasses with face shield. Contact lenses should not be worn.
Skin and body protection	: Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear appropriate chemical gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138. Rubber shoes and apron where risk of liquid spill exists. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.
Respiratory protection	: When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).
Thermal hazard protection	: Wear cold insulating gloves when transfilling or breaking transfer connections.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Color	: Colorless
Odor	: ether-like
Odor threshold	: 420 - 490 ppm
pH	: Not applicable.
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: No data available
Freezing point	: No data available
Boiling point	: 10.5 °C (51.26 °F)
Flash point	: -20 °C (-4 °F)
Critical temperature	: 195.8 °C
Auto-ignition temperature	: 429 °C (804 °F)
Decomposition temperature	: No data available
Flammability (solid, gas)	: 3 - 100 vol %
Vapor pressure	: 1.5 bar (22 psia) (at 20°C (68°F))
Relative vapor density at 20 °C	: No data available
Relative density	: 0.87 (Water = 1) (at 4°C (39.2°F))
Density	: 1.824 kg/m ³ (0.1139 lb/ft ³) (at 21.1 °C (70 °F))
Relative gas density	: 1.52 (Air = 1) (at 21.1 °C (70 °F))
Solubility	: Water: No data available
Log Pow	: Not applicable.
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Forms explosive mixtures with air and oxidizing agents.
Oxidizing properties	: None.

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Explosion limits : No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Exothermic polymerization is possible (see incompatible materials).

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May occur.

10.4. Conditions to avoid

Contamination, especially by incompatible materials (see 10.5). Heat. Sparks. Ignition sources.

Pure ethylene oxide decomposes violently if exposed to a high enough temperature. The temperature required for decomposition can vary depending on time, pressure, and conditions within the system and is reduced as pressure and volume-to-surface ratios are increased. Decomposition temperatures ranging from 842°F-1040°F (450°C-560°C) have been observed in experimental apparatus.

10.5. Incompatible materials

Oxidizing agents. Mercaptans. Alcohols. Alkali metals, Alkaline earth metals, Acetylide forming metals, Chromium, Titanium > 1022°F (550°C), Uranium (U) > 1382°F (750°C), Magnesium > 1427°F (775°C). . **Will polymerize violently if contaminated with:** Amines. alkalis. Acids. Mineral acids. Metal chlorides. Metal oxides. Water. Organic materials.

10.6. Hazardous decomposition products

Carbon dioxide. Carbon monoxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation:gas: TOXIC IF INHALED.

Ethylene oxide (f)75-21-8	
LC50 inhalation rat (ppm)	2920 ppm/1h
ATE US (gases)	1460.000 ppmV/4h

Skin corrosion/irritation : CAUSES SKIN IRRITATION.

pH: Not applicable.

Serious eye damage/irritation : CAUSES SERIOUS EYE IRRITATION.

pH: Not applicable.

Respiratory or skin sensitization : MAY CAUSE AN ALLERGIC SKIN REACTION.

Germ cell mutagenicity : MAY CAUSE GENETIC DEFECTS.

Carcinogenicity : MAY CAUSE CANCER.

Ethylene oxide (75-21-8)	
IARC group	1 - Carcinogenic to humans
National Toxicology Program (NTP) Status	2 - Known Human Carcinogens

Reproductive toxicity : MAY DAMAGE FERTILITY OR THE UNBORN CHILD.

Specific target organ toxicity (single exposure) : MAY CAUSE RESPIRATORY IRRITATION.

Specific target organ toxicity (repeated exposure) : CAUSES DAMAGE TO ORGANS (NERVOUS SYSTEM, KIDNEYS) THROUGH PROLONGED OR REPEATED EXPOSURE.

Aspiration hazard : Not classified

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SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

Ethylene oxide (75-21-8)

Persistence and degradability	No ecological damage caused by this product.
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12.3. Bioaccumulative potential

Ethylene oxide (75-21-8)

Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

Ethylene oxide (75-21-8)

Mobility in soil	No data available.
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12.5. Other adverse effects

Effect on ozone layer : None

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

Additional information : This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use

STORAGE AND DISPOSAL:

Do not contaminate water, food, or feed by storage and disposal.

Pesticide Storage: Cylinders should be stored in a well ventilated area.

Pesticide Disposal: Return cylinder with residual product to supplier.

Container Handling: Do not reuse this container for any other purpose. Do not refill this cylinder; return to supplier.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1040 Ethylene oxide (up to a total pressure of 1MPa (10 bar) at 50 degrees C), 2.3

UN-No.(DOT) : UN1040

Proper Shipping Name (DOT) : Ethylene oxide
up to a total pressure of 1MPa (10 bar) at 50 degrees C

Class (DOT) : 2.3 - Class 2.3 - Poisonous gas 49 CFR 173.115

Hazard labels (DOT) : Poison Gas
2.3 - Poison gas
2.1 - Flammable gas



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DOT Special Provisions (49 CFR 172.102) : 4 - This material is poisonous by inhalation (see 171.8 of this subchapter) in Hazard Zone D (see 173.116(a) of this subchapter), and must be described as an inhalation hazard under the provisions of this subchapter

342 - Glass inner packaging (such as ampoules or capsules) intended only for use in sterilization devices, when containing less than 30 mL of ethylene oxide per inner packaging with not more than 300 mL per outer packaging, may be transported in accordance with §173.4a of this subchapter, irrespective of the restriction of §173.4a(b) provided that: a. After filling, each glass inner packaging must be determined to be leak-tight by placing the glass inner packaging in a hot water bath at a temperature and for a period of time sufficient to ensure that an internal pressure equal to the vapor pressure of ethylene oxide at 55 °C is achieved. Any glass inner packaging showing evidence of leakage, distortion or other defect under this test must not be transported under the terms of this special provision;b. In addition to the packaging required in §173.4a, each glass inner packaging must be placed in a sealed plastic bag compatible with ethylene oxide and capable of containing the contents in the event of breakage or leakage of the glass inner packaging; andc. Each glass inner packaging is protected by a means of preventing puncture of the plastic bag (e.g, sleeves or cushioning) in the event of damage to the packaging (e.g, by crushing)

T50 - When portable tank instruction T50 is referenced in Column (7) of the 172.101 Table, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter

TP20 - This hazardous material must only be transported in insulated tanks under a nitrogen blanket

Additional information

Other information : No supplementary information available.

Special transport precautions : 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 there is adequate ventilation. - 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.

Transport by sea

UN-No. (IMDG) : 1040
Proper Shipping Name (IMDG) : ETHYLENE OXIDE
Class (IMDG) : 2 - Gases

Air transport

UN-No. (IATA) : 1040
Proper Shipping Name (IATA) : Ethylene oxide
Class (IATA) : 2

SECTION 15: Regulatory information

15.1. US Federal regulations

Ethylene oxide (75-21-8)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	10 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	1000 lb
SARA Section 311/312 Hazard Classes	Delayed (chronic) health hazard Fire hazard Immediate (acute) health hazard Reactive hazard Sudden release of pressure hazard

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15.2. International regulations

CANADA

EU-Regulations

15.2.2. National regulations

Ethylene oxide (75-21-8)

Listed on IARC (International Agency for Research on Cancer)
Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

Ethylene oxide(75-21-8)

U.S. - California - Proposition 65 - Carcinogens List	Yes
U.S. - California - Proposition 65 - Developmental Toxicity	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	Yes
Non-significant risk level (NSRL)	20
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Other information

: When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc, it is the user's obligation to determine the conditions of safe use of the product

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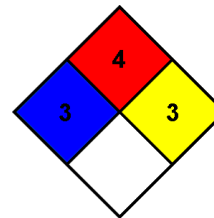
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- NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.
- NFPA fire hazard : 4 - Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.
- NFPA reactivity : 3 - Capable of detonation or explosive reaction, but requires a strong initiating source or must be heated under confinement before initiation, or reacts explosively with water.



HMIS III Rating

- Health : 1 Slight Hazard - Irritation or minor reversible injury possible
- Flammability : 4 Severe Hazard
- Physical : 3 Serious Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.