Safety data sheet
Ethylene Oxide

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

1.1. Product identifier
Product name
Ethylene Oxide

EC No (from EINECS): 200-849-9
CAS No: 75-21-8
Index-Nr. 603-023-00-X
Chemical formula C2H4O
REACH Registration number:
01-2119432402-53

1.2. Relevant identified uses of the substance or mixture and uses advised against
Relevant identified uses
Industrial and professional. Perform risk assessment prior to use.
Biocidal uses.
Uses advised against
Consumer use.

1.3. Details of the supplier of the safety data sheet
Company identification
BOC, PO Box 1201, Bluebell, Dublin
E-Mail Address ReachSDS@boc.com

1.4. Emergency telephone number
Emergency phone numbers (24h): 1850 333 435

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification acc. to Regulation (EC) No 1272/2008/EC (CLP/GHS)
Press. Gas (Liquefied gas) - Contains gas under pressure; may explode if heated.
Flam. Gas 1 - Extremely flammable gas.
Carc. 1B - May cause cancer.
Muta. 1B - May cause genetic defects.
Acute Tox. 3 - Toxic if inhaled.
Eye Irrit. 2 - Causes serious eye irritation.
STOT SE 3 - May cause respiratory irritation.
Skin Irrit. 2 - Causes skin irritation.
- Explosive with or without contact with air.

Classification acc. to Directive 67/548/EEC & 1999/45/EC
Carc. Cat.2; R45 **|** Mut. Cat.2; R46 **|** T; R23 **|** Xi; R36/37/38 **|** F+; R12 **|** R6
May cause cancer.
May cause heritable genetic damage
Explosive with or without contact with air.
Extremely flammable.
Toxic by inhalation.
Irritating to eyes, respiratory system and skin.
Risk advice to man and the environment
Liquefied gas.
Contact with liquid may cause cold burns/frost bite.

2.2. Label elements
- Labelling Pictograms

- Signal word

Danger

- Hazard Statements

H280	Contains gas under pressure; may explode if heated.
H220	Extremely flammable gas.
H350	May cause cancer.
H340	May cause genetic defects.
H331	Toxic if inhaled.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H315	Causes skin irritation.
EUH006	Explosive with or without contact with air.

- Precautionary Statements

Precautionary Statement Prevention

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P260	Do not breathe gas, vapours.
P202	Do not handle until all safety precautions have been read and understood.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary Statement Response

P304+P340+P315	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice/attention.
P305+P351+P338+P315	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P332 + P313	If skin irritation occurs: Get medical advice/attention.

Precautionary Statement Storage

P403	Store in a well-ventilated place.
P405	Store locked up.

Precautionary Statement Disposal
None.

2.3. Other hazards
Contact with liquid may cause cold burns/frost bite.

SECTION 3: Composition/information on ingredients

Substance / Mixture: Substance.

3.1. Substances
Ethylene Oxide
CAS No: 75-21-8
Index-Nr.: 603-023-00-X
EC No (from EINECS): 200-849-9
REACH Registration number:
01-2119432402-53
Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures
Not applicable.

SECTION 4: First aid measures

4.1. Description of first aid measures
First Aid General Information:
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
First Aid Inhalation:
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
First Aid Skin / Eye:
Remove contaminated clothing. Drench affected area with water for at least 15 minutes. In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Immediately flush eyes thoroughly with water for at least 15 minutes. Obtain medical assistance.
First Aid Ingestion:
Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed
In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. May cause irritation to cornea (with temporary disturbance to vision). In low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of co-ordination. May cause irritation to skin. May result in pulmonary oedema.

4.3. Indication of any immediate medical attention and special treatment needed
Obtain medical assistance. Treat with a corticosteroid spray as soon as possible after inhalation.

SECTION 5: Fire fighting measures

5.1. Extinguishing media

Suitable extinguishing media
All known extinguishants can be used.
Unsuitable extinguishing media
Do not use a solid water stream.

5.2. Special hazards arising from the substance or mixture
Specific hazards
Exposure to fire may cause containers to rupture/explode. Can form violent, spontaneously explosive mixture in air.
Hazardous combustion products
If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Aldehydes.
Carbon dioxide, Carbon monoxide.

5.3. Advice for firefighters
Specific methods
If possible, stop flow of product. Continue water spray from protected position until container stays cool. Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire. Move container away or cool with water from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.
Special protective equipment for fire fighters
Use self-contained breathing apparatus and chemically protective clothing. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to EN 469 will provide a basic level of protection from chemical incidents. EN 469:2005: Protective clothing for fire-fighters. Performance requirements for protective clothing for fire-fighting.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Consider the risk of potentially explosive atmospheres. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Monitor concentration of released product. Evacuate area. Use self-contained breathing apparatus and chemically protective clothing. Eliminate ignition sources. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ensure adequate air ventilation.

6.2. Environmental precautions
Try to stop release. Reduce vapour with fog or fine water spray.

6.3. Methods and material for containment and cleaning up
Ventilate area. Keep area evacuated and free from ignition sources until any spilled liquid has evaporated. (Ground free from frost). Hose down area with water. Wash contaminated equipment or sites of leaks with copious quantities of water. Absorb excess liquid spillage on inorganic adsorbent material such as fine sand, brick dust etc. Place spent adsorbent in sealed packages and contact specialist waste disposal contractor. Prevent evaporation by covering with foam.

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

SECTION 7: Handling and storage

7.1. Precautions for safe handling
Only experienced and properly instructed persons should handle gases under pressure. The substance must be handled in accordance with good industrial hygiene and safety procedures. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Avoid exposure, obtain special instructions before use. Take precautionary measures against static discharges. Purge air from system before introducing gas. Keep away from ignition sources (including static discharges). Do not smoke while handling product. Assess the risk of potentially explosive atmosphere and the need for explosion-proof equipment. Consider the use of only non-sparking tools. Ensure equipment is adequately earthed. Ensure the complete gas system has been (or is regularly) checked for leaks before use. Installation of a cross purge assembly between the cylinder and the regulator is recommended. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Avoid suckback of water, acid and alkalis. Refer to supplier's handling instructions. Do not allow backfeed into the container. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Never attempt to transfer gases from one cylinder/container to another. Damaged valves should be reported immediately to the supplier. Keep container valve outlets clean and free from contaminates particularly oil and water. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Close container valve after each use and when empty, even if still connected to equipment. Never use direct flame or electrical heating devices to raise the pressure of a container. Never attempt to repair or modify container valves or safety relief devices. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents.

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

7.3. Specific end use(s)
None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters
Exposure limit value

Value type	value	Note
TLV (ACGIH)	1 ppm	ACGIH 1995 - 1996
Great Britain - LTEL	5 ppm	EH 40/07

Derived No Effect Levels

Type	Exposure	Value	Population	Effects
DNEL	Short term inhalation	5 mg/m^3	Workers	Systemic
DNEL	Long term Inhalation	1,6 mg/m^3	Workers	Systemic

Predicted No Effect Concentrations

Type	Compartment Detail	Value
PNEC	Fresh	0,084 mg/l
PNEC	Marine	0,0084 mg/l
PNEC	Fresh water sediment	0,178 mg/kg sediment dw
PNEC	Marine water sediment	0,178 mg/kg sediment dw
PNEC	Soil	0,0136 mg/kg soil dw
PNEC	STP (Sewage Treatment Plant)	13 mg/l

8.2. Exposure controls
Appropriate engineering controls
A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered. Product to be handled in a closed system and under strictly controlled conditions. Use only permanent leak-tight installations (e.g. welded pipes). Keep concentrations well below occupational exposure limits. Systems under pressure should be regularly checked for leakages. Gas detectors should be used when quantities of flammable gases/vapours may be released. Gas detectors should be used when toxic quantities may be released. Provide adequate general or local ventilation. Consider work permit system e.g. for maintenance activities. The substance must be handled in accordance with good industrial hygiene and safety procedures.
Personal protective equipment
Eye and face protection
Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Wear a face-shield when transfilling and breaking transfer connections.

Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes. Wear eye protection to EN 166 when using gases. Full-face mask recommended.
Guideline:
EN 136: Respiratory protective devices. Full face masks. Requirements, testing, marking.
Skin protection
Hand protection
Advice:
Wear working gloves and safety shoes while handling gas cylinders. Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. The substance is readily absorbed by rubber. Change gloves every few minutes and ensure they have been sufficiently de-gased before re-use. Materials suitable for prolonged, direct contact.
Material:
Butyl rubber (Butyl)
Min. Breakthrough time:
30 min
Glove thickness:
>= 0,7 mm
Protection index: 2

Body protection
Protect eyes, face and skin from contact with product. Keep suitable chemically resistant protective clothing readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved.
Guideline:
EN 943: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles.
Other protection
Take precautionary measures against static discharges. Wear flame resistant/retardant clothing. Wear working gloves and safety shoes while handling gas cylinders. ISO 20345 Safety footwear.
Respiratory protection
Keep self contained breathing apparatus readily available for emergency use.Use SCBA in the event of high concentrations.The selection of the Respiratory Protective Device (RPD) must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected RPD.When allowed by a risk assessment Respiratory Protective Equipment (RPE) may be used.

Material:
Filter AX
Guideline:
EN 136: Respiratory protective devices. Full face masks. Requirements, testing, marking. EN 14387: Respiratory protective devices. Gas filter(s) and combined filter(s). Requirements, testing, marking

Self-contained breathing apparatus (SCBA)
Material:
Filter AX
Guideline:
EN 14387: Respiratory protective devices. Gas filter(s) and combined filter(s). Requirements, testing, marking
Thermal hazards
If there is a risk of contact with the liquid, all protective equipment should be suitable for extremely low temperatures
Environmental Exposure Controls
Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties
General information
Appearance/Colour: Colourless gas.
Odour: Ethereal Poor warning properties at low concentrations.
Odour threshold:
Odour threshold is subjective and inadequate to warn for over exposure.
Melting point: -112 °C
Boiling point: 10,4 °C
Flash point: Not applicable for gases and gas mixtures.
Evaporation rate:
Not applicable for gases and gas mixtures.
Flammability range: 2,6 %(V) - 100 %(V)
Vapour Pressure 20 °C: 1,4 bar
Relative density, gas: 1,5
Solubility in water: No reliable data available.
Partition coefficient: n-octanol/water: -0,3 logPow
Autoignition temperature: 440 °C
Viscosity:
Dynamic: 0,25 mPa.s
Kinematic: 0,32 mm2/s
Molecular weight: 44 g/mol
Critical temperature: 196 °C
Relative density, liquid: 0,89
Critical pressure: 71,9 bar

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

SECTION 10: Stability and reactivity

10.1. Reactivity
Unreactive under normal conditions.

10.2. Chemical stability
Stable under normal conditions., May polymerise., Containers are commonly pressurised to 5-7 bars with nitrogen.

10.3. Possibility of hazardous reactions
Can form potential explosive atmosphere in air., May react violently with oxidants., Exothermic reaction.

10.4. Conditions to avoid
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. May decompose violently at high temperature and/or pressure or in the presence of a catalyst Avoid moisture in installation systems.

10.5. Incompatible materials

Air, Oxidiser. For material compatibility see latest version of ISO-11114.

10.6. Hazardous decomposition products
Under normal conditions of storage and use, hazardous decomposition products should not be produced.
If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Aldehydes.
Carbon dioxide, Carbon monoxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute oral toxicity
Value: LD50
Species: Rat
Value in standard unit mg/kg: 72 mg/kg

Acute inhalation toxicity
Value: LC50
Species: Rat
Exposure time: 4 h
Value in non-standard unit: 1,6 - 4,2 mg/kg
Acute dermal toxicity
Value: LD50
Species: Rat
Value in standard unit mg/kg: 187 mg/kg

Acute dermal toxicity
Not applicable.
Skin irritation
Species: Rabbit
Exposure time: >= 0,1 h
Irritant
Eye irritation
Species: Rabbit
Method: OECD Test Guideline 405
Exposure time: 24 - 48 h
May cause severe irritation with corneal damage which may result in permanent impairment of vision, even blindness.
Sensitization
Species: Human
Reactions were observed in people with sensitive skin/respiratory system.
Repeated dose toxicity
Value type: NOAEC
Species: Rat
Route of application: Inhalation
Method: OECD Test Guideline 453
Exposure time: 2 weeks (daily, 5 days/week)
Value: 10ppm
No known effects from this product.

Value type: NOAEC
Species: Mouse
Route of application: Inhalation
Method: Other
Exposure time: 10 weeks (daily, 5 days/week)
Value: 10ppm
No known effects from this product.

Genetic toxicity in vitro
Test type: Ames test in vitro:
Mutagenic.
Genetic toxicity in vivo
Species: Bacteria
Method: OECD 471
Result: Positive

Species: Rat
Method: OECD 478
Result: Positive

Assessment mutagenicity
May cause genetic defects.
Carcinogenicity
Value type: NOAEC
Species: Rat
Route of application: Inhalation
Method: OECD 453: Combined Chronic toxicity/ Carcinogenicity Studies.
Exposure time: 27 to 103 weeks (daily, 5 days/week)
Value: 10ppm
No known effects from this product.

Assessment carcinogenicity
May have carcinogenic effect.
Toxicity to reproduction/fertility
Value type: NOAEC (P)
Species: Rat
Route of application: Inhalation
Method: OECD 415
Exposure time 14 weeks (daily, 5 days/week)
Value: 0,054 mg/l air
No known effects from this product.

Developmental toxicity/teratogenicity
Value type: NOAEC
Species: Rat
Route of application: Inhalation
Method: OECD 414
Exposure time: 6- 15 days (gestation, daily)
Value: 0,18 mg/l air
No known effects from this product.

Assessment teratogenicity
No known effects from this product.

SECTION 12: Ecological information

12.1. Toxicity
No known ecological damage caused by this product.
Acute and prolonged toxicity fish
Species: Fathead Minnow (Pimephales promelas)
Exposure time: 96 h
Value type: LC50
Value in standard unit mg/l: 84 mg/l
Harmful to fish.
Acute toxicity aquatic invertebrates
Species: Daphnia magna
Exposure time: 48 h
Value type: EC50
Value in standard unit mg/l: 137 - 300 mg/l
Not harmful to invertebrates
Toxicity aquatic plants
Species: Algae

Exposure time: 96 h
Value type: EC50
Value in standard unit mg/l: 240 mg/l
Method: OECD Test Guideline 201
Not harmful to algae.
Toxicity microorganisms
Species: Bacteria
Exposure time: 16 h
Value type: EC50
Value in standard unit mg/l: 10 - 100 mg/l
Toxicity microorganisms
Test type: Activated sludge, domestic.
Species: Bacteria
Value type: EC50
Value in standard unit mg/l: > 3.000 mg/l
Not harmful to microorganisms.

12.2. Persistence and degradability
Photodegradation
Exposure time: 57.2 days
Value: 57.2 days
Method SRC AOP v.1.92
Conc. OH-radicals: 500000
Reference: QSAR
Remark: 0.00000000000028 cm^3/molecule.s

Stability in water
Exposure time: 28 days
Value: 93/98%
Method: OECD 301C: Modified MITI Test (I)
Readily biodegradable

12.3. Bioaccumulative potential
Does not bioaccumulate., Because of the partition coefficient of the contaminant in the organic fraction of the soil (log Kow), accumulation in organisms is not to be expected.

12.4. Mobility in soil
Log Koc: 0,157
Volatility (Henry's constant H)
Method: SRC HENRYWIN V3.10
Value at 25°C: 12,159 Pa.m^3/mol

The substance is soluble in water., Low potential for adsorption into soil.

12.5. Results of PBT and vPvB assessment
Not classified as PBT or vPvB.

12.6. Other adverse effects
Depending on local conditions and existing concentrations, disturbances in the biodegradation process of activated sludge are possible. May cause pH changes in aqueous ecological systems.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Do not discharge into any place where its accumulation could be dangerous. Toxic and corrosive gases formed during combustion should be scrubbed before discharge to atmosphere. Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor.
Contact supplier if guidance is required. Must not be discharged to atmosphere. Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", downloadable at http://www.eiga.org) for more guidance on suitable disposal methods.
Gases in pressure containers (including halons) containing dangerous substances
EWC Nr. 16 05 04*

SECTION 14: Transport information

ADR/RID

14.1. UN number
1040

14.2. UN proper shipping name
Ethylene Oxide

14.3. Transport hazard class(es)
Class: 2
Classification Code: 2TF
Labels: 2.3, 2.1
Hazard number: 263
Emergency Action Code: 2PE
Tunnel code: (B/D)

14.4. Packing group (Packing Instruction)
P200

14.5. Environmental hazards
None.

14.6. Special precautions for user
None.

IMDG

14.1. UN number
1040

14.2. UN proper shipping name
Ethylene Oxide

14.3. Transport hazard class(es)
Class: 2.3
Labels: 2.3, 2.1
EmS: FD,SU

14.4. Packing group (Packing Instruction)
P200

14.5. Environmental hazards
None.

14.6. Special precautions for user
None.

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable.

IATA

14.1. UN number

1040

14.2. UN proper shipping name
Ethylene Oxide

14.3. Transport hazard class(es)
Class: 2.3
Labels: 2.3, 2.1

14.4. Packing group (Packing Instruction)
P200

14.5. Environmental hazards
None.

14.6. Special precautions for user
None.

Other transport information
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 that they are firmly secured. Ensure that the cylinder valve is closed and not leaking. Ensure that the valve outlet cap nut or plug (where provided) is correctly fitted. Ensure that the valve protection device (where provided) is correctly fitted. Ensure adequate ventilation. Ensure compliance with applicable regulations.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
Seveso Directive 96/82/EC: Listed
Further regulations
Biocidal Product Directive (98/8/EC)

15.2. Chemical safety assessment
CSA has been carried out.

SECTION 16: Other information

Ensure all national/local regulations are observed. Ensure operators understand the flammability hazard. Ensure operators understand the toxicity hazard. Users of breathing apparatus must be trained. Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
Advice
Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted. Details given in this document are believed to be correct at the time of going to press.
Further Information
Note:
When using this document care should be taken, as the decimal sign and its position complies with rules for the structure and drafting of international standards, and is a comma on the line. As an example 2,000 is two (to three decimal places) and not two thousand, whilst 1.000 is one thousand and not one (to three decimal places).

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