

Section 1. Chemical product and company identification

Product name	: Ethylene Oxide
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: Oxirane; Dihydrooxirene; Dimethylene oxide; Epoxyethane; Ethene oxide; ETO; Oxacyclopropane; Oxane; Oxidoethane; Oxirene, Dihydro-; Oxyfume; Oxyfume 12; T-Gas; 1,2-Epoxyethane; Aethylenoxid; Amprolene; Anprolene; ENT-26263; E.O.; 1,2-Epoxyaethan; Ethox; Ethyleenoxide; Etylenu tlenek; FEMA No. 2433; Merpol; NCI-C50088; α,β -Oxidoethane; Oxiraan; Oxiran; Rcra waste number U115; Sterilizing gas ethylene oxide 100%; UN 1040; C ₂ H ₄ O; Qazi-ketcham
MSDS #	: 001081
Date of Preparation/Revision	: 4/23/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [COLORLESS GAS AT ROOM TEMP. MOBILE LIQUID BELOW BOILING POINT. HAS A SWEET ODOR]
Emergency overview	: WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. HARMFUL IF INHALED OR SWALLOWED. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CAN CAUSE CANCER. CAUSES SEVERE SKIN IRRITATION. CAUSES SEVERE EYE IRRITATION. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Do not ingest. Avoid breathing gas. Avoid contact with eyes, skin and clothing. May cause target organ damage, based on animal data. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	: May cause damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).
Routes of entry	: Inhalation Dermal Eyes
Potential acute health effects	
Eyes	: Severely irritating to eyes. Risk of serious damage to eyes. Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Severely irritating to the skin. Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Toxic by inhalation.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	: CARCINOGENIC EFFECTS: Classified 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH. Classified A2 (Suspected for humans.) by ACGIH, 2 (Suspected for humans.) by European Union. MUTAGENIC EFFECTS: Classified 2 by European Union. TERATOGENIC EFFECTS: Not available.

Ethylene Oxide

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
Ethylene Oxide	75-21-8	100	ACGIH TLV (United States, 1/2009). TWA: 1.8 mg/m ³ 8 hour(s). TWA: 1 ppm 8 hour(s). NIOSH REL (United States, 6/2009). CEIL: 9 mg/m ³ 10 minute(s). CEIL: 5 ppm TWA: 0.18 mg/m ³ 10 hour(s). TWA: 0.1 ppm 10 hour(s). OSHA PEL (United States, 11/2006). STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). OSHA PEL 1989 (United States, 3/1989). STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : 428.88°C (804°F)
- Flash point** : Open cup: -29.15°C (-20.5°F).
- Flammable limits** : Lower: 3% Upper: 100%
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

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Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Do not ingest. Keep container closed. Avoid contact with skin and clothing. Avoid contact with eyes. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Personal protection**
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

Product name

Ethylene Oxide

ethylene oxide

ACGIH TLV (United States, 1/2009).

TWA: 1.8 mg/m³ 8 hour(s).

TWA: 1 ppm 8 hour(s).

NIOSH REL (United States, 6/2009).

CEIL: 9 mg/m³ 10 minute(s).

CEIL: 5 ppm

TWA: 0.18 mg/m³ 10 hour(s).

TWA: 0.1 ppm 10 hour(s).

OSHA PEL (United States, 11/2006).

STEL: 5 ppm 15 minute(s).

TWA: 1 ppm 8 hour(s).

OSHA PEL 1989 (United States, 3/1989).

STEL: 5 ppm 15 minute(s).

TWA: 1 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight	: 44.06 g/mole
Molecular formula	: C ₂ H ₄ O
Boiling/condensation point	: 10.7°C (51.3°F)
Melting/freezing point	: -112.8°C (-171°F)
Critical temperature	: 195.9°C (384.6°F)
Vapor pressure	: 22 (psia)
Vapor density	: 1.52 (Air = 1)
Specific Volume (ft³/lb)	: 8.7719
Gas Density (lb/ft³)	: 0.114

Section 10. Stability and reactivity

Stability and reactivity	: The product is stable.
Incompatibility with various substances	: Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
ethylene oxide	LD50 Oral	Rat	72 mg/kg	-
	LD50 Subcutaneous	Rat	187 mg/kg	-
	LDLo Unreported	Rat	200 mg/kg	-
	LC50 Inhalation Gas.	Rat	1460 ppm	4 hours
	LC50 Inhalation Gas.	Mouse	836 ppm	4 hours
	LC50 Inhalation Gas.	Rat	800 ppm	4 hours
	LC50 Inhalation Gas.	Rat	800 ppm	4 hours
	LC50 Inhalation Gas.	Rat	800 ppm	4 hours
	LC50 Inhalation Gas.	Rat	800 ppm	4 hours

IDLH : 800 ppm

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Chronic effects on humans : **CARCINOGENIC EFFECTS:** Classified 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH. Classified A2 (Suspected for humans.) by ACGIH, 2 (Suspected for humans.) by European Union.

MUTAGENIC EFFECTS: Classified 2 by European Union.

May cause damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other toxic effects on humans : Hazardous by the following route of exposure: of skin contact (irritant), of eye contact (irritant), of inhalation (lung irritant).

Specific effects

Carcinogenic effects : Can cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Product/ingredient name	Test	Result	Species	Exposure
ethylene oxide	-	Acute LC50 1000000 ug/L Marine water	Crustaceans - Brine shrimp - Artemia sp.	48 hours
	-	Acute LC50 >500000 ug/L Marine water	Crustaceans - Brine shrimp - Artemia sp.	48 hours
	-	Acute LC50 490000 ug/L Marine water	Crustaceans - Brine shrimp - Artemia sp.	48 hours
	-	Acute LC50 300000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 200000 to 243000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 137000 to 179000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 84000 to 96000 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas	96 hours

Products of degradation : Products of degradation: carbon oxides (CO, CO₂) and water.

Environmental fate : Not available.

Environmental hazards : No known significant effects or critical hazards.







Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information

Ethylene Oxide						
DOT Classification	UN1040	Ethylene Oxide	2.3	Not applicable (gas).	 	Reportable quantity 10 lbs. (4.54 kg)
TDG Classification	UN1040	Ethylene Oxide	2.3	Not applicable (gas).	 	Explosive Limit and Limited Quantity Index 0 ERAP Index 500 Passenger Carrying Ship Index Forbidden Passenger Carrying Road or Rail Index Forbidden
Mexico Classification	UN1040	Ethylene Oxide	2.3	Not applicable (gas).	 	-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

- U.S. Federal regulations** : **United States inventory (TSCA 8b)**: This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: ethylene oxide
SARA 302/304 emergency planning and notification: ethylene oxide
SARA 302/304/311/312 hazardous chemicals: ethylene oxide
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: ethylene oxide: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: ethylene oxide
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: ethylene oxide

SARA 313

Form R - Reporting requirements

Product name
: Ethylene Oxide

CAS number
75-21-8

Concentration
100

Ethylene Oxide

Supplier notification : Ethylene Oxide 75-21-8 100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations :

- Connecticut Carcinogen Reporting:** This material is not listed.
- Connecticut Hazardous Material Survey:** This material is not listed.
- Florida substances:** This material is not listed.
- Illinois Chemical Safety Act:** This material is not listed.
- Illinois Toxic Substances Disclosure to Employee Act:** This material is not listed.
- Louisiana Reporting:** This material is not listed.
- Louisiana Spill:** This material is not listed.
- Massachusetts Spill:** This material is not listed.
- Massachusetts Substances:** This material is listed.
- Michigan Critical Material:** This material is not listed.
- Minnesota Hazardous Substances:** This material is not listed.
- New Jersey Hazardous Substances:** This material is listed.
- New Jersey Spill:** This material is not listed.
- New Jersey Toxic Catastrophe Prevention Act:** This material is listed.
- New York Acutely Hazardous Substances:** This material is listed.
- New York Toxic Chemical Release Reporting:** This material is not listed.
- Pennsylvania RTK Hazardous Substances:** This material is listed.
- Rhode Island Hazardous Substances:** This material is not listed.

California Prop. 65 : **WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

<u>Ingredient name</u>	<u>Cancer</u>	<u>Reproductive</u>	<u>No significant risk level</u>	<u>Maximum acceptable dosage level</u>
Ethylene Oxide	Yes.	Yes.	Yes.	Yes.

Canada

WHMIS (Canada) :

- Class A: Compressed gas.
- Class B-1: Flammable gas.
- Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
- Class D-2A: Material causing other toxic effects (Very toxic).
- Class E: Corrosive material
- Class F: Dangerously reactive material.

CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements :

- FLAMMABLE GAS.
- MAY CAUSE FLASH FIRE.
- HARMFUL IF INHALED OR SWALLOWED.
- MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
- CANCER HAZARD - CAN CAUSE CANCER.
- CAUSES SEVERE SKIN IRRITATION.
- CAUSES SEVERE EYE IRRITATION.
- CONTENTS UNDER PRESSURE.

Canada

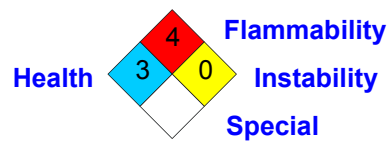
Ethylene Oxide

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class E: Corrosive material
Class F: Dangerously reactive material.

Hazardous Material Information System (U.S.A.) :

Health	*	3
Flammability		4
Physical hazards		3

National Fire Protection Association (U.S.A.) :



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.