Danger

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

1.1. Product identifier

Trade name : Ethylene oxide
SDS no : SDS-056-CLP
Chemical description : Ethylene oxide
CAS No : 75-21-8
EC no : 200-849-9
EC index no : 603-023-00-X
Registration-No. : 01-2119432402-53
Chemical formula : C2H4O

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.
Test gas/Calibration gas.
Laboratory use.
Chemical reaction / Synthesis.
Contact supplier for more information on uses.
Uses advised against : Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification : Air Liquide UK Ltd.
Station Road, Coleshill
B46 1JY Birmingham United Kingdom
01675462424
genenq.aluk@airliquide.com

1.4. Emergency telephone number

Emergency telephone number : 01675 462695

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Flammable gases, Category 1	H220
	Chemically Unstable gases, Category A	H230
	Gases under pressure : Liquefied gas	H280
Health hazards	Acute toxicity (inhal.), Category 3	H331
	Acute toxicity (inhalation:gas) Category 3	H331
	Skin corrosion/irritation, Category 2	H315
	Serious eye damage/eye irritation, Category 2	H319
	Germ cell mutagenicity, Category 1B	H340
	Carcinogenicity, Category 1B	H350
	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation	H335

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

F+; R12

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :

GHS02 GHS04 GHS06 GHS08

Signal word (CLP) : Danger

Hazard statements (CLP) : H315 - Causes skin irritation.
H319 - Causes serious eye irritation.
H335 - May cause respiratory irritation.
H340 - May cause genetic defects.
H350 - May cause cancer.
H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.
H331 - Toxic if inhaled.
H230 - May react explosively even in the absence of air.

Precautionary statements (CLP)

- Prevention : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P261 - Avoid breathing dust/fume/gas/mist/vapours/spray.
P264 - Wash ... thoroughly after handling.
P271 - Use only outdoors or in a well-ventilated area.
P280 - Wear protective gloves, protective clothing, eye protection, face protection.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

- Response : P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313 - IF exposed or concerned: Get medical advice/attention.
P321 - Specific treatment (see ... on this label).
P332+P313 - If skin irritation occurs: Get medical advice/attention.
P337+P313 - If eye irritation persists: 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.
P362+P364 - Take off contaminated clothing and wash it before reuse.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P311 - Call a POISON CENTER/doctor/….
P302+P352 - IF ON SKIN: Wash with plenty of water/….

- Storage : P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.
P403 - Store in a well-ventilated place.
P410+P403 - Protect from sunlight. Store in a well-ventilated place.

- Disposal considerations : P501 - Dispose of contents/container to ....

2.3. Other hazards

: None.

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%	Classification according to Directive 67/548/EEC	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Ethylene oxide	(CAS No) 75-21-8	100	F+; R12	Flam. Gas 1, H220

	(EC no) 200-849-9 (EC index no) 603-023-00-X (Registration-No.) 01-2119432402-53			Chem. Unst. Gas A, H230 Press. Gas (Liq.), H280 Acute Tox. 3 (Inhalation), H331 Acute Tox. 3 (Inhalation:gas), H331 Skin Irrit. 2, H315 Eye Irrit. 2, H319 Muta. 1B, H340 Carc. 1B, H350 STOT SE 3, H335

Contains no other components or impurities which will influence the classification of the product.

Full text of R-phrases see section 16. Full text of H-statements see section 16.

3.2. Mixture : Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- 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.
- Skin contact : Remove contaminated clothing.
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
- 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.
In low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of co-ordination.
May cause irritation to cornea (with temporary disturbance to vision).
May cause irritation to skin.
Refer to section 11.

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

: Treat with corticosteroid spray as soon as possible after inhalation.
Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog.
Dry powder.
- Unsuitable extinguishing media : Do not use water jet to extinguish.
Carbon dioxide.

5.2. Special hazards arising from the substance or mixture

Specific hazards : Exposure to fire may cause containers to rupture/explode.

Hazardous combustion products : Incomplete combustion may form carbon monoxide.

5.3. Advice for fire-fighters

Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.
If possible, stop flow of product.
Use water spray or fog to knock down fire fumes if possible.
Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
Move containers away from the fire area if this can be done without risk.

Special protective equipment for fire fighters	:	Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

: Try to stop release.
Evacuate area.
Monitor concentration of released product.
Consider the risk of potentially explosive atmospheres.
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Wear gas tight chemically protective clothing in combination with self contained breathing apparatus.
Eliminate ignition sources.
Ensure adequate air ventilation.
Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Act in accordance with local emergency plan.
Stay upwind.

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

: Hose down area with water.
Ventilate area.
Keep area evacuated and free from ignition sources until any spilled liquid has evaporated (ground free from frost).
Wash contaminated equipment or sites of leaks with copious quantities of water.

6.4. Reference to other sections

: See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Safe use of the product	:	The substance must be handled in accordance with good industrial hygiene and safety procedures. Only experienced and properly instructed persons should handle gases under pressure. Consider pressure relief device(s) in gas installations. Ensure the complete gas system was (or is regularily) checked for leaks before use. Do not smoke while handling product. Avoid exposure, obtain special instructions before use. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. 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 suck back of water, acid and alkalis. Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment. Purge air from system before introducing gas. Take precautionary measures against static discharge. Keep away from ignition sources (including static discharges). Consider the use of only non-sparking tools. Do not breathe gas. Avoid release of product into atmosphere.
Safe handling of the gas receptacle	:	Refer to supplier's container 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 repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Keep container valve outlets clean and free from contaminants 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 attempt to transfer gases from one cylinder/container to another. Never use direct flame or electrical heating devices to raise the pressure of a container. 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

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

7.3. Specific end use(s)

: None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ethylene oxide (75-21-8)		
OEL : Occupational Exposure Limits		
United Kingdom	WEL - LTEL - UK [mg/m³]	9.2 mg/m³

	WEL - LTEL - UK [ppm]	5 ppm

Ethylene oxide (75-21-8)	
DNEL: Derived no effect level (Workers)	
Acute - systemic effects, inhalation	5 mg/m³ 2.7 ppm
Long-term - systemic effects, inhalation	1.6 mg/m³ (DMEL)

Ethylene oxide (75-21-8)	
PNEC: Predicted no effect concentration	
Aqua (freshwater)	0.084 mg/l
Aqua (marine water)	0.0084 mg/l
Sediment, freshwater	0.178 mg/kg dwt
Sediment,marine water	0.0178 mg/kg dwt
Soil, agricultural	0.0136 mg/kg dwt
Micro-organisms or PNEC sewage treatment plant (STP)	13 mg/l

8.2. Exposure controls

8.2.1. Appropriate engineering controls

: Provide adequate general and local exhaust ventilation.
Product to be handled in a closed system.
Preferably use only permanent leak-tight installations (e.g. welded pipes).
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Gas detectors should be used when toxic gases may be released.
Consider work permit system e.g. for maintenance activities.

8.2.2. Individual protection measures, e.g. personal protective equipment

: 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:
Protect eyes, face and skin from liquid splashes.
PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection

: Wear safety glasses with side shields.
Wear goggles and a face shield when transfilling or breaking transfer connections.
Standard EN 166 - Personal eye-protection.
Provide readily accessible eye wash stations and safety showers.

• Skin protection

- Hand protection

: Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.
Wear chemically resistant protective gloves.
Standard EN 374 - Protective gloves against chemicals.
Permeation time: minimum >480min long term exposure: material / thickness [mm] Butyl rubber (IIR) 0,7
Consult glove manufacturer´s product information on material suitability and material thickness.
The breakthrough time of the selected gloves must be greater than the intended use period.

- Other

: Consider the use of flame resistant anti-static safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
Standard EN ISO 1149-5 - Protective clothing: Electrostatic properties.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.
Keep suitable chemically resistant protective clothing readily available for emergency use.
Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.

• Respiratory protection	:	Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known. Use gas filters and full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers. Recommended: Filter AX (brown). Consult respiratory device supplier´s product information for the selection of the appropriate device. Gas filters do not protect against oxygen deficiency. Standard EN 14387 - Gas filter(s), combined filter(s) and full face mask - EN 136. Keep self contained breathing apparatus readily available for emergency use. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask. Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
• Thermal hazards	:	None necessary.

8.2.3. 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

Appearance

• Physical state at 20°C / 101.3kPa	:	Gas.
• Colour	:	Colourless.
Odour	:	Ethereal. Poor warning properties at low concentrations.
Odour threshold	:	Odour threshold is subjective and inadequate to warn of overexposure.
pH value	:	Not applicable.
Molar mass	:	44 g/mol
Melting point	:	-112 °C
Boiling point	:	10.4 °C
Flash point	:	Not applicable for gases and gas mixtures.
Critical temperature [°C]	:	196 °C
Evaporation rate (ether=1)	:	Not applicable for gases and gas mixtures.
Flammability range	:	2.6 - 100 vol %
Vapour pressure [20°C]	:	1.4 bar(a)
Vapour pressure [50°C]	:	3.9 bar(a)
Relative density, gas (air=1)	:	1.5
Relative density, liquid (water=1)	:	0.89
Solubility in water	:	No reliable data available.
Partition coefficient n-octanol/water [log Kow]	:	-0.3
Auto-ignition temperature	:	435 °C
Viscosity [20°C]	:	Not applicable.
Explosive Properties	:	Not applicable.
Oxidising Properties	:	None.

9.2. Other information

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

SECTION 10: Stability and reactivity

10.1. Reactivity

: No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

: Stable under normal conditions.
Containers are commonly pressurised to 5-7 bars with nitrogen.
May polymerise.

10.3. Possibility of hazardous reactions

: May react violently with oxidants.
Can form explosive mixture with air.

10.4. Conditions to avoid

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

10.5. Incompatible materials

: Air, Oxidiser.
For additional information on compatibility refer to ISO 11114.

10.6. Hazardous decomposition products

: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity :

LC50 inhalation rat (ppm)	1450 ppm/4h

Skin corrosion/irritation : Irritation to skin.

Serious eye damage/irritation : Irritation to eyes.

Respiratory or skin sensitisation : No known effects from this product.

Germ cell mutagenicity : Possible risk of irreversible effects.

Carcinogenicity : May have carcinogenic effect.

Toxic for reproduction : Fertility : No known effects from this product.

Toxic for reproduction : unborn child : No known effects from this product.

STOT-single exposure : May cause irritation to the respiratory tract.
Damage to red blood cells (haemolytic poison).

STOT-repeated exposure : Damage to red blood cells (haemolytic poison).

Aspiration hazard : Not applicable for gases and gas mixtures.

SECTION 12: Ecological information

12.1. Toxicity

EC50 48h - Daphnia magna [mg/l]	137 - 300 mg/l
EC50 72h - Algae [mg/l]	240 mg/l
LC50 96 h - Fish [mg/l]	84 mg/l

12.2. Persistence and degradability

Assessment : The substance is biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Assessment : Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Assessment : Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB.

12.6. Other adverse effects

Effect on ozone layer : None.

Effect on the global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Must not be discharged to atmosphere.
Ensure that the emission levels from local regulations or operating permits are not exceeded.
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.

List of hazardous waste codes (from Commission Decision 2001/118/EC) : 16 05 04: Gases in pressure containers (including halons) containing dangerous substances.

13.2. Additional information

: None.

SECTION 14: Transport information

14.1. UN number

UN-No. : 1040

14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : ETHYLENE OXIDE

Transport by air (ICAO-TI / IATA-DGR) : Ethylene oxide

Transport by sea (IMDG) : ETHYLENE OXIDE

14.3. Transport hazard class(es)

Labelling :

2.3 : Toxic gases
2.1 : Flammable gases

Transport by road/rail (ADR/RID)

Class : 2

Classification code : 2TF

Hazard identification number : 263

Tunnel Restriction : B/D - Tank carriage : Passage forbidden through tunnels of category B, C, D and E. Other carriage : Passage forbidden through tunnels of category D and E

Transport by air (ICAO-TI / IATA-DGR)

Class / Div. (Sub. risk(s)) :

Transport by sea (IMDG)

Class / Div. (Sub. risk(s)) : 2.3 (2.1)

Emergency Schedule (EmS) - Fire : F-D

Emergency Schedule (EmS) - Spillage : S-U

14.4. Packing group

Transport by road/rail (ADR/RID) : Not applicable

Transport by air (ICAO-TI / IATA-DGR) : Not applicable

Transport by sea (IMDG) : Not applicable

14.5. Environmental hazards

Transport by road/rail (ADR/RID) : None.

Transport by air (ICAO-TI / IATA-DGR) : None.

Transport by sea (IMDG) : None.

14.6. Special precautions for user

Packing Instruction(s)

Transport by road/rail (ADR/RID) : P200

Transport by air (ICAO-TI / IATA-DGR)

Passenger and Cargo Aircraft : Forbidden

Cargo Aircraft only : Forbidden

Transport by sea (IMDG) : P200

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.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

: Not applicable

SECTION 15: Regulatory information

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

EU-Regulations

Restrictions on use : Restricted to professional users (Annex XVII REACH).

Seveso directive 96/82/EC : Listed.

National regulations

National legislation : Ensure all national/local regulations are observed.

Water hazard class (WGK) : -
Kenn-Nr. : 253

15.2. Chemical safety assessment

: A CSA has been carried out.

SECTION 16: Other information

Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 453/2010.

Training advice : Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard. Ensure operators understand the flammability hazard.

Further information : This Safety Data Sheet has been established in accordance with the applicable European Union legislation.

Full text of R-, H- and EUH-phrases

Acute Tox. 3 (Inhalation)	Acute toxicity (inhal.), Category 3
Acute Tox. 3 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 3
Carc. 1B	Carcinogenicity, Category 1B
Chem. Unst. Gas A	Chemically Unstable gases, Category A
Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
Flam. Gas 1	Flammable gases, Category 1
Muta. 1B	Germ cell mutagenicity, Category 1B
Press. Gas (Liq.)	Gases under pressure : Liquefied gas
Skin Irrit. 2	Skin corrosion/irritation, Category 2
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation
H220	Extremely flammable gas
H230	May react explosively even in the absence of air
H280	Contains gas under pressure; may explode if heated
H315	Causes skin irritation
H319	Causes serious eye irritation
H331	Toxic if inhaled
H335	May cause respiratory irritation
H340	May cause genetic defects
H350	May cause cancer
R12	Extremely flammable
F+	Extremely flammable

DISCLAIMER OF LIABILITY : Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
Details given in this document are believed to be correct at the time of going to press.
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