

SAFETY DATA SHEET

C Ethylene Oxide

Version 1.0

Revision Date 18.09.2024

Print Date 25.09.2024

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : C Ethylene Oxide
Product code : U1115
Synonyms : EO (Ethylene Oxide), Oxirane
CAS-No. : 75-21-8

Manufacturer or supplier's details

Supplier : SHELL EASTERN CHEMICALS (S)
A REGISTERED BUSINESS OF SHELL EASTERN
TRADING (PTE) LTD (UEN:198902087C)
9 North Buona Vista Drive , #07-01
The Metropolis Tower 1
Singapore 138588
Singapore
Telephone : +65 6384 8269
Telefax : +65 6384 8454
Contact for Safety Data Sheet :
Emergency telephone number : +800 2537 8747 (ALERT SGS- toll Free) or +65 6542 9595 (ALERT SGS)

Recommended use of the chemical and restrictions on use

Recommended use : Chemical intermediate.
Restrictions on use : This product must not be used in applications other than the above without first seeking the advice of the supplier.
This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.

2. HAZARDS IDENTIFICATION

GHS Classification

Flammable gases : Category 1A
Chemically unstable gas : Category A
Gases under pressure : Liquefied gas
Acute toxicity (Oral) : Category 3
Skin corrosion : Category 1
Serious eye damage : Category 1
Acute toxicity (Inhalation) : Category 3
Specific target organ toxicity - : Category 3 (Central nervous system)

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single exposure
Specific target organ toxicity - single exposure : Category 3 (Respiratory system)
Germ cell mutagenicity : Category 1B
Carcinogenicity : Category 1B
Reproductive toxicity : Category 1B
Specific target organ toxicity - repeated exposure (Inhalation) : Category 1 (Central nervous system)
Short-term (acute) aquatic hazard : Category 3

GHS label elements

Hazard pictograms :



Signal word : Danger

Hazard statements : PHYSICAL HAZARDS:
H220 Extremely flammable gas.
H230 May react explosively even in the absence of air.
H280 Contains gas under pressure; may explode if heated.
HEALTH HAZARDS:
H301 Toxic if swallowed.
H314 Causes severe skin burns and eye damage.
H318 Causes serious eye damage.
H331 Toxic if inhaled.
H335 May cause respiratory irritation.
H336 May cause drowsiness or dizziness.
H340 May cause genetic defects.
H350 May cause cancer.
H360Fd May damage fertility. Suspected of damaging the unborn child.
H372 Causes damage to organs (Central nervous system) through prolonged or repeated exposure.
ENVIRONMENTAL HAZARDS:
H402 Harmful to aquatic life.

Precautionary statements :

Prevention:

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P273 Avoid release to the environment.

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Response:

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381 Eliminate all ignition sources if safe to do so.

P330 Rinse mouth.

P362 + P364 Take off contaminated clothing and wash it before reuse.

P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P311 Call a POISON CENTER/ doctor.

P308 + P313 IF exposed or concerned: Get medical advice/ attention.

P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.

P331 Do NOT induce vomiting.

P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.

Storage:

P410 Protect from sunlight.

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

P405 Store locked up.

Disposal:

P501 Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations.

Other hazards which do not result in classification

Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Dangerous polymerisation can occur on contact with highly catalytic surfaces. Highly reactive. This material is shipped under pressure. Exposure to rapidly expanding gases may cause frost burns to eyes and/or skin. Liquid solutions of ethylene oxide cause serious chemical burns of the skin and eye lesions. The severity of injury will vary depending on the concentration and duration of skin contact. Concentrations of around 50% are the most dangerous, however a 1% solution of EO in water and gaseous EO dissolved in sweat can also cause damage to the skin. The onset of effects may be delayed for several hours. Causes burns.

3. COMPOSITION/INFORMATION ON INGREDIENTS

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Components

Chemical name	CAS-No.	Classification	Concentration (% w/w)
Ethylene Oxide	75-21-8	Flam. Gas1A; H220 Chem. Unst. GasA; H230 Press. GasLiquefied gas; H280 Acute Tox.3; H301 Skin Corr.1; H314 Eye Dam.1; H318 Acute Tox.3; H331 STOT SE3; H335 STOT SE3; H336 Muta.1B; H340 Carc.1B; H350 Repr.1B; H360 STOT RE1; H372 Aquatic Acute3; H402	100

For explanation of abbreviations see section 16.

4. FIRST-AID MEASURES

- General advice : DO NOT DELAY.
Keep victim calm. Obtain medical treatment immediately.
DO NOT attempt to rescue the victim unless proper respiratory protection is worn.
Take appropriate steps to avoid fire, explosion and inhalation hazards.
Contaminated leather articles including shoes cannot be decontaminated and should be destroyed to prevent reuse.
- If inhaled : Call emergency number for your location / facility.
Remove to fresh air. Do not attempt to rescue the victim unless proper respiratory protection is worn. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting, or unresponsive, give 100% oxygen with rescue breathing or Cardio-Pulmonary Resuscitation as required and transport to the nearest medical facility.
- In case of skin contact : DO NOT DELAY.
Call emergency number for your location / facility.
Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

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All burns should receive medical attention.

- | | |
|---|---|
| In case of eye contact | : Immediately flush eye(s) with plenty of water.
Remove contact lenses, if present and easy to do. Continue rinsing.
Transport to the nearest medical facility for additional treatment. |
| If swallowed | : Do not induce vomiting. If victim is alert, rinse mouth and drink 1/2 to 1 glass of water to help dilute the material. Do not give liquids to a drowsy, convulsing, or unconscious person.
Transport to nearest medical facility for additional treatment.
Rinse mouth. |
| Most important symptoms and effects, both acute and delayed | : Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing.
Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination.
Continued inhalation may result in unconsciousness and death.
Corrosive to skin.
Contact with the skin can cause chemical burns, redness, swelling, and tissue damage.
Corrosive to eyes.
Contact can cause severe eye damage including chemical burns, pain, clouding of the eye surface, inflammation of the eye, and may result in permanent loss of vision.

Rapid release of gases which are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling.
Peripheral nerve damage may be evidenced by impairment of motor function (incoordination, unsteady walk, or muscle weakness in the extremities, and/or loss of sensation in the arms and legs).

Other signs and symptoms of central nervous system (CNS) depression may include headache, nausea, and lack of coordination.
Symptoms may vary by the agent. Symptoms may extend to being locally corrosive to involving generalized systems including respiratory system, circulatory system, central nervous system (CNS), and may lead to death.
Burns and tearing of the esophagus and stomach are possible. |
| Protection of first-aiders | : When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings. |
| Notes to physician | : IMMEDIATE TREATMENT IS EXTREMELY IMPORTANT!
Treat symptomatically. |

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Artificial respiration and/or oxygen may be necessary.
Call a doctor or poison control center for guidance.

5. FIRE-FIGHTING MEASURES

- Suitable extinguishing media : Shut off supply. If not possible and no risk to surroundings, let the fire burn itself out.
- Unsuitable extinguishing media : Do not use water in a jet.
- Specific hazards during firefighting : The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Sustained fire attack on vessels may result in a Boiling Liquid Expanding Vapor Explosion (BLEVE).
Containers exposed to intense heat from fires should be cooled with large quantities of water.
Contents are under pressure and can explode when exposed to heat or flames.
As the vapours become lighter than air, the vapours may reach ignition sources at ground or elevated locations.
- Specific extinguishing methods : Standard procedure for chemical fires.
Clear fire area of all non-emergency personnel.
If the fire cannot be extinguished the only course of action is to evacuate immediately.
Large fires should only be fought by properly trained fire fighters.
Evacuate the area of all non-essential personnel.
- Special protective equipment for firefighters : Wear full protective clothing and self-contained breathing apparatus.

Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet.
Isolate hazard area and deny entry to unnecessary or unprotected personnel.
Stay upwind and keep out of low areas.
Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks.
Note - Since the danger of fire is so great, bunker gear worn

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over protective clothing is highly recommended.

- Environmental precautions : Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area and evacuate all personnel. Attempt to disperse the gas or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Monitor area with combustible gas meter.
Prevent from spreading or entering into waterways, sewers, basements or confined areas.
Use water spray barriers (curtains) to contain the toxic clouds.
- Methods and materials for containment and cleaning up : Use water spray (fog) to reduce vapours or divert vapour cloud drift.
Do not use water in a jet.
Alcohol foam applied to surface of liquid pools may slow release of EO vapours into the atmosphere.
- Additional advice : For personal protection see section 8.
See Chapter 13 for information on disposal.
Observe all relevant local regulations.
Notify authorities if any exposure to the general public or the environment occurs or is likely to occur.
Dike and contain spill water.
Water dilution of at least 22:1 for open spaces or 100:1 for confined spaces is necessary to eliminate the fire hazard.
Due to its high volatility, spilled liquid EO should either be allowed to evaporate or diluted with water as noted above.
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Monitor area with combustible gas indicator.
Run-off may cause a fire or explosion hazard.
DOT recommends evacuating in all directions. For small spills the distance to evacuate is at least 200 feet; protect persons downwind to at least 0.1 miles during the day and 0.2 miles at night. For large spills the distance to evacuate is at least 400 feet; protect persons downwind to at least 0.2 miles during the day and 0.6 miles at night.

7. HANDLING AND STORAGE

- General Precautions : Avoid breathing of or direct contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet.
Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Ensure that all local regulations regarding handling and storage facilities are followed.

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Advice on safe handling : Avoid exposure. Obtain special instructions before use.
This product is intended for use in closed systems only.
Ventilate workplace in such a way that the Occupational Exposure Limit (OEL) is not exceeded.
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk.
The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.
Do NOT use compressed air for filling, discharging, or handling operations.

Avoidance of contact : Avoid contamination with organic bases, strong acids, ammonia, copper, silver, magnesium and their salts, anhydrous chlorides of iron, tin and aluminium, and alkali metal hydroxides.

Product Transfer : Refer to guidance under Handling section. Lines should be purged with nitrogen before and after product transfer. Refer to supplier for further product transfer instructions if required.

Storage

Conditions for safe storage : Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Other data : Ethylene oxide (EO), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers.
Tanks must be specifically designed for use with this product.
Tanks must be clean, dry and rust-free.
Keep container tightly closed.
Vapours from tanks should not be released to atmosphere.
Breathing losses during storage should be controlled by a suitable vapour treatment system.
Nitrogen blanket recommended.
Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.
Keep away from flammables, oxidizing agents, and corrosives.
Storage Temperature:
30 °C / 86 °F maximum.
Potential exists for runaway reaction at elevated temperatures in the presence of strong bases and salts of strong bases.
Must be stored in a diked (bunded) well-ventilated area, away from sunlight, ignition sources and other sources of heat.
A reliable fixed sprinkler/deluge system should be installed.

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Packaging material : Suitable material: Stainless steel., Mild steel., Carbon steel
Unsuitable material: Compatibility should be checked with the manufacturer.

Container Advice : Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.

Specific use(s) : Not applicable

Ensure that all local regulations regarding handling and storage facilities are followed.

See additional references that provide safe handling practices: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity).

IEC/TS 60079-32-1: Electrostatic hazards, guidance

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Ethylene Oxide	75-21-8	PEL (long term)	1 ppm 1.8 mg/m3	SG OEL
Ethylene Oxide	75-21-8	TWA	1 ppm 1.8 mg/m3	Shell Internal Standard (SIS) for 8 hour TWA.
Ethylene Oxide	75-21-8	TWA	1 ppm	ACGIH
Ethylene Oxide		PEL	1 ppm	OSHA CARC
Ethylene Oxide		STEL	5 ppm	OSHA CARC

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.

Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.

Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods
<http://www.cdc.gov/niosh/>

Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods

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<http://www.osha.gov/>

Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances

<http://www.hse.gov.uk/>

Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany

<http://www.dguv.de/inhalt/index.jsp>

L'Institut National de Recherche et de Sécurité, (INRS), France <http://www.inrs.fr/accueil>

Engineering measures

: The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:
Use sealed systems as far as possible.
Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.
Local exhaust ventilation is recommended.
The American Industrial Hygiene Association has established emergency response planning guidelines (ERPG) for ethylene oxide. These guidelines are estimates of concentration ranges which alone could reasonably anticipate observing adverse effects.
Ethylene Oxide ERPG-2, 50 ppm, is a maximum airborne concentration below which individuals could be exposed for up to 1 hour without experiencing mild transient health effects.
Ethylene Oxide ERPG-3, 500 ppm, is a maximum airborne concentration below which it is believed that individuals could be exposed for up to 1 hour without experiencing or developing life threatening health effects.
Firewater monitors and deluge systems are recommended.
Eye washes and showers for emergency use.

General Information:

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when there is potential for inhalation; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
Do not ingest. If swallowed, then seek immediate medical assistance
Items that cannot be decontaminated should be destroyed (see Chapter 13).

Personal protective equipment

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Protective measures

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. If air-filtering respirators are suitable for conditions of use:

Select a filter suitable for organic gases and vapours [Type AX boiling point $\leq 65^{\circ}\text{C}$ (149°F)].

An approved respirator should be used when making or breaking connections to an ethylene oxide rail car or when sampling this material.

The odour threshold for ethylene oxide is above 250 ppm.

This is much greater than the OSHA exposure limits.

Therefore, do not depend on sense of smell for warning. If you smell ethylene oxide, you are in danger. Absence of odour, though, does not assure low enough exposure levels; its vapour may deaden the sense of smell.

Hand protection
Remarks

: 4Htm (PE/EVAL) or butyl rubber gloves, First Responder chemical suit. Neoprene, Polyvinyl Chloride (PVC) or Vitontm are not recommended.

Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. Longer term protection: Butyl rubber. Incidental contact/Splash protection: Nitrile rubber gloves. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material,

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dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.

- Eye protection : Wear goggles for use against liquids and gas, combined with face shield with chin guard.
- Skin and body protection : Where risk of splashing or in spillage clean up, use chemical resistant one-piece overall with integral hood, chemical resistant knee length boots and chemical resistant gloves. Otherwise use chemical resistant apron and gauntlets.
- Hygiene measures : Wash hands before eating, drinking, smoking and using the toilet.
Launder contaminated clothing before re-use.

Environmental exposure controls

- General advice : Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.
Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.
Information on accidental release measures are to be found in section 6.

9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance : Liquid under pressure.
- Colour : clear
- Odour : Ethereal, sweet
- Odour Threshold : Data not available
- pH : Not applicable
- Melting point/freezing point : -112 °C / -170 °F
- Boiling point/boiling range : 10.6 °C / 51.1 °F
- Flash point : -57 °C / -71 °F
- Evaporation rate : Data not available
- Flammability (solid, gas) : Extremely flammable.
- Upper explosion limit : 99.99 %(V)
- Lower explosion limit : 2.6 %(V)

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Vapour pressure : 144.6 kPa (20 °C / 68 °F)

Relative vapour density : ca. 1.5

Relative density : Data not available

Density : 898 kg/m³ (0 °C / 32 °F)
Method: ASTM D4052

Solubility(ies)

Water solubility : completely miscible

Solubility in other solvents : Data not available

Partition coefficient: n-octanol/water : log Pow: -0.3

Auto-ignition temperature : 428 °C / 802 °F

Decomposition temperature : Data not available

Viscosity

Viscosity, dynamic : 0.41 mPa.s (0 °C / 32 °F)
Method: ASTM D445

Viscosity, kinematic : Data not available

Particle characteristics

Explosive properties : Not applicable

Oxidizing properties : Not applicable

Surface tension : Data not available

Conductivity : Electrical conductivity: > 10,000 pS/m

A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid, This material is not expected to be a static accumulator.

Molecular weight : 44 g/mol

10. STABILITY AND REACTIVITY

Reactivity : The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph.

Chemical stability : Stable under normal conditions of use. Pure EO or EO vapour mixed with air or inert gases can decompose explosively. The

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violence of the explosion depends on pressure, temperature and concentration; the form and energy of the ignition source, and the type of container. Reacts exothermically with bases (eg caustic soda), ammonia, primary and secondary amines, alcohols, water and acids.

Possibility of hazardous reactions : Data not available

Conditions to avoid : Heat, flames, and sparks.
Temperatures above 30 °C / 86 °F.
Prevent vapour accumulation.

In certain circumstances product can ignite due to static electricity.

Incompatible materials : Avoid contamination with organic bases, strong acids, ammonia, copper, silver, magnesium and their salts, anhydrous chlorides of iron, tin and aluminium, and alkali metal hydroxides.

Hazardous decomposition products : Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

11. TOXICOLOGICAL INFORMATION

Basis for assessment : Information given is based on product testing.
Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Information on likely routes of exposure : Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
This material penetrates the intact skin and eye rapidly as a liquid or mist, producing severe burns.

Acute toxicity

Components:

Ethylene Oxide:

Acute oral toxicity : LD 50 Rat, male: > 50 - <= 300 mg/kg
Method: Literature data
Remarks: Toxic if swallowed.

Acute inhalation toxicity : LC 50 Rat, male: > 500 - <= 2500 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: Literature data

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Remarks: Toxic if inhaled.

High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.

Acute dermal toxicity

:

Remarks: Based on available data, the classification criteria are not met.

Skin corrosion/irritation

Components:

Ethylene Oxide:

Species: Rabbit

Method: Acceptable non-standard method.

Remarks: Causes severe skin burns and eye damage., Liquid solutions of ethylene oxide cause serious chemical burns of the skin and eye lesions. The severity of injury will vary depending on the concentration and duration of skin contact., Rapid release of gases which are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling.

Serious eye damage/eye irritation

Components:

Ethylene Oxide:

Species: Rabbit

Method: Literature data

Remarks: Causes serious eye damage.

Respiratory or skin sensitisation

Components:

Ethylene Oxide:

Species: Guinea pig

Method: Literature data

Remarks: Based on available data, the classification criteria are not met.

Germ cell mutagenicity

Components:

Ethylene Oxide:

Genotoxicity in vitro

: Method: OECD Test Guideline 471

Remarks: May cause genetic defects.

: Method: Literature data

Remarks: May cause genetic defects.

: Test species: MouseApplication Route: Inhalation

Method: Literature data

Remarks: May cause genetic defects.

Germ cell mutagenicity-
Assessment

: May cause genetic defects.

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Carcinogenicity

Components:

Ethylene Oxide:

Species: Rat, (male and female)

Application Route: Inhalation

Method: Literature data

Remarks: May cause cancer.

Carcinogenicity - Assessment : May cause cancer.

Material	GHS/CLP Carcinogenicity Classification
Ethylene Oxide	Carcinogenicity Category 1B

Material	Other Carcinogenicity Classification
Ethylene Oxide	IARC: Group 1: Carcinogenic to humans

Reproductive toxicity

Components:

Ethylene Oxide:

: Species: Rat
Sex: male and female
Application Route: Inhalation

Method: Literature data

Remarks: Based on available data, the classification criteria are not met., May impair fertility based on animal studies.

Effects on foetal development : Species: Rat, male and female
Application Route: Inhalation
Method: Test(s) equivalent or similar to OECD Test Guideline 414

Remarks: May damage fertility or the unborn child., Causes slight foetotoxicity.

Species: Rabbit, female
Application Route: Inhalation
Method: Literature data

Remarks: Based on available data, the classification criteria are not met., Causes slight foetotoxicity.

Reproductive toxicity - Assessment : This product does not meet the criteria for classification in categories 1A/1B.

STOT - single exposure

Components:

Ethylene Oxide:

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Exposure routes: Inhalation

Target Organs: Respiratory system

Remarks: May cause respiratory irritation., High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea.

STOT - repeated exposure

Components:

Ethylene Oxide:

Exposure routes: Inhalation

Target Organs: Nervous system

Remarks: Causes damage to organs through prolonged or repeated exposure.

Repeated dose toxicity

Components:

Ethylene Oxide:

Rat, male and female:

Application Route: Inhalation

Test atmosphere: vapour

Method: Test(s) equivalent or similar to OECD Test Guideline 453

Target Organs: Nervous system

Remarks: Causes damage to organs through prolonged or repeated exposure.

Aspiration toxicity

Components:

Ethylene Oxide:

Based on available data, the classification criteria are not met.

Further information

Components:

Ethylene Oxide:

Remarks: Classifications by other authorities under varying regulatory frameworks may exist.

12. ECOLOGICAL INFORMATION

Basis for assessment

: Information given is based on product testing.
Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Ecotoxicity

Components:

Ethylene Oxide :

Toxicity to fish (Acute

: LC50 (Pimephales promelas (fathead minnow)): 84 mg/l

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toxicity)

Exposure time: 96 h

Method: Test(s) equivalent or similar to OECD Guideline 203

Remarks: Harmful

LL/EL/IL50 >10 <= 100 mg/l

Toxicity to crustacean (Acute toxicity)

: LC50 (Daphnia magna (Water flea)): 137 - 300 mg/l

Exposure time: 48 h

Method: Test(s) equivalent or similar to OECD Guideline 202

Remarks: Practically non toxic:

LC/EC/IC50 > 100 mg/l

Toxicity to algae/aquatic plants (Acute toxicity)

: EC50 (Pseudokirchneriella subcapitata (algae)): 240 mg/l

Exposure time: 96 h

Method: Information given is based on data obtained from similar substances.

Remarks: Practically non toxic:

LC/EC/IC50 > 100 mg/l

Toxicity to microorganisms (Acute toxicity)

: EC50 (Activated sludge, domestic waste): > 713 mg/l

Exposure time: 3 h

Method: OECD Test Guideline 209

Remarks: Practically non toxic:

LC/EC/IC50 > 100 mg/l

Toxicity to fish (Chronic toxicity)

: Remarks: Data not available

Toxicity to crustacean(Chronic toxicity)

: Remarks: Data not available

Persistence and degradability

Components:

Ethylene Oxide :

Biodegradability

: Biodegradation: 93 - 98 %

Exposure time: 28 d

Method: Information given is based on data obtained from similar substances.

Remarks: Readily biodegradable.

Rapidly hydrolyses in water and soil.

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water

: log Pow: -0.3

Components:

Ethylene Oxide :

Bioaccumulation

: Remarks: Does not have the potential to bioaccumulate significantly.

Mobility in soil

Components:

Ethylene Oxide :

Mobility

: Remarks: When released to air, transfers to soil or water by

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wet and dry deposition.

Other adverse effects

Components:

Ethylene Oxide :

Results of PBT and vPvB assessment : The substance does not fulfill all screening criteria for persistence, bioaccumulation and toxicity and hence is not considered to be PBT or vPvB.

13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Do not dispose into the environment, in drains or in water courses.
Waste product should not be allowed to contaminate soil or water.
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Disposal should be in accordance with applicable regional, national, and local laws and regulations.
Local regulations may be more stringent than regional or national requirements and must be complied with.

Contaminated packaging : Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand.

14. TRANSPORT INFORMATION

International Regulations

ADR

UN number : 1040
Proper shipping name : ETHYLENE OXIDE WITH NITROGEN
Class : 2
Subsidiary risk : 2.1
Packing group : Not Assigned
Labels : 2.3 (2.1)
Hazard Identification Number : 263
Environmentally hazardous : no

IATA-DGR

UN/ID No. : UN 1040 (Not permitted for transport)
Proper shipping name : ETHYLENE OXIDE WITH NITROGEN

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Class	: 2.3
Packing group	: Not Assigned
IMDG-Code	
UN number	: UN 1040
Proper shipping name	: ETHYLENE OXIDE WITH NITROGEN
Class	: 2.3
Subsidiary risk	: 2.1
Packing group	: Not Assigned
Labels	: 2.3 (2.1)
Marine pollutant	: no

Maritime transport in bulk according to IMO instruments

Pollution category	: Not applicable
Ship type	: Not applicable
Product name	: Not applicable

Special precautions for user

Remarks	: Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.
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Additional Information	: SHUNT WITH CARE (Label nr. 13 - for RID only) This product may be transported under nitrogen blanketing. Nitrogen is an odourless and invisible gas. Exposure to nitrogen enriched atmospheres displaces available oxygen which may cause asphyxiation or death. Personnel must observe strict safety precautions when involved with a confined space entry.
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15. REGULATORY INFORMATION

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

Local Regulations

Workplace Safety and Health Act & Workplace Safety and Health (General Provision) Regulations	This product is subject to the SDS, Labelling, PEL and other requirements in the Act/ Regulations.
Fire Safety Act and Fire Safety (Petroleum & Flammable Materials) Regulations	This product is not subject to the requirements in the Act/Regulations.
Maritime and Port Authority of Singapore (Dangerous Goods, Petroleum and Explosives) Regulations	This product is subject to the requirements of this regulation.
Environmental Protection and Management Act and Environmental Protection and Management (Hazardous Substances) Regulations	This product is subject to the requirements in the Act/ Regulations.

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The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Other international regulations

The components of this product are reported in the following inventories:

AIIC	: Listed
DSL	: Listed
IECSC	: Listed
ENCS	: Listed
KECI	: Listed
NZIoC	: Listed
PICCS	: Listed
TSCA	: Listed
TCSI	: Listed

16. OTHER INFORMATION

Full text of H-Statements

H220	Extremely flammable gas.
H230	May react explosively even in the absence of air.
H280	Contains gas under pressure; may explode if heated.
H301	Toxic if swallowed.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H340	May cause genetic defects.
H350	May cause cancer.
H360	May damage fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H402	Harmful to aquatic life.

Full text of other abbreviations

Acute Tox.	Acute toxicity
Aquatic Acute	Short-term (acute) aquatic hazard
Carc.	Carcinogenicity
Chem. Unst. Gas	Chemically unstable gas
Eye Dam.	Serious eye damage
Flam. Gas	Flammable gases
Muta.	Germ cell mutagenicity
Press. Gas	Gases under pressure
Repr.	Reproductive toxicity
Skin Corr.	Skin corrosion
STOT RE	Specific target organ toxicity - repeated exposure
STOT SE	Specific target organ toxicity - single exposure

Abbreviations and Acronyms

AIIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR -

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Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

Further information

- Training advice : Provide adequate information, instruction and training for operators.
- Other information : A vertical bar (|) in the left margin indicates an amendment from the previous version.
- Sources of key data used to compile the Safety Data Sheet : The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID data base, EC 1272 regulation, etc).

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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