

# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

## ETHYLENE (AT 150 PPM)

Version: 2.00      Revision Date: 20 June 2019      This version replaces all previous versions

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

#### 1.1 Product identifier

Product name : ETHYLENE (≥90%)  
Annex I Index number : 601-010-00-3  
CAS number : 74-85-1  
EC number : 200-815-3

**Note: This SDS refers specifically to ethylene at 150 ppm in air produced *in-situ* by the RESTRAIN generator, which limits the output of ethylene to a maximum of 150 ppm in air, when used as instructed.**

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

Relevant identified uses	:	As a Plant Growth Regulator (PGR)
Uses advised against	:	Do not use for any other purpose Do not use at concentrations above 150 ppm in air.

#### 1.3 Details of the supplier of the safety data sheet

Company : Restrain Company Ltd.  
Unit 7 The Forum,  
Minerva Business Park,  
Lynch Wood, Peterborough, PE2 6FT  
United Kingdom

Telephone : +44 (0)1733 372 526

Fax: : +44 (0)1733 237 157

Email address of person responsible for the SDS : [dirk.garos@restrain.io](mailto:dirk.garos@restrain.io)

#### 1.4 Emergency telephone number

Emergency telephone number : +44 (0)1733 372 526

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### SECTION 2: Hazards identification

#### 2.1 Classification of the substance or mixture

Ethylene at 150 ppm in air does not meet the criteria for classification in accordance with Regulation (EC) No. 1272/2008.

#### 2.2 Label elements

Not applicable for ethylene at 150 ppm in air.

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### 2.3 Other hazards

This substance/mixture is not classified as persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) according to current EU criteria.

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Not applicable.

### 3.2 Mixtures

Chemical Name	CAS-No. EC-No. Index-No.	Classification	Concentration (%)
Ethylene	74-85-1 200-815-3 601-010-00-3	Flam. Gas 1, H220; STOT SE 3, H336	0.015%

## SECTION 4: First aid measures

### 4.1 Description of first aid measures

- General Information : Remove patient to uncontaminated area wearing self-contained breathing apparatus. Keep patient warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
- Following inhalation : Remove patient to uncontaminated area wearing self-contained breathing apparatus. Keep patient warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
- Following skin contact : In case of induced frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Get medical attention.
- Following eye contact : Immediately flush eyes with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Get immediate medical assistance. If medical assistance is not immediately available, flush for an additional 15 minutes.
- Following ingestion : Ingestion is not considered a potential route of exposure.

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

At high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Patient may not be aware of asphyxiation.

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

At high concentrations, remove patient to uncontaminated area wearing self-contained breathing apparatus. Keep patient warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

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## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

Suitable extinguishing media : Extinguishing media – small fires  
Use media such as "alcohol" foam, dry chemical, water spray or carbon dioxide

Extinguishing media – large fires  
Apply water

### 5.2 Special hazards arising from the substance or mixture

Fire hazards : Extremely flammable at higher concentrations. Concentrated vapour may travel considerable distance to source of ignition and flash back. Emits toxic fumes (CO & CO<sub>2</sub>) under fire conditions. See Section 9.

Explosion hazards : May form explosive mixtures with air at higher concentrations. Vapour may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions. See Section 9.

### 5.3 Advice for firefighters

Special protective equipment for firefighters : Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

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## SECTION 6: Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions : In case of leak of high concentration ethylene:  
Refer to protective measures listed in sections 7 and 8.  
Evacuate area and keep personnel upwind.  
Shut off all sources of ignition.  
Shut off leak if there is no risk.  
Beware of vapours accumulating to form explosive concentrations.  
Pay attention to flashback.  
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

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### 6.2 Environmental precautions

Environmental precautions : Prevent further leakage if safe to do so.

### 6.3 Methods and material for containment and cleaning up

Methods for cleaning up : Ventilate area and wash leakage site after material pickup is complete.

### 6.4 Reference to other sections

Refer to protective measures listed in sections 7 and 8.

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## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

Advice on safe handling : Do not breathe concentrated gas. When using do not eat, drink or smoke. Do not get concentrated gas in eyes, on skin, on clothing. Avoid prolonged or repeated exposure. For personal protection see section 8.

### 7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Not applicable - this SDS refers specifically to ethylene produced *in-situ* by the RESTRAIN generator.

Incompatible Materials: : All electrical equipment in the application areas should be compatible with the risk of a potentially explosive atmosphere. Segregate from oxidant gases and other oxidants.

### 7.3 Specific end use(s)

Specific use(s) : As a Plant Growth Regulator (PGR)  
Recommendations: Observe instructions for use.  
Do not use at concentrations above 150 ppm in air.

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## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Occupational Exposure Limits

Component	Type	Value	Basis
Ethylene	Level Limit Value (LLV)	250 ppm; 330 mg/m <sup>3</sup>	Sweden; Occupational Exposure Limit Values, AFS 2011:18
Ethylene	Short-term value (STV)	1000 ppm; 1200 mg/m <sup>3</sup>	Sweden; Occupational Exposure Limit Values, AFS 2011:18

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Ethylene	Time Weighted Average (TWA)	10,000 ppm; 11,500 mg/m <sup>3</sup>	Switzerland OEL
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### Biological occupational exposure limits

Not applicable

### Derived No Effect Level (DNEL) according to Regulation (EC) No. 1907/2006:

Component	Type	Value
Ethylene	Worker – Acute local effects, inhalation	230 mg/m <sup>3</sup>
Ethylene	Worker – Acute systemic effects, inhalation	230 mg/m <sup>3</sup>

### Predicted No Effect Concentration (PNEC) according to Regulation (EC) No. 1907/2006:

Component	Type	Value
Ethylene	Aquatic (freshwater)	1.67 mg/l
Ethylene	Aquatic (marine water)	1.67 mg/l

## 8.2 Exposure controls

### 8.2.1 Appropriate engineering controls

Engineering controls and appropriate work processes must be used to eliminate or reduce worker and environmental exposure in the areas where the substance is used. These measures must be adequate for the extent of the actual risk. Provide adequate local exhaust ventilation. This SDS refers specifically to ethylene produced *in-situ* by the RESTRAIN generator, which limits the output of ethylene to a maximum of 150 ppm in air, when used as instructed.

### 8.2.2 Individual protection measures, such as personal protective equipment

Eye / face protection : Chemical safety goggles.

Skin protection : Hand protection

Compatible chemical-resistant gloves.

Body protection

Wear fire/flame resistant/retardant clothing.

Other skin protection

Not applicable

Respiratory protection : Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.

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Thermal hazards: : Keep away from heat/sparks/open flames/hot surfaces — No smoking.

Hygiene measures : Wash contaminated clothing before reuse. Wash thoroughly after handling.

Work practices : Use with adequate ventilation.

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### SECTION 9: Physical and chemical properties

#### 9.1 Information on basic physical and chemical properties

Appearance : Colourless gas diluted in air (maximum concentration of 150 ppm)  
Physical state of Ethylene (at 150 ppm)

#### Properties at high concentration (≥90% ethylene)

Colour : Colourless  
Odour : Faint sweet odour  
Odour threshold : Odour threshold is subjective and is inadequate to warn of over exposure  
pH : Not applicable (gas)  
Melting point : -169.15 °C  
Boiling point : -103.71 °C  
Flash point : 100 °C Method: closed cup  
Evaporation rate : Not applicable to gases and gas mixtures  
Flammability (solid, gas) : Flammable Gas  
Upper flammability limit : 34% (V)  
Lower flammability limit : 2.7% (V)  
Vapour pressure : 4.27 MPa @ 0 °C  
Relative vapour density (air =1) : 0.978  
Density : 0.0012 g/cm<sup>3</sup> @ 21°C (as vapour)  
Solubility : 0.131 g/l @ 25°C  
Partition coefficient: n-octanol/water : Log P<sub>ow</sub> = 1.13  
Auto-ignition temperature : 425 °C  
Decomposition temperature : Not known  
Viscosity  
Kinematic viscosity : 8.77E-06 m<sup>2</sup>/s (20 °C)  
Dynamic viscosity : 0.01 mPa.s (20 °C)  
Explosive properties : Explosive between 2.7% and 34% (V)  
Oxidizing properties : Not applicable

#### 9.2 Other information

Molecular weight : 28.05 g/mol

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Formula : C<sub>2</sub>H<sub>4</sub>  
Henry's Law constant : 1279 MPa (25 °C)

### SECTION 10: Stability and reactivity

#### 10.1 Reactivity

All electrical equipment in the application areas should be compatible with the risk of a potentially explosive atmosphere. Segregate from oxidant gases and other oxidants.

#### 10.2 Chemical stability

Stable under normal conditions.

#### 10.3 Possibility of hazardous reactions

At higher concentrations: can form a potentially explosive atmosphere in air. May react violently with oxidants.

#### 10.4 Conditions to avoid

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

#### 10.5 Incompatible materials

At higher concentrations: Oxidisers.

#### 10.6 Hazardous decomposition products

Under normal conditions of use, hazardous decomposition products should not be produced. Carbon monoxide and carbon dioxide are produced when ethylene combusts.

### SECTION 11: Toxicological information

#### General information

Exposure at concentrations higher than 150 ppm can cause: narcotic effect, nausea, dizziness, and headache. Ethylene vapour will act as a simple asphyxiant.

#### 11.1 Information on toxicological effects

<b>Acute toxicity – Oral</b>	
Ethylene	: Not applicable
<b>Acute toxicity – Dermal</b>	
Ethylene	: Not applicable
<b>Acute toxicity – Inhalation</b>	
Ethylene	: LC 50 (Rat, 5 h): > 12.518 mg/l
<b>Repeated dose toxicity</b>	
Ethylene	: LOAEL (Rat (Female, Male), Inhalation, 13 Weeks): 300 ppm(m) Inhalation LOAEC (Rat): 300 ppm May cause central nervous system depression.

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<b>Skin corrosion/irritation</b>	
Ethylene	: Non-irritant (based on industrial experience)
<b>Serious Eye Damage/Eye Irritation</b>	
Ethylene	: Non-irritant (based on industrial experience)
<b>Respiratory or Skin Sensitisation</b>	
Ethylene	: Not a skin sensitiser (based on industrial experience)
<b>Germ Cell Mutagenicity</b>	
Ethylene	: No evidence of significant genotoxic potential
<b>Carcinogenicity</b>	
Ethylene	: Rat NOAEC: 3003 ppm
<b>Reproductive toxicity</b>	
Ethylene	: Based on inhalation data, no effects were demonstrated in a screening study
<b>Reproductive toxicity (Fertility)</b>	
Ethylene	: Rat (OECD Guideline 421 (Reproduction / Developmental Toxicity Screening Test)) NOAEC: 5,000 ppm
<b>Developmental toxicity (Teratogenicity)</b>	
Ethylene	: Rat (OECD Guideline 421 (Reproduction / Developmental Toxicity Screening Test)) NOAEC: 5,000 ppm
<b>Specific Target Organ Toxicity - Single Exposure</b>	
Ethylene	: May cause drowsiness or dizziness.
<b>Specific Target Organ Toxicity - Repeated Exposure</b>	
Ethylene	: Based on available data, the classification criteria are not met.
<b>Aspiration Hazard</b>	
Ethylene	: Not applicable to gases and gas mixtures.

## SECTION 12: Ecological information

### 12.1 Toxicity

#### Aquatic toxicology

<b>Toxicity to fish</b>	
Ethylene	: LC 50 ( <i>Pimephales promelas</i> , 96 h): 84 mg/l
<b>Toxicity to daphnia and other aquatic invertebrates</b>	
Ethylene	: EC 50 ( <i>Daphnia magna</i> , 48 h): 53 mg/l Remarks: QSAR
<b>Toxicity to algae</b>	
Ethylene	: ErC50 ( <i>Algae Selenastrum capricornutum</i> , 72 h, static): 40 mg/l

### 12.2 Persistence and degradability

Based on the Atkinson method, the first order half-life of ethylene in air was calculated to be 1.255 days which is equivalent to 15.065 hours. Therefore, ethylene will not persist in air.

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#### 12.3 Bioaccumulative potential

Ethylene has a log  $P_{ow}$  of 1.13 and thus is not considered to be of concern with respect to bioaccumulation potential.

#### 12.4 Mobility in soil

Because of its high volatility, ethylene is distributed to the air and therefore exposure of the soil is considered to be minimal.

Henry's Law Constant (ethylene): 1279 MPa (25 °C)

#### 12.5 Results of PBT and vPvB assessment

Not classified as PBT or vPvB

#### 12.6 Other adverse effects

No available data

#### 12.7 Additional information

No available data

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### SECTION 13: Disposal considerations

#### 13.1 Waste treatment methods

Substance disposal: use the store ventilation system to exhaust the air containing 150 ppm ethylene to the outside environment. Observe all national, state, and local environmental regulations.

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### SECTION 14: Transport information (for compressed gas in steel tanks)

Not applicable - this SDS refers specifically to Ethylene at 150 ppm in air produced *in-situ* by the RESTRAIN generator. The following transport information refers to compressed gas in steel tanks.

The details in Section 14.1, 14.2, 14.3 and 14.4 are applicable to Land transport ADR/RID, Maritime transport IMDG and Air transport IATA-DGR:

#### 14.1 UN number

UN number : UN 1962

#### 14.2 UN proper shipping name

UN proper shipping name : Ethylene, compressed

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### 14.3 Transport hazard class(es)

Transport hazard class(es) : 2.1

### 14.4 Packing group

Packing group : Not applicable

### 14.5 Environmental hazards

Environmental hazards

Land transport (ADR/RID) - : No

Environmentally Hazardous : No

Maritime transport (IMDG) – : No

Marine pollutant

### 14.6 Special precautions for user

Special precautions for user : IATA – Passenger and cargo aircraft – Forbidden;  
Cargo aircraft only – Allowed.

Other Information

Inhalation Packing Group I : No

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

Transport in bulk according to : Not applicable  
Annex II of Marpol and the IBC  
Code

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## SECTION 15: Regulatory information

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

#### EU Regulations

Authorisations and/or restrictions on use : To avoid risks to human health and the environment, comply with the instructions for use on the Restrain Fuel product label.

Other EU legislation : Commission Regulation (EU) No 944/2013 of 2 October 2013 (5<sup>th</sup> ATP) amending Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures

: Regulation (EC) No 1107/2009 of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC

#### National regulations (Germany)

Wassergefährdungsklasse (water hazard class): : No hazard to waters  
ID-Number: 742  
KBwS-Decision

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### Other regulations

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.

Take note of Directive 92/85/EEC regarding maternity protection or stricter national regulations, where applicable.

Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

### 15.2 Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

## SECTION 16: Other information

### Classification of the substance (Ethylene $\geq 90\%$ )

Ethylene is classified as follows according to Regulation (EC) no. 1272/2008\*

Flammable Gas, Category 1

H220: Extremely flammable gas

Specific Target Organ Toxicity –

H336: May cause drowsiness or dizziness

Single Exposure, Category 3,

Narcosis

\*Ethylene as a pressurised gas (Press. Gas) is classified in accordance with the harmonised classification – Annex VI of Regulation (EC) No 1272/2008 (CLP Regulation); however, this SDS refers specifically to ethylene produced *in-situ* by the RESTRAIN generator which is not under pressure.

### Label elements

Labelling of ethylene ( $\geq 90\%$ ) according to Regulation (EC) No. 1272/2008:

Hazard pictograms

:



Signal word

: Danger

Hazard statements

: H220 Extremely flammable gas  
H336 May cause drowsiness or dizziness

Supplemental Hazard statements

: EUH401 To avoid risks to human health and the environment, comply with the instructions for use.

Precautionary statements

: P102 Keep out of reach of children

### Prevention:

P210 Keep away from heat/sparks/open flames/hot surfaces — No smoking

P261 Avoid breathing gas

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### Response:

P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P312 Call a POISON CENTER or doctor/physician if you feel unwell.

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

P381 Eliminate all ignition sources if safe to do so.

### Storage:

Not applicable - this SDS refers specifically to ethylene produced *in-situ* by the RESTRAIN generator.

### Disposal:

Not applicable - this SDS refers specifically to ethylene produced *in-situ* by the RESTRAIN generator.

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<b>Revision information</b>	:	Version 2.00. This version replaces all previous versions.
<b>Reason for revision</b>	:	Change in concentration of ethylene to 150 ppm in air produced <i>in-situ</i> by the RESTRAIN generator.
<b>Key literature references and sources for data</b>	:	Various sources of data have been used in the compilation of this SDS, they include but are not exclusive to: European Chemical Agency: Guidance on the Compilation of Safety Data Sheets. European Chemical Agency: Information on Registered Substances <a href="http://apps.echa.europa.eu/registered/registered-sub.aspx#search">http://apps.echa.europa.eu/registered/registered-sub.aspx#search</a> OECD SIDS Ethylene CAS No. 74-85-1 Ethylene DAR, Volume 1, December 2007 Substance specific information from suppliers. Previous version of MSDS for Ethylene (at 100ppm) Restrain Comp. Ltd. Version 1.01 30/8/2006. Details given in this document are believed to be correct at the time of publication.
<b>Full text of H-statements</b>	:	H220: Extremely flammable gas H336: May cause drowsiness or dizziness
<b>Full text of other abbreviations</b>	:	Flam. Gas : Flammable Gas STOT SE : Specific target organ toxicity - single exposure
<b>Other information</b>	:	NFPA Rating: Health – 2; Fire – 4; Instability – 2. HMIS Rating: Health – 1; Flammability – 4; Physical hazard – 3.
<b>Last revised date</b>	:	20 June 2019
<b>Warranty</b>	:	The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Restrain

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Comp. Ltd. shall not be held liable for any damage resulting from handling or from contact with the above product.