

Ethylene oxide

C₂H₄O**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

Name of product	Ethylene oxide Art-Nr(n).: 1400-1402
Name of substance	ethylene-oxide
Index No	603-023-00-X
EC No	200-849-9
REACH registration number	01-2119432402-53
CAS No	75-21-8

Manufacturer / Distributor:**Ehsan International Gases**

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1.2. Relevant identified uses of the substance or mixture and uses advised against**Identified uses****Sector of uses [SU]**

SU22 - Professional uses: Public domain (administration, education, entertainment, services, craftsmen)

SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites

SU8 - Manufacture of bulk, large scale chemicals (including petroleum products)

SU9 - Manufacture of fine chemicals

Process categories [PROC]

PROC1 - Use in closed process, no likelihood of exposure

PROC2 - Use in closed, continuous process with occasional controlled exposure

PROC3 - Use in closed batch process (synthesis or formulation)

PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

PROC15 - Use as laboratory reagent

Environmental release categories [ERC]

ERC1 - Manufacture of substances

ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates)

ERC6c - Industrial use of monomers for manufacture of thermoplastics

Recommended intended purpose(s)

Basic substance.

Biocidal product.

Fumigant.

1.3. Details of the supplier of the safety data sheet

Ethylene oxide

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SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to 67/548/EEC or 1999/45/EC

F+; R12
T; R23
Xi; R36/37/38
Carc. Cat. 2; R45
Muta. Cat. 2; R46
T; R48/23
R6

R-phrases

45 May cause cancer.
46 May cause heritable genetic damage.
12 Extremely flammable.
36/37/38 Irritating to eyes, respiratory system and skin.
48/23 Toxic: danger of serious damage to health by prolonged exposure through inhalation.
6 Explosive with or without contact with air. 23 Also toxic by inhalation.

Additional hints

Listed substance (Regulation (EC) No 1272/2008, Annex VI, part 3).

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

Hazard classes and Hazard categories	Hazard Statements	Classification procedure
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Flam. Gas 1	H220
Chem. Unst. Gas A	H230
Liquef. Gas	H280
Acute Tox. 3	H331
Acute Tox. 4	H302 Skin Irrit. 2 H315
Eye Irrit. 2	H319
Muta. 1B	H340
Carc. 1B	H350 STOT SE 3 H335 STOT RE 1 H372

Hazard statements for 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.

Hazard statements for health hazards

H302 Harmful if swallowed.
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.
H372 Causes damage to the nervous system and to blood forming organs through prolonged or repeated exposure by inhalation.

Additional hints

Listed substance (Regulation (EC) No 1272/2008, Annex VI, part 3).

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2.2. Label elements

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



GHS02



GHS06



GHS08

Signal word

Danger

Hazard statements for 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.

Hazard statements for health hazards

- H302 Harmful if swallowed.
 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.
 H372 Causes damage to the nervous system and to blood forming organs through prolonged or repeated exposure by inhalation.

Precautionary Statements

Prevention

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

Response

- P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
 P308 + P313 IF exposed or concerned: Get medical advice/attention.
 P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

Storage

- P405 Store locked up.
 P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Special rules for supplemental label elements for certain mixtures

Restricted to professional users.

Additional information

Remark

BAuA-Reg.-Nr.: N-13454

In case of use as a biocidal product: Read attached instructions before use.

Use as a biocidal product: disinfection of surfaces, materials, equipment and furniture which are not used for direct contact with food or feeding stuffs, eg medical devices.

2.3. Other hazards

Information pertaining to special dangers for human and environment

In use, may form flammable/explosive vapour-air mixture. In high concentrations may cause asphyxiation.

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 C_2H_4O

Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level. Contact with liquid may cause cold burns/frostbite.

Results of PBT and vPvB assessment

This substance does not meet the PBT/vPvB criteria of REACH, annex XIII.

SECTION 3: Composition/ information on ingredients

3.1. Substances

CAS No 75-21-8

ethylene-oxide

EC No 200-849-9

Index No 603-023-00-X

REACH registration number 01-2119432402-53

3.2. Mixtures

not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

General information

Remove contaminated soaked clothing immediately.

Adhere to personal protective measures when giving first aid.

Seek medical advice immediately.

In case of inhalation

Remove the casualty into fresh air and keep him immobile.

In the event of pulmonary irritation treat initially with corticoid spray, e.g. Ventolair- or Pulmicort- metered-dose aerosol (Ventolair and Pulmicort are registered trademarks).

Seek medical treatment immediately.

In case of respiratory standstill give artificial respiration by respiratory bag (Ambu bag) or respirator. Send for a doctor.

In case of skin contact

In case of frostbite rinse with plenty of water. Don't remove clothing.

In case of frostbite spray with lukewarm (not hot) water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.

In case of contact with skin wash off immediately and for a long time (at least 15 minutes) with plenty of water. Refer for medical treatment.

In case of eye contact

Eye rinsing with water carefully while protecting unhurt eye.

Call for a doctor immediately.

In case of ingestion

Ingestion is not considered a potential route of exposure.

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

Physician's information / possible symptoms Redness / blebs on the skin.

Coughing

Cardiac arrhythmia (disordered cardiac rhythm).

vomiting

Headache

Nausea

Physician's information / possible dangers

Risk of bullous dermatitis on exposure to vapors.

Risk of pulmonary oedema

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

Treatment (Advice to doctor) Treat symptoms.

Symptoms may not occur until several hours.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media

Foam

Dry powder

Carbon dioxide

Water spray jet

Unsuitable extinguishing media

Full water jet

5.2. Special hazards arising from the substance or mixture

In case of fire formation of dangerous gases possible.

Formation of explosive gas mixtures in air.

In the event of fire the following can be released:

Carbon monoxide (CO)

5.3. Advice for firefighters

Special protective equipment for fire-fighters

Use breathing apparatus with independent air supply (isolated). Wear full protective clothing.

Additional information

Cool endangered containers with water spray jet.

Exposure to fire may cause containers to rupture / explode.

Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur.

Extinguish any other fire.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel Remove persons to safety.

Evacuate area.

Eliminate all ignition sources if safe to do so.

Keep away sources of ignition.

For emergency responders

See chapter 8.

Personal protection by wearing close-fitting protective clothing and breathing apparatus.

6.2. Environmental precautions

If possible, stop flow of product.

Eliminate ignition sources.

Do not discharge into the drains/surface waters/groundwater.

Suppress gases/vapours/mists with water spray jet Do not

discharge into the subsoil/soil.

6.3. Methods and material for containment and cleaning up

Ensure adequate air ventilation.

Flush away residues with water.

6.4. Reference to other sections

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Informations for safe handling see chapter 7.

Informations for personal protective equipment see chapter 8.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling

Use only in thoroughly ventilated areas.

Transfer and handle only in enclosed systems.

Containers' temperature may not be increased above 50 °C.

Do not heat with open flames.

The working pressure in the receptacle must not exceed 10 bar.

Barrels and installations thoroughly earthing (grounding).

Use antistatic tools.

Treatment only in suitable rooms and systems.

Provide good room ventilation even at ground level (vapours are heavier than air).

Prevent cylinders from falling over.

Ensure valve protection device is correctly fitted.

Ensure valve outlet cap nut or plug (where provided) is correctly fitted.

Open valve slowly to avoid pressure shock.

Use only properly specified equipment which is suitable for this product, its supply pressure and temperature.

Do not allow backfeed into the container.

Suck back of water into the container must be prevented.

No water to valves, flanges and other fittings.

Purging of pipes and valves with inert gases - to avoid: water, solvents.

General protective measures

Do not inhale gases/vapours/aerosols.

Hygiene measures

At work do not eat, drink and smoke.

Wash hands before breaks and after work.

Advice on protection against fire and explosion

The product is combustible.

Because of risk of explosion avoid vapours getting into cellar, sewage system and holes. Take precautionary measures against static discharges.

Formation of explosive gas mixtures in air.

Use explosion-proof equipment / fittings and non-sparking tools.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and vessels

Keep in closed original container.

Ventilate store-rooms thoroughly.

Use transportable pressure equipment.

Suitable materials: Normalised steel and carbon steel, tempered steel, aluminium alloys, stainless steel. Valve:

Suitable materials: Brass, copper alloys, carbon steels, aluminium alloys, stainless steel.

Advice on storage compatibility

Do not store with spontaneously flammable materials.

Do not store together with combustible liquids or combustible solids.

Do not store together with animal feedstuffs.

Do not store together with explosives.

Do not store together with infectious substances.

Do not store together with radioactive material.

Do not store together with toxic liquids or toxic solids.

Do not store together with food.

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Do not store together with oxidizing liquids or oxidizing solids.

Further information on storage conditions

Ensure valve protection device is correctly fitted.
Keep container tightly closed and store at cool and aired place.
Prevent cylinders from falling over.
Protect of heat.
Storage temperature may not exceed 50°C (=122°F).
Recommended storage temperature: =< 10 °C.

7.3. Specific end use(s)

Recommendation(s) for intended use

See exposure scenario(s).
In case of use as a biocidal product: Use the product in gaseous form. Dose rates and period of time needed for the biocidal effect have to be determined in each case.
Use as a biocidal product in accordance with Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ingredients with occupational exposure limits to be monitored

CAS No	Name	Code	[mg/m ³]	[ppm]	Remark
75-21-8	Ethylene oxide	WEL, 8 hours	9.2	5	EH40, UK
75-21-8		Ethylene oxide term 5	PEL, 8 hours	1	OSHA, USA Short-
75-21-8		Ethylene oxide term 3	TLV, 8 hours	1	ACGIH, USA Short-
75-21-8		Ethylene oxide Short-term 9	REL, 8 hours 5	0.18	0.1 NIOSH, USA

Additional advice

DMEL (workers, inhalation, long-term, systemic effects): 2 mg/m³.
DMEL (workers, inhalation, short-term, systemic effects): 10 mg/m³.

8.2. Exposure controls

Respiratory protection

Keep self contained breathing apparatus readily available for emergency use.
In case of rescue and maintenance activities in storage containers use environment-independent breathing apparatus because of risk of suffocation by edging out of air oxygen
Short-term: filter apparatus, filter AX, otherwise environment-independent breathing apparatus.

Hand protection

chemical-resistant gloves
Leather gloves
Glove material specification [make/type, thickness, permeation time/life]: IIR, >= 0,7 mm, > 30 min

Eye protection safety goggles, in case of increased risk add protective face shield

Other protection measures

Safety shoes with steel toe.
Body covering work clothing, or chemical resistant suit at increased risk.

Limitation and surveillance of the environment

Ethylene oxide

C₂H₄O

PNEC (freshwater): 0,084 mg/l
 PNEC (sea water): 0,0084 mg/l / 0,84 mg/l (sporadic emission)
 PNEC (sewage treatment plant): 13 mg/l
 PNEC (freshwater sediment): 0.329 mg/kg sediment dw
 PNEC (marine water sediment): 0.0329 mg/kg sediment dw
 PNEC (soil): 0,0165 mg/kg See chapter 7.

Appropriate engineering controls

Please note: EN 1422 - Sterilizers for medical purposes - Ethylene oxide sterilizers - Requirements and test methods.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Colour	Odour
Gaseous / liquefied under pressure.	colourless	ethereal

Odour threshold
 257 - 690 ppm (470 - 1263 mg/m³)

Important health, safety and environmental information

	Value	Temperature	at	Method	Remark
pH value	not applicable				
boiling point	10,4 °C		1013 hPa		
melting point	-111 °C				
Flash point	-57 °C			DIN 51755	
Vapourisation rate	not determined				
Flammable (solid)	not applicable				
Flammability (gas)	Flammable.				
Ignition temperature	429 °C			DIN 51794	
Self ignition temperature	no				
Lower explosion limit	2,6 Vol-%				
Upper explosion limit	99,9 Vol-%				
Vapour pressure	1440 hPa	20 °C			
Relative density	0,89 g/cm ³	20 °C			liquid phase
Vapour density	1,52	20 °C	1013 hPa		air = 1
Solubility in water	multimiscible				

Ethylene oxide

C₂H₄O

	Value	Temperature	at	Method	Remark
Solubility/other					soluble in polar solvents
Partition coefficient noctanol/water (log P O/W)	-0,3	25 °C			
Decomposition temperature	ca. 560 °C				
Viscosity dynamic	0,25 mPa*s	10 °C			liquid phase

Oxidising properties

no

Explosive properties

Due to its chemical structure, the product is not classified as explosive.

9.2. Other information

Vapours are heavier than air.

SECTION 10: Stability and reactivity

10.1. Reactivity

See section "Possibility of hazardous reactions".

10.2. Chemical stability

Stable under normal conditions.

Risk of polymerisation.

10.3. Possibility of hazardous reactions

Strong exothermic reaction with acids.

Risk of polymerisation.

10.4. Conditions to avoid

Formation of explosive gas/air mixtures. Heat

sources / heat - risk of bursting.

10.5. Incompatible materials

Substances to avoid Acids.

Oxidants.

Alkalis.

Metallic oxides.

Metallic salts.

Amine.

10.6. Hazardous decomposition products

Carbon monoxide

Hydrogen

Methane **Thermal**

decomposition

Remark >= 560 °C

Ethylene oxide

C₂H₄O

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity/Irritability/Sensitization

	Value/Validation	Species	Method	Remark
LD50 acute oral	330 mg/kg	rat		
LD50 acute dermal	No data available			Study scientifically not justified.
LC50 acute inhalation	1460 ppm (4 h)	Rat (male)		
Irritability skin	irritant	rabbit		
Irritability eye	irritant	rabbit eye	24; 48 hours	
Skin sensitization	not determined			Study scientifically not justified.
Sensitization respiratory system	not determined			Study scientifically not justified.

Subacute Toxicity - Carcinogenicity

	Value	Species	Method	Validation
Subchronic Toxicity	NOAEC 10 ppm	Mouse		May cause damage to the peripheral nervous system (reduced body weight increase, loss of reflexes).
Chronic Toxicity	Subchronic toxicity (inhalation of vapours). NOAEC 10 ppm (2 a)	Rat	OECD 453	May cause damage to blood forming organs, reduced body weight increase.
Mutagenicity	Target organ toxicity, repeated exposure (inhalation of vapours).			Information on genotoxicity in vivo and in vitro available.
Reproduction-Toxicity	NOAEL 0,054 mg/l	Rat	OECD 415	No indications of toxic effects were observed in reproduction studies in animals. Inhalation

Ethylene oxide

C₂H₄O

	Value	Species	Method	Validation
Carcinogenicity	NOAEC 10 ppm (2 a)	Rat	OECD 453	Indications of carcinogenic
	(98 d) 6 h/d, 5 d/w			
	6 h/d, 5 d/w			effects are available from long-term trials. Inhalation

Specific target organ toxicity (single exposure)

May cause respiratory irritation.

Specific target organ toxicity (repeated exposure)

Causes damage to the nervous system and to blood forming organs through prolonged or repeated exposure by inhalation.

Aspiration hazard

not applicable

Toxicity test (Additional information)

In animal studies cancerogenic effects proved.

Experiences made from practice

May cause frostbite.

Gases have a suffocating effect.

SECTION 12: Ecological information

12.1. Toxicity

Ecotoxicological effects

	Value	Species	Method	Validation
Fish	LC50 84 mg/l (96 h)	Pimephales promelas	EPA 660/3-75/009	
Daphnia	EC50 212 mg/l (48 h)	Daphnia magna	EPA 660/3-75/009	
Algae	EC50 240 mg/l (96 h)	Selenastrum capricornutum		The product has not been tested. The information was derived from products of similar structure or composition.
Bacteria	EC10 130 mg/l (3 h)	activated sludge	OECD 209	

12.2. Persistence and degradability Physico-chemical

not determined **degradability**

Biological degradability	> 60 % (28 d)	OECD 301	readily degradable
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Degradability	not determined
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Ethylene oxide

C₂H₄O

12.3. Bioaccumulative potential

Because of the n-octanol/water distribution coefficient (log K_{ow}) accumulation in organisms is not expected.

12.4. Mobility in soil

high mobility

Ethylene oxide

C₂H₄O

Adsorption in the soil is not likely.

Koc: 0,51 - 0,67

12.5. Results of PBT and vPvB assessment

This substance does not meet the PBT/vPvB criteria of REACH, annex XIII.

12.6. Other adverse effects

Not known.

Behaviour in sewage plant

When low concentrations are discharged correctly into adapted biological sewage treatment plants, interference with the degradation activity of activated sludge is not likely.

General regulation

Do not allow uncontrolled leakage of product into the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste code No.

16 05 04*

Name of waste

gases in pressure containers (including halons) containing dangerous substances

Wastes marked with an asterisk are considered to be hazardous waste pursuant to Directive 2008/98/EC on hazardous waste.

Recommendations for the product

Dispose of as hazardous waste.

Recommendations for packaging

Transportable pressure equipment (empty, residual pressure): Return to supplier / manufacturer.

SECTION 14: Transport information

	ADR/RID	IMDG	IATA-DGR	
14.1. UN number	1040	1040	1040	14.6.
14.2. UN proper shipping name	ETHYLENE OXIDE	ETHYLENE OXIDE WITH NITROGEN	Ethylene oxide	
14.3. Transport hazard class(es)	2.3 (2.1)	2.3 (2.1)	2.3 (2.1)	
14.4. Packing group	-	-	-	
14.5. Environmental hazards	No	No	No	

Special precautions for user

The protective measures listed in Sections 6, 7 and 8 of the Safety Data Sheet have to be considered.

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

not applicable

No transport as bulk according IBC - Code.

Ethylamine

C₂H₇N**Land and inland navigation transport ADR/RID**

Hazard label(s) 2.3+2.1 tunnel restriction code

B/D Classification code 2TF

Marine transport IMDG

Ems: F-D, S-U

Air transport ICAO/IATA-DGR

FORBIDDEN

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**Other regulations (EU)**

Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), Annex XVII No 28 - 30.

Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products.

Regulation (EC) No 649/2012 concerning the export and import of dangerous chemicals.

Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), Annex XVII No 40.

Directive 96/82/EC on the control of major-accident hazards involving dangerous substances.

VOC standard**VOC content** >=99 % 20 °C 1440 hPa**15.2. Chemical Safety Assessment**

For this substance a chemical safety assessment has been carried out.

Exposure scenarios (ESs) see <http://www.ghc.de/media/en/downloads/expo/1400.pdf>.

SECTION 16: Other information

Recommended uses and restrictions

Use as a biocidal product in accordance with Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products.

National and local regulations concerning chemicals shall be observed.

Please note: EN 1422 - Sterilizers for medical purposes - Ethylene oxide sterilizers - Requirements and test methods.

Please note: EN ISO 11135 - Sterilization of health care products - Ethylene oxide - Requirements for the development, validation and routine control of a sterilization process for medical devices.

Further information

All declarations of safety-data-sheet refer to pure substance.

The information contained herein is based on the state of our knowledge. It characterizes the product with regard to the appropriate safety precautions. It does not represent a guarantee of the properties of the product.