

ethylene

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

1.1 Product identifier:

Product name	: ethylene
Synonyms	: ethene; ethylene, liquefied, under pressure
Registration number REACH	: 01-2119462827-27-0035 01-2119462827-27-0219
Product type REACH	: Substance/mono-constituent
CAS number	: 74-85-1
EC index number	: 601-010-00-3
EC number	: 200-815-3
RTECS number	: KU5340000
Molecular mass	: 28.05 g/mol
Formula	: C2H4

1.2 Relevant identified uses of the substance or mixture and uses advised against:

1.2.1 Relevant identified uses

Exposure scenario title	Exposure scenario group	Sector of use	Use descriptors (PROC or PC)	Use descriptors (ERC)
Distribution of substance	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 1
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 2
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 3
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 4
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 5
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6a
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6b
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6c
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6d
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 7
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 1
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 2
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 3
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 4
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 5
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6a
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6b
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6c
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6d

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Distribution of substance	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 7
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 1
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 2
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 3
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 4
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 5
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6a
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6b
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6c
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 6d
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15, PROC 9	ERC 7
Formulation & (re)packing of substances and mixtures	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 8a, PROC 8b, PROC 9, PROC 14, PROC 15	ERC 2
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 8a, PROC 8b, PROC 9, PROC 14, PROC 15	ERC 2
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 8a, PROC 8b, PROC 9, PROC 14, PROC 15	ERC 2
Functional Fluids	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 9	ERC 7
	Professional	SU 0	PROC 1, PROC 2, PROC 3, PROC 8a, PROC 9, PROC 20	ERC 9a
	Professional	SU 0	PROC 1, PROC 2, PROC 3, PROC 8a, PROC 9, PROC 20	ERC 9b
Manufacture of substance	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15	ERC 1
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15	ERC 4
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15	ERC 1
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15	ERC 4
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15	ERC 1
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15	ERC 4
Polymer processing	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 9, PROC 13, PROC 14, PROC 21	ERC 4
	Industrial	SU 10	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 9, PROC 13, PROC 14, PROC 21	ERC 4
	Industrial	SU 12	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 9, PROC 13, PROC 14, PROC 21	ERC 4
Production of polymers	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 21, PROC 9	ERC 4
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 21, PROC 9	ERC 6c
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 21, PROC 9	ERC 4

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Production of polymers	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 21, PROC 9	ERC 6c
Rubber production and processing	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 7, PROC 13, PROC 21	ERC 1
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 7, PROC 13, PROC 21	ERC 4
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 7, PROC 13, PROC 21	ERC 6d
	Industrial	SU 10	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 7, PROC 13, PROC 21	ERC 1
	Industrial	SU 10	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 7, PROC 13, PROC 21	ERC 4
	Industrial	SU 10	PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 6, PROC 8a, PROC 8b, PROC 14, PROC 7, PROC 13, PROC 21	ERC 6d
Use as an intermediate	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b	ERC 6a
	Industrial	SU 8	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b	ERC 6a
	Industrial	SU 9	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b	ERC 6a
Use in laboratories	Industrial	SU 0	PROC 10, PROC 15	ERC 2
	Industrial	SU 0	PROC 10, PROC 15	ERC 4
	Professional	SU 0	PROC 10, PROC 15	ERC 8a
Use of fuel	Consumer		PC 13	ERC 9a
	Consumer		PC 13	ERC 9b
	Industrial	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 16	ERC 7
	Professional	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 16	ERC 9a
	Professional	SU 0	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 16	ERC 9b

1.2.2 Uses advised against

Group	Uses advised against	Use descriptors (PC)	Environmental release category (ERC)
Consumer	No uses advised against		
Industrial	No uses advised against		
Professional	No uses advised against		

Group	Uses advised against	Use descriptors (PC)	Article (AC)
Consumer	No uses advised against		
Industrial	No uses advised against		
Professional	No uses advised against		

1.3 Details of the supplier of the safety data sheet:

Supplier of the safety data sheet

INEOS N.V.
Haven 1053 - Nieuwe Weg 1
B-2070 Zwijndrecht
☎ +32 3 250 91 11
✉ +32 3 252 84 33
reach.oxide.be@ineos.com

Manufacturer of the product

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INEOS C2T
Haven 1053 - Nieuwe Weg 1
B-2070 Zwijndrecht
☎ +32 3 250 91 11
📠 +32 3 252 84 33

1.4 Emergency telephone number:

24h/24h (Telephone advice: English, French, German, Dutch):
+32 14 58 45 45 (BIG)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture:

Classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

Class	Category	Hazard statements
Flam. Gas	category 1	H220: Extremely flammable gas.
Press. Gas	Liquefied gas	H280: Contains gas under pressure; may explode if heated.
STOT SE	category 3	H336: May cause drowsiness or dizziness.

2.2 Label elements:



Signal word



Danger

H-statements

H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.
H336 May cause drowsiness or dizziness.

P-statements

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P261 Avoid breathing gas.
P312 Call a POISON CENTER/doctor if you feel unwell.
P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P381 Eliminate all ignition sources if safe to do so.
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

2.3 Other hazards:

SECTION 3: Composition/information on ingredients

3.1 Substances:

Name REACH Registration No	CAS No EC No	Conc. (C)	Classification according to CLP	Note	Remark
ethylene 01-2119462827-27	74-85-1 200-815-3	>80 %	Flam. Gas 1; H220 Press. Gas - Liquefied gas; H280 STOT SE 3; H336	(1)(10)(2)	Mono-constituent

(1) For H-statements in full: see heading 16

(2) Substance with a Community workplace exposure limit

(10) Subject to restrictions of Annex XVII of Regulation (EC) No. 1907/2006

3.2 Mixtures:

Not applicable

SECTION 4: First aid measures

4.1 Description of first aid measures:

General:

Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

After inhalation:

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Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

After skin contact:

Rinse with water. Soap may be used. Take victim to a doctor if irritation persists. In case of frostbites: Wash immediately with lots of water (15 minutes) /shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

After eye contact:

Do not apply neutralizing agents. Take victim to an ophthalmologist if irritation persists. Rinse with water.

After ingestion:

Not applicable.

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

4.2.1 Acute symptoms

After inhalation:

Slight irritation. EXPOSURE TO HIGH CONCENTRATIONS: Headache. Nausea. Dizziness. Narcosis. Feeling of weakness. Rapid respiration. Accelerated heart action. Coordination disorders. Disturbances of consciousness. Respiratory difficulties. Cramps/uncontrolled muscular contractions.

After skin contact:

Frostbites.

After eye contact:

Redness of the eye tissue. Frostbites.

After ingestion:

Not applicable.

4.2.2 Delayed symptoms

If applicable and available it will be listed below.

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

If applicable and available it will be listed below.

SECTION 5: Firefighting measures

5.1 Extinguishing media:

5.1.1 Suitable extinguishing media:

Polyvalent foam. BC powder. Carbon dioxide. Dry sand. MAJOR FIRE: Water spray.

5.1.2 Unsuitable extinguishing media:

Solid water jet ineffective as extinguishing medium.

5.2 Special hazards arising from the substance or mixture:

Upon combustion: CO and CO₂ are formed. Polymerizes on exposure to temperature rise and upon a rise of pressure.

5.3 Advice for firefighters:

5.3.1 Instructions:

If no hazard for/from the surroundings: controlled burning. If hazardous substances are nearby: consider extinguishment. Extinguish only if gas supply/leak can be shut afterwards. Cool tanks/drums with water spray/remove them into safety. Physical explosion risk: extinguish/cool from behind cover. Do not move the load if exposed to heat. After cooling: persistent risk of physical explosion.

5.3.2 Special protective equipment for fire-fighters:

Insulating gloves. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus. Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Keep upwind. Close doors and windows of adjacent premises. Stop engines and no smoking. No naked flames or sparks. Spark- and explosionproof appliances and lighting equipment. Avoid ingress of water in the containers.

6.1.1 Protective equipment for non-emergency personnel

See heading 8.2

6.1.2 Protective equipment for emergency responders

Insulating gloves. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus.

Suitable protective clothing

See heading 8.2

6.2 Environmental precautions:

Contain released substance, pump into suitable containers. Plug the leak, cut off the supply. Dam up the liquid spill. Tip the container on one side to stop the leakage. Try to reduce evaporation. Prevent spreading in sewers.

6.3 Methods and material for containment and cleaning up:

Take up liquid spill into a non combustible material e.g.: sand, earth, vermiculite. Scoop absorbed substance into closing containers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

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6.4 Reference to other sections:

See heading 13.

SECTION 7: Handling and storage

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

7.1 Precautions for safe handling:

Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Observe normal hygiene standards.

7.2 Conditions for safe storage, including any incompatibilities:

7.2.1 Safe storage requirements:

Storage temperature: < 52 °C. Store in a cool area. Keep out of direct sunlight. Keep container in a well-ventilated place. Fireproof storeroom. Provide for an automatic sprinkler system. Provide for a tub to collect spills. Provide the tank with earthing. Under a shelter/in the open. Detached building. Meet the legal requirements.

7.2.2 Keep away from:

Heat sources, ignition sources, combustible materials, oxidizing agents, (strong) acids, halogens, gases.

7.2.3 Suitable packaging material:

Steel, stainless steel, monel steel, aluminium, copper, polyethylene.

7.2.4 Non suitable packaging material:

No data available

7.3 Specific end use(s):

If applicable and available, exposure scenarios are attached in annex. See information supplied by the manufacturer.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters:

8.1.1 Occupational exposure

a) Occupational exposure limit values

If limit values are applicable and available these will be listed below.

The Netherlands

Ethyleen	Time-weighted average exposure limit 8 h (Private occupational exposure limit value)	283 ppm
	Time-weighted average exposure limit 8 h (Private occupational exposure limit value)	330 mg/m ³
	Short time value (Private occupational exposure limit value)	1029 ppm
	Short time value (Private occupational exposure limit value)	1200 mg/m ³

Belgium

Ethylène	Time-weighted average exposure limit 8 h	200 ppm (A)
	Time-weighted average exposure limit 8 h	233 mg/m ³ (A)

La mention "A" signifie que l'agent libère un gaz ou une vapeur qui n'ont en eux-mêmes aucun effet physiologique mais peuvent diminuer le taux d'oxygène dans l'air. Lorsque le taux d'oxygène descend en dessous de 17-18 % (vol/vol) le manque d'oxygène provoque des suffocations qu'aucun symptôme préalable n'annonce

USA (TLV-ACGIH)

Ethylene	Time-weighted average exposure limit 8 h (TLV - Adopted Value)	200 ppm
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b) National biological limit values

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods

If applicable and available it will be listed below.

8.1.3 Applicable limit values when using the substance or mixture as intended

If limit values are applicable and available these will be listed below.

8.1.4 DNEL/PNEC values

DNEL - Workers

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Effect level (DNEL/DMEL)	Type	Value	Remark
		Not applicable	

DNEL - General population

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Effect level (DNEL/DMEL)	Type	Value	Remark
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		Not applicable	
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PNEC

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Compartments	Value	Remark
	Not applicable	

8.1.5 Control banding

If applicable and available it will be listed below.

8.2 Exposure controls:

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

8.2.1 Appropriate engineering controls

Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Measure the concentration in the air regularly. Work under local exhaust/ventilation.

8.2.2 Individual protection measures, such as personal protective equipment

Observe normal hygiene standards. Do not eat, drink or smoke during work.

a) Respiratory protection:

High vapour/gas concentration: self-contained respirator.

b) Hand protection:

Insulated gloves.

- materials (good resistance)

Butyl rubber, chlorinated polyethylene, neoprene, polyethylene, viton.

c) Eye protection:

Protective goggles.

d) Skin protection:

Protective clothing.

8.2.3 Environmental exposure controls:

See headings 6.2, 6.3 and 13

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties:

Physical form	Gas
Odour	No data available
Odour threshold	No data available
Colour	Colourless
Particle size	Not applicable
Explosion limits	2.7 - 36 vol % 31 - 390 g/m ³
Flammability	Extremely flammable gas.
Log Kow	1.13 ; 20 °C
Dynamic viscosity	Not applicable
Kinematic viscosity	Not applicable
Melting point	-169.15 °C ; 1013 hPa
Boiling point	-103.77 °C ; 1013 hPa
Flash point	No data available
Evaporation rate	No data available ; ether
Relative vapour density	No data available
Vapour pressure	2124 hPa ; -90 °C
Solubility	water ; 0.131 g/100 ml
Relative density	0.5678 ; -104 °C
Decomposition temperature	No data available
Auto-ignition temperature	450 °C ; 1013 hPa
Explosive properties	No chemical group associated with explosive properties
Oxidising properties	No chemical group associated with oxidising properties
pH	No data available

9.2 Other information:

Minimum ignition energy	0.070 mJ
Specific conductivity	< 10000 pS/m
Critical temperature	10 °C
Critical pressure	51200 hPa
Surface tension	0.016 N/m ; -104 °C

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Absolute density

600 kg/m³ ; -104 °C

SECTION 10: Stability and reactivity

10.1 Reactivity:

May build up electrostatic charges: risk of ignition. May be ignited by sparks. Gas/vapour spreads at floor level: ignition hazard. Substance has neutral reaction.

10.2 Chemical stability:

Stable under normal conditions.

10.3 Possibility of hazardous reactions:

May polymerize on exposure to some compounds: (increased) risk of fire/explosion. Reacts violently with many compounds e.g.: with (strong) oxidizers, with (some) halogens compounds and with (some) acids: (increased) risk of fire/explosion.

10.4 Conditions to avoid:

Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks.

10.5 Incompatible materials:

Combustible materials, oxidizing agents, (strong) acids, halogens, gases.

10.6 Hazardous decomposition products:

Upon combustion: CO and CO₂ are formed.

SECTION 11: Toxicological information

11.1 Information on toxicological effects:

11.1.1 Test results

- Toxicokinetics: summary

Non-human information:

Absorption: During exposure of rats by inhalation, uptake of ethylene was rapid and steady state concentrations in blood and tissues were attained within 12 hours (Guest et al., 1981; Eide et al., 1995). Approximately 15% of inhaled ethylene is absorbed, a significant proportion of that absorbed is eliminated unchanged in exhaled air; this results in a retained dose at steady state of approximately 3% (Csanady et al., 2000). At atmospheric concentrations below that which saturates metabolism, blood concentrations peak rapidly but then decline to a lower steady state concentration. This effect has also been observed with other alkenes and has been explained by a transient reduction in the activity of the enzymes responsible for metabolism (Fennel et al., 2004).

Distribution: Tissue: air partition coefficients for ethylene have been determined; with the exception of blood, values are similar in rat and human tissue. The human blood: air partition coefficient is approximately half that measured with rat blood; this is attributed to species difference in protein binding (Csanady et al., 2000). Measurements of total radioactivity (Guest et al., 1981), unchanged ethylene (Eide et al., 1995) or adducts (Eide et al., 1999; Rusyn et al., 2005; Walker et al., 2000; Wu et al., 1999) in tissues following exposure of rodents to ethylene by inhalation demonstrated distribution of ethylene or metabolites into all tissues studied.

Metabolism and adduct formation: A fraction of the systemically available ethylene can be metabolised to ethylene oxide, some of which is further metabolised by epoxide hydrolase to form ethane-1,2-diol. Approximately 50% of systemic ethylene oxide is conjugated with glutathione to form S-(2-hydroxyethyl)-glutathione (GSEO); this product has been measured in liver tissue and shown to follow a similar concentration-time profile to that of ethylene oxide (Filser, 2007). Peak blood concentrations of ethylene oxide were achieved within two hours of the start of exposure to ethylene; AUC values for ethylene oxide showed a non-linear dose response (Fennel et al., 2004). The rate of metabolism of ethylene is affected by pre-treatment with enzyme inducers or inhibitors of cytochrome P450 (Guest et al., 1981; Filser and Bolt, 1983). Values for V_{max} were 8.5, 13.7 and 0 µmol/h/kg in untreated rats and those treated with Aroclor 1254 or diethyldithiocarbamate respectively (Filser and Bolt, 1983). In rats and mice, metabolism of ethylene is saturated at exposure concentrations above 1,000 ppm (Filser and Bolt, 1983, Walker et al., 2000). The transient reduction in the activity of metabolising enzymes has been investigated and shown to result predominantly from effects on cytochrome P450 2E1 (Fennel et al., 2004).

A small, dose dependant proportion of the ethylene oxide reacts with haemoglobin or DNA to form adducts; these provide sensitive markers of exposure. Eide et al. (1995) measured the haemoglobin adduct N-(2-hydroxyethyl) valine (HEVal) in blood and the DNA adduct 7-ethylguanine in lymphocytes and liver of rats following exposure to 300 ppm ethylene for three consecutive days. A subsequent study showed the presence of low levels of the DNA adduct N7-(2-hydroxyethyl) guanine (7-HEG) in unexposed rats (Eide et al., 1999). Wu et al. (1999) determined the dose-response curves for 7-HEG concentrations in tissues from rats and mice exposed by inhalation to ethylene oxide (0-100 ppm). Background concentrations were 0.2-0.3 pmol/µmol guanine in both species and increased linearly with atmospheric concentrations. Adduct concentrations were higher in rats than mice; values in rats were 5 to 13-fold higher than in control animals while in mice the increase was only 1 to 3-fold. The authors commented that the species difference may be due to either more efficient detoxification or DNA repair in mice. At ethylene exposure concentrations above 1,000 ppm, saturation of metabolism limits the adduct concentrations in rodents, resulting in a non-linear dose-response for both HEVal and 7-HEG. Comparison of 7-HEG concentrations showed that values in rodents exposed to 40 and 3,000 ppm ethylene were similar to rats exposed to 0.7-2.3 and 6.4-23.3 ppm ethylene oxide, respectively, or mice exposed to 3.0-8.8 and 6.7-21.5 ppm ethylene oxide, respectively (Walker et al. EC number: 200-815-3 CHEMICAL SAFETY REPORT CAS number: 74-85-1 2010-06-21 CSA 25 2000). Similar comparisons by Rusyn et al. (2005) found that exposure of rats to 40 ppm ethylene resulted in 38 to 65-fold lower concentrations of 7-HEG than exposure to 100 ppm of the metabolite ethylene oxide. Following exposure of rats to 100 ppm ethylene oxide, HEVal concentrations were greater than 10-fold higher than when rats were exposed to 3,000 ppm ethylene.

Elimination: Rats exposed to [14C]-ethylene by inhalation exhaled small amounts of unchanged ethylene, along with some [14C]-CO₂. Polar metabolites and conjugates are eliminated predominantly in urine with smaller amounts in faeces (Guest et al., 1981).

Human Information: Exposure of healthy human volunteers by inhalation to initial concentrations of 5 or 50 ppm ethylene for 2 hours showed that the

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metabolism of ethylene is not saturated over this concentration range. The alveolar retention of inhaled ethylene was $2 \pm 0.8\%$ (Filser et al., 1992). Tornqvist et al. (1989) demonstrated a statistically significant increase in HEVal concentrations in fruit store workers exposed to ethylene (0.03-3.35 ppm; average 0.3 ppm) when compared to a control population. A similar effect was seen in both smokers and non-smokers, although concentrations of HEVal were higher in both control and exposed smokers than in comparable groups of non-smokers. The authors estimated that approximately 3% of atmospheric ethylene is converted to ethylene oxide by metabolism. Workers exposed occupationally to ethylene in a plastics factory were divided into groups according to their level of exposure. Concentrations of HEVal were 15 pmol/g (range 9-32) in the control group and 110 pmol/g (range 56-200) in the group exposed to approximately 4 mg/m³ (3.5 ppm) ethylene; the fraction of inhaled ethylene converted to ethylene oxide was estimated to be 0.5% (Granath et al., 1996).

Endogenous production of ethylene: Filser and Bolt (1983) identified that control rats excreted low concentrations of ethylene oxide, indicating endogenous production of ethylene. Csanady et al. (2000) determined that the rate of endogenous production of ethylene in rats was 11.5 nmol/h/kg bodyweight resulting in a steady state blood concentration of 0.57 nmol/l. The values in humans were 33 nmol/h/70kg bodyweight resulting in a steady state concentration of 0.097 nmol/l; this is similar to that resulting from occupational exposure to 0.126 ppm ethylene for 8 h/day, 5 days/week.

Acute toxicity

ethylene

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral						Not relevant, expert judgement	
Dermal						Not relevant, expert judgement	
Inhalation	LC50	Equivalent to OECD 403	> 57000 ppm	4 h	Rat (male)	Experimental value	

Conclusion

Low acute toxicity by the oral route

Low acute toxicity by the dermal route

Low acute toxicity by the inhalation route

Corrosion/irritation

ethylene

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Not relevant, expert judgement						
Skin	Not relevant, expert judgement						

Conclusion

Not classified as irritating to the skin

Not classified as irritating to the eyes

Respiratory or skin sensitisation

ethylene

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Skin	Not relevant, expert judgement						
Inhalation	Not relevant, expert judgement						

Conclusion

Not classified as sensitizing for skin

No respiratory sensitization data available

Specific target organ toxicity

ethylene

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral								Not relevant, expert judgement
Inhalation	NOAEC	OECD 413	10000 ppm		No effect	13 weeks (daily, 5 days/week)	Rat (male/female)	Experimental value

Conclusion

Low sub-chronic toxicity by the oral route

Low sub-chronic toxicity by the dermal route

Low sub-chronic toxicity by inhalation route

Reason for revision: 1.1; 1.3

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Mutagenicity (in vitro)

ethylene

Result	Method	Test substrate	Effect	Value determination
Negative	OECD 471	Bacteria (S.typhimurium)		Experimental value
Negative	OECD 473	Chinese hamster ovary (CHO)		Experimental value

Mutagenicity (in vivo)

ethylene

Result	Method	Exposure time	Test substrate	Organ	Value determination
Negative	Equivalent to OECD 474		Rat (male/female)		Experimental value
Negative	OECD 474		Rat (male)		Experimental value

Carcinogenicity

ethylene

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Organ	Effect
Inhalation	NOAEC	Equivalent to OECD 453	3445 mg/m ³ air	106 weeks (daily, 5 days/week)	Rat (male/female)	Experimental value		No effect

Reproductive toxicity

ethylene

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity	NOAEC	OECD 421	5737 mg/m ³ air	28 days (gestation, daily)	Rat (male/female)	No effect		Experimental value
Effects on fertility	NOAEC (P)	OECD 421	5000 ppm	28 day(s)	Rat (male/female)	No effect		Experimental value

Conclusion CMR

Mutagenicity and genotoxicity are not likely to be manifest

Not classified for carcinogenicity

Not classified for reprotoxic or developmental toxicity

Toxicity other effects

ethylene

No (test)data available

SECTION 12: Ecological information

12.1 Toxicity:

ethylene

	Parameter	Method	Value	Duration	Species	Test design	Fresh/salt water	Value determination
Acute toxicity fishes	LC50	ECOSAR	126.012 mg/l	96 h			Fresh water	QSAR
Acute toxicity invertebrates	LC50	ECOSAR	62.482 mg/l	48 h	Daphnia sp.		Fresh water	QSAR
Toxicity algae and other aquatic plants	EC50	ECOSAR	30.327 mg/l	96 h	Algae		Fresh water	QSAR
	EC50	OECD 201	40.5 mg/l	72 h	Pseudokirchneria subcapitata	Static system	Fresh water	Experimental value
Long-term toxicity fish	ChV	ECOSAR	12.385 mg/l	30 day(s)			Fresh water	QSAR
Long-term toxicity aquatic invertebrates	ChV	ECOSAR	6.311 mg/l		Daphnia sp.		Fresh water	QSAR

	Parameter	Method	Value	Duration	Species	Value determination
Toxicity soil macro-organisms	LC50	ECOSAR	60.037 mg/l	14 day(s)	Annelida	QSAR
Toxicity terrestrial plants	NOEC	Other	< 10 ppm	16 week(s)	Solanum tuberosum L.	Experimental value
	EC50	Other	0.1 ppm	4 h	Phaseolus vulgaris	Experimental value

Conclusion

Harmful to fishes

Reason for revision: 1.1; 1.3

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Harmful to algae

Harmful to invertebrates

Classification concerning the environment: not applicable

12.2 Persistence and degradability:

ethylene

Biodegradation water

Method	Value	Duration	Value determination
	50 %	2.9 day(s)	QSAR

Half-life soil (t1/2 soil)

Method	Value	Primary degradation/mineralisation	Value determination
Not applicable			

Conclusion

Readily biodegradable in water

12.3 Bioaccumulative potential:

ethylene

Log Kow

Method	Remark	Value	Temperature	Value determination
		1.13	20 °C	

Conclusion

Low potential for bioaccumulation (Log Kow < 4)

12.4 Mobility in soil:

Low potential for adsorption in soil

12.5 Results of PBT and vPvB assessment:

Substance does not meet the criteria of PBT, nor the criteria of vPvB according to Annex XIII of Regulation (EC) No 1907/2006, so is neither PBT nor vPvB.

12.6 Other adverse effects:

ethylene

Ozone-depleting potential (ODP)

Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009)

SECTION 13: Disposal considerations

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

13.1 Waste treatment methods:

13.1.1 Provisions relating to waste

Waste material code (Directive 2008/98/EC, Decision 2000/0532/EC).

16 05 04* (gases in pressure containers and discarded chemicals: gases in pressure containers (including halons) containing dangerous substances).

Depending on branch of industry and production process, also other waste codes may be applicable. Hazardous waste according to Regulation (EU) No 1357/2014.

13.1.2 Disposal methods

Refer to manufacturer/supplier for information on recovery/ recycling. Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Do not discharge into drains or the environment.

13.1.3 Packaging/Container

Waste material code packaging (Directive 2008/98/EC).

15 01 10* (packaging containing residues of or contaminated by dangerous substances).

SECTION 14: Transport information

Road (ADR)

14.1 UN number:

UN number	1962
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14.2 UN proper shipping name:

Proper shipping name	Ethylene
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14.3 Transport hazard class(es):

Reason for revision: 1.1; 1.3

Publication date: 2008-09-25

Date of revision: 2015-06-22

Revision number: 0101

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Hazard identification number	23
Class	2
Classification code	2F

14.4 Packing group:

Packing group	
Labels	2.1

14.5 Environmental hazards:

Environmentally hazardous substance mark	no
--	----

14.6 Special precautions for user:

Special provisions	662
Limited quantities	none.

Rail (RID)

14.1 UN number:

UN number	1962
-----------	------

14.2 UN proper shipping name:

Proper shipping name	Ethylene
----------------------	----------

14.3 Transport hazard class(es):

Hazard identification number	23
Class	2
Classification code	2F

14.4 Packing group:

Packing group	
Labels	2.1 (+13)

14.5 Environmental hazards:

Environmentally hazardous substance mark	no
--	----

14.6 Special precautions for user:

Special provisions	662
Limited quantities	none.

Inland waterways (ADN)

14.1 UN number:

UN number	1962
-----------	------

14.2 UN proper shipping name:

Proper shipping name	Ethylene
----------------------	----------

14.3 Transport hazard class(es):

Class	2
Classification code	2F

14.4 Packing group:

Packing group	
Labels	2.1

14.5 Environmental hazards:

Environmentally hazardous substance mark	no
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14.6 Special precautions for user:

Special provisions	662
Limited quantities	none.

Sea (IMDG/IMSBC)

14.1 UN number:

UN number	1962
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14.2 UN proper shipping name:

Proper shipping name	Ethylene
----------------------	----------

14.3 Transport hazard class(es):

Class	2.1
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14.4 Packing group:

Packing group	
Labels	2.1

14.5 Environmental hazards:

Marine pollutant	-
Environmentally hazardous substance mark	no

14.6 Special precautions for user:

Special provisions	
Limited quantities	none.

Reason for revision: 1.1; 1.3

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Revision number: 0101

Product number: S0539

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14.7 Transport in bulk according to Annex II of Marpol and the IBC Code:

Annex II of MARPOL 73/78	Not applicable
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Air (ICAO-TI/IATA-DGR)

14.1 UN number:

UN number	1962
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14.2 UN proper shipping name:

Proper shipping name	Ethylene
----------------------	----------

14.3 Transport hazard class(es):

Class	2.1
-------	-----

14.4 Packing group:

Packing group	
Labels	2.1

14.5 Environmental hazards:

Environmentally hazardous substance mark	no
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14.6 Special precautions for user:

Special provisions	A1
Passenger and cargo transport: limited quantities: maximum net quantity per packaging	

SECTION 15: Regulatory information

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

European legislation:

VOC content Directive 2010/75/EU

VOC content	Remark
100 %	

Plant protection products

Included in implementing Regulation (EU) No 540/2011, annex part A

European drinking water standards (Directive 98/83/EC)

ethylene

Parameter	Parametric value	Note	Reference
Pesticides	0,1 µg/l		Listed in Annex I, Part B, of Directive 98/83/EC on the quality of water intended for human consumption.
Pesticides — Total	0,5 µg/l		Listed in Annex I, Part B, of Directive 98/83/EC on the quality of water intended for human consumption.

Information exposure scenarios

Substance is classified as dangerous, but exposure scenarios are not required.

REACH Annex XVII - Restriction

Subject to restrictions of Annex XVII of Regulation (EC) No. 1907/2006: restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

	Designation of the substance, of the group of substances or of the mixture	Conditions of restriction
ethylene	Substances classified as flammable gases category 1 or 2, flammable liquids categories 1, 2 or 3, flammable solids category 1 or 2, substances and mixtures which, in contact with water, emit flammable gases, category 1, 2 or 3, pyrophoric liquids category 1 or pyrophoric solids category 1, regardless of whether they appear in Part 3 of Annex VI to that Regulation or not.	1. Shall not be used, as substance or as mixtures in aerosol dispensers where these aerosol dispensers are intended for supply to the general public for entertainment and decorative purposes such as the following: — metallic glitter intended mainly for decoration, — artificial snow and frost, — “whoopie” cushions, — silly string aerosols, — imitation excrement, — horns for parties, — decorative flakes and foams, — artificial cobwebs, — stink bombs.2. Without prejudice to the application of other Community provisions on the classification, packaging and labelling of substances, suppliers shall ensure before the placing on the market that the packaging of aerosol dispensers referred to above is marked visibly, legibly and indelibly with: “For professional users only”.3. By way of derogation, paragraphs 1 and 2 shall not apply to the aerosol dispensers referred to Article 8 (1a) of Council Directive 75/ 324/EEC.4. The aerosol dispensers referred to in paragraphs 1 and 2 shall not be placed on the market unless they conform to the requirements indicated.

National legislation The Netherlands

Waste identification (the Netherlands)	LWCA (the Netherlands): KGA category 06
Waterbezwaarlijkheid	8

Reason for revision: 1.1; 1.3

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National legislation Germany

TRGS905 - Krebserzeugend	-
TRGS905 - Erbgutverändernd	3
TRGS905 - Fruchtbarkeitsgefährdend	-
MAK - Krebserzeugend Kategorie	3B
WGK	nwg; Classification non-water polluting in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 27 July 2005 (Anhang 1)
TA-Luft	5.2.5; I
	5.2.5

National legislation France

No data available

National legislation Belgium

No data available

Other relevant data

IARC - classification	3; Ethylene
TLV - Carcinogen	Ethylene; A4

15.2 Chemical safety assessment:

A chemical safety assessment has been performed.

SECTION 16: Other information

Full text of any H-statements referred to under headings 2 and 3:

H220 Extremely flammable gas.

H280 Contains gas under pressure; may explode if heated.

H336 May cause drowsiness or dizziness.

(*) = INTERNAL CLASSIFICATION BY BIG

PBT-substances = persistent, bioaccumulative and toxic substances

CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question. Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided and cannot be held liable for any changes by third parties. This safety data sheet is only to be used within the European Union, Switzerland, Iceland, Norway and Liechtenstein. Any use outside of this area is at your own risk. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement or when this is failing the general conditions of BIG. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult the mentioned agreement/conditions for details.