SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

- Trade name: **ETHYLENE FOR POLYMERIZATION**
- Chemical name: Ethylene
- Registration number REACH: 01-2119462827-27-0036
- UFI code: irrelevant for substances
- Index number: 601-010-00-3
- CAS number: 74-85-1
- EC number: 200-815-3

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

1.2.1. Identified uses

Monomer for the production of polymers, intermediate product for the production of chemical substances, technical gas for welding, cutting, etc., as fuel, component for the preparation of mixtures - e.g. calibration gases.
Specific intended uses are listed in subsection 7.3. and Section 16.
Industrial and professional use.

1.2.2. Non-recommended uses

There are no non-recommended uses stated in the registration. The product may not be used in any way other than that specified in point 1.2.1 or subsection 7.3.

1.3. Details of the supplier of the safety data sheet

manufacturer: ORLEN Unipetrol RPA s.r.o., Záluží 1, 436 70 Litvínov, Czech Republic
ID No.: 27597075
☎: +420 476 161 111
fax: +420 476 619 553
info@orlenunipetrol.cz
www.orlenunipetrolrpa.cz

Other contacts:

- Director of the Monomers and Chemicals Unit: ☎: +48 242 566 615; e-mail: Dorota.Smolarek@orlen.pl
- Key Account Manager: ☎: +48 691 991 378; e-mail: Marta.Rosul@orlen.pl
- Head of Customer Service Department: ☎: +420 476 162 006; Lucie.Markova@orlenunipetrol.cz
- Person professionally qualified to compile a SDS: reach.unirpa@orlenunipetrol.cz

1.4. Emergency telephone number

- ORLEN Unipetrol RPA s.r.o. ☎:+420 476 163 111 (NON STOP)
- Toxicological Information Center (TIS) ☎:+420 224 919 293 (NON STOP)
  Na bojišti 1, 120 00 Prague 2, Czech Republic ☎:+420 224 915 402 (NON STOP)
  e-mail: tis@vfn.cz
- Transport Information & Accident System (TRINS) ☎:+420 476 163 111 (NON STOP)

Note: Emergency telephone numbers for EU countries are listed in section 16.

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

The product is classified as hazardous pursuant to CLP Regulation (EC) No. 1272/2008 CLP:

(A) Refrigerated liquefied product with temperatures approx. -93 to -82°C

FLAMMABLE GAS, CATEGORY 1A	**Flam. Gas 1A, H 220**

GASES UNDER PRESSURE (REFRIGERATED LIQUEFIED GAS)	**Press. gas (Refrigerated liquefied gas), H 281**
SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE, CATEGORY 3	**STOT SE 3, H 336**

(B) Compressed liquefied product with pressure 1.2-1.4 MPa (long-distance pipelines)

FLAMMABLE GAS, CATEGORY 1A	**Flam. Gas 1A, H 220**
GASES UNDER PRESSURE (COMPRESSED GAS)	**Press. gas (Compressed gas), H 280**
SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE, CATEGORY 3	**STOT SE 3, H 336**

Note: The full text of the H-sentence and / or EUH-sentences is stated in Section 16.

2.2. Label elements

(A) Refrigerated liquefied product with temperatures approx. -93 to -82°C

Product identifiers		**ETHYLENE FOR POLYMERIZATION** ETHEN / ETHYLENE index number: 601-010-00-3
Warning hazard symbol		
Signal word		**DANGER**
H-phrases (standard hazard phrases)	H220 H281 H336	Extremely flammable gas. Contains refrigerated gas; may cause cryogenic burns or injury. May cause drowsiness or dizziness.
P-statements (precautionary statements)	P210 P243 P261 P271 P377 P381 P304+P340 P410+403	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take action to prevent static discharges. Avoid breathing gas. Use only outdoors or in a well-ventilated area. Leaking gas fire – do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Protect from sunlight. Store in a well-ventilated place.
Additional information		None
		ORLEN Unipetrol RPA s.r.o. Záluží 1, 436 70 Litvínov, Czech Republic ☎: +420 476 161 111, +420 476 163 111

(B) Compressed liquefied product with pressure 1.2-1.4 MPa (long-distance pipelines)

Product identifiers		**ETHYLENE FOR POLYMERIZATION** ETHEN / ETHYLENE index number: 601-010-00-3
Warning hazard symbol		
Signal word		**DANGER**
H-phrases (standard hazard phrases)	H220 H280 H336	Extremely flammable gas. Contains gas under pressure; may explode if heated. May cause drowsiness or dizziness.
P-statements (precautionary statements)	P210 P243 P261 P271 P377 P381 P304+P340 P410+P403	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take action to prevent static discharges. Avoid breathing gas. Use only outdoors or in a well-ventilated area. Leaking gas fire – do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Protect from sunlight. Store in a well-ventilated place.
Additional information		None
		ORLEN Unipetrol RPA s.r.o. Záluží 1, 436 70 Litvínov, Czech Republic ☎: +420 476 161 111, +420 476 163 111

2.3. Other hazards

The product is easily flammable compressed or refrigerated liquefied gas. Liquefied product vaporizes quickly and may cause frostbites. Leaked gas spreads to long distances and creates explosive mixtures with air; after the product initiation it may cause fire or explosion even far from the leak source. Ethylene displaces oxygen in the air and may cause suffocation.

Produkt does not meet the criteria for PBT (P-persistent, B-bioaccumulative, T-toxic) or vPvB (vP-very persistent, vB-very bioaccumulative) substances. Product assessments for PBT / vPvB criteria see Subsection 12.5. ("Results of PBT and vPvB assessment").

The substance is not included in the candidate list pursuant to Article 59 (Paragraph 1) of the REACH Directive (SVHC substances).

Based on the available information, the product is not identified as a PMT substance (P-persistent, M-mobile, T-toxic) or as a vPvM substance (vP-very persistent, vM-very mobile).

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Name of the substance:	ETHYLENE
Concentration [% hm.] :	min. 99.9
Index number (index):	601-010-00-3

CAS number:	74-85-1
EC number:	200-815-3

IMPURITIES	*NAME:*	*IDENTIFIER :*
The product does not contain any impurities, stabilizing additives or other components, which would have an impact on its classification.		
Note: The substance is not or not contain a nanoform.		
Note:		
Harmonized classification: Specific concentration limits (SCL), M-factor (M-) and Acute toxicity estimate (ATE) were not determined for this substance.		
Registration documentation: and Acute toxicity estimate (ATE) =LD_{50} stated in the section 11.1.; M-factor (M-) – NOEC a LC_{50} stated in the section 12.1.		

3.2. Mixtures

Not applicable, the product is a substance.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

4.1.1. General instructions

When providing first aid, ensure your own safety.
Call the emergency medical services (☎ 112 EU) and follow their instructions until they arrive.
Provision of first aid must always focus on checking for consciousness, breathing, and blood circulation. In case of loss of consciousness and breathing, check if the airway is clear (pull out the lower jaw slightly). If the airway is clear, immediately start CPR (chest compressions) and artificial respiration in a 30:2 ratio. It is also possible to perform only chest COMPRESSIONS without artificial respiration if you are not trained or if for reasons of personal safety you are unwilling to perform artificial respiration. If the subject is unconscious and breathing NORMALLY (REGULARLY), place them in the recovery position. When in doubt, if you are not sure if the person is breathing (for example, there is a long pause between breaths), act as if the person were not breathing.
If the person is unconscious or has spasms, do not administer anything by mouth, just place the person in the recovery position.
A patient's condition can improve very quickly, so never take your eyes off the patient and keep checking on consciousness and breathing.

4.1.2. When inhaled

If possible with respect to your own safety, move the victim to fresh air and make sure they do not get cold. Ensure specialized medical help.

4.1.3. Skin contact

In case of frostbite do not pull off adherent clothing and wash the place with water (not warm). Do not rub the affected area, only cover it with sterile bandage or clean piece of cloth. Ensure specialized medical help.

4.1.4. Contact with eyes

Immediately start washing eyes while wide open under flowing tepid water, continue for at least 15 minutes. If the patient has contact lenses, remove them before washing eyes. Protect unharmed eye. Ensure specialized medical help; in case of eye contact with liquefied gas immediately, as there may be serious eye damage when freezing.

4.1.5. When ingested

Consumption is not a probable way of exposure. Contact with liquefied gas may cause frostbites of lips and mouth. In such case wash your mouth with luke water and ensure specialized medical help immediately.

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

Lack of oxygen may cause exhaustion, drowsiness, weariness, dizziness, nausea, vomiting, loss of coordination, problems with attention and reasoning, and general confusion. The victim may not even notice

he is suffocating, and may fall unconscious and suffocate quickly without warning. In case of frostbite the affected areas appear pale, cold and insensitive, and may later change to red, swell, tingle, burn and hurt.

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

Immediate medical help is required in case of inhalation or eye contact with liquefied gas.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Appropriate extinguishing media: low expansion foam, spray or water fog.
Inappropriate extinguishing media: direct water stream.
Extinguishing small fire: dry-powder or carbon dioxide (CO_2) extinguisher, dry sand or extinguishing foam.

5.2. Special hazards arising from the substance or mixture

Do not fight the fire until the source of its leak is removed. If this is not possible, let the fire burn out and only use water to cool the tanks near the fire. Otherwise there is a danger of a fast reaction or explosion. The gases may spread to significant distances and in contact with a source of ignition may cause back-up with subsequent explosion and / or fire. A cold mist forms from evaporation of the liquefied product. The mist accumulates near the ground and in enclosed areas, and may cause explosion and suffocation. Tanks containing the product can explode due to heat. Burning may cause the creation of toxic fumes containing carbon monoxide and carbon dioxide. Leaked refrigerated liquefied gas may create ice, which can create obstructions in sewage and freeze vents.

5.3. Advice for firefighters

Minimize the penetration of extinguishing medium contaminated by the substance into the sewage, surface or underground waters or into the soil. There is a danger of explosion and subsequent fire in case of a leak into the sewage.
Use water spray to keep the containers cool in order to prevent an explosion caused by the heat.
Do not use foam and water at the same time because water dissolves the foam.
Water contact with cooled liquefied gas can lead to significant foaming and quick creation of gases.
Protective equipment for fire fighters: full protective gear and self-contained close-circuit breathing apparatus.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Enclose the place and prevent the access to the area in danger. Remain on the windward side. There is a danger of fire in case of accidental release of this substance, therefore remove all possible ignition sources, do not smoke and do not manipulate with open fire. If possible, ensure a sufficient ventilation of enclosed spaces. Prevent contact with the substance and its vapors. Use proper personal protective equipment (as indicated in Subsection 8.2.) when removing the effects of the emergency event/accident. Evacuate people from the whole area in danger for large accidents. There is a danger of suffocation and in case of initiation also of explosion in areas below ground and in enclosed areas (including sewage). Leaked refrigerated liquefied gas may create ice, which can create obstructions in sewage and freeze vents.

6.2. Environmental precautions

Prevent further leaking and enclose the leaking place. In the case of leak of liquefied gas, prevent its escape into the sewage system or into surface and underground water by closing sewage entrances.

6.3. Methods and material for containment and cleaning up

Leak of liquefied gas will cause quick evaporation with no efficient way of stopping it. Use a water shower to reduce the amount of gases in the air. Increase the intensity of air ventilation at the site of the leak, especially if it occurred in an enclosed area, and monitor the concentration of gases in the air.
For large leaks into water use floating barrage and collect the substance from surface using surface skimmers (separators) or cover the leaked substance with sorbent and remove saturated sorbent from the surface by scraping or draining. Consult a professional before using dispersing agents.

6.4. Reference to other

For recommended personal protective aids – see Subsection 8.2. (“Exposure controls”).

For recommended manner of removing waste – see Section 13 ("Disposal considerations").

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Adhere to all fire safety precautions (no smoking, no open fire, removal of all possible combustion sources) and stay in well-ventilated areas when manipulating with the substance and with empty tanks (may contain residue). Do not perform activities such as welding, cutting, grinding etc. near casings (even empty ones). Prevent bolts of static electricity.

Only use in technological plants which are made of suitable construction materials, can withstand the appropriate pressure and are equipped with a protective mechanism which would prevent back-flow. Ensure that the whole gas system was inspected for possible leaks before use. Use recommended personal protective measures and follow all instructions to prevent possible contact of the substance with skin, eyes and possible inhalation. When entering enclosed or non-ventilated areas always use airway protective measures.

General sanitary precautions*:* Please keep the rules of personal hygiene. Take off contaminated pieces of clothing. Do not eat, drink or smoke during work! Wash your hands and exposed parts of body thoroughly with soap and water after work and before meal and possibly treat with suitable reparation lotion. Do not wear contaminated clothing, shoes or protective equipment in the catering area.

7.2. Conditions for safe storage, including any incompatibilities

Storage must adhere to the fire safety requirements on buildings and electric equipment must adhere to valid regulations. Store in cool, well-ventilated places with efficient suction from all heat and combustion sources. Protect from direct sunlight. Storage containers must be closed, properly labeled and grounded. Recommended material for liquid phase storage: cold-rolled steel or aluminum alloys. Do not store near incompatible materials, such as oxidizers.

7.3. Specific end use(s)

Use of gaseous and liquid ethylene in accordance with the registration documentation.

The substance is intended for specific use as a monomer. Futher as intermediate product for the production of chemical substances, technical gas for welding, cutting, etc., as fuel, component for the preparation of mixtures - e.g. calibration gases.

All conditions for safe use are described directly in the relevant sections of the safety data sheet itself.

An overview of specific uses is given in section 16 of the body of the safety data sheet. Exposure scenarios are part of the annex to this Safety Data Sheet.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

8.1.1. Occupational exposure limit values

The following Permissible Exposure Limits (PELs) and Maximum Allowable Concentrations (NPK-P) of Chemicals in the Atmosphere of Workplaces within the Czech Republic are set by the Government Regulation No. 361/2007 Coll., determining conditions of occupational health protection, as amended:

Name	CAS number	PEL [mg.m^{-3}]	NPK-P [mg.m^{-3}]	Note
Ethylene	74-85-1	Limit values for the substance have not been determine.		
Decomposition products:	*NAME / CAS NUMBER:*	*PEL [mg.m^{-3}]*	*NPK-P [mg.m^{-3}]*	
	Carbon monoxide / 630-08-0	*23*	*117*	
	Carbon dioxide / 124-38-9	*9 000*	*45 000*	

Note 1: An explanation of the meaning of the PEL and NPK-P abbreviations is in section 16.
Note 2: Occupational exposure limit values for EU countries are listed in section 16.

8.1.2. DNEL/DMEL values
The DNEL / DMEL was not established because no risk to human health was identified.

8.1.3. PNEC values
PNECs were not established because no risk was identified for any of the environmental compartments. Substance is a gas and is extremely unlikely to reside in the aquatic compartment.

8.1.4. Recommended monitoring of the concentration in the workplace
Gas chromatography (GC) with a flame ionizing detector (FID) or a mass spectrometer (MS) in accordance with technical norms ČSN EN 689 and ČSN EN 482.

8.2. Exposure control

8.2.1. Technical protective measures for limiting the exposure of people and the environment
Exposure control of unwanted exposure of humans and the environment must be ensured by strictly keeping the substance under control by using process and control technologies, which reduce emissions and subsequent exposure with the goal of preventing the substance from entering the air and water systems as well as the soil, and of preventing possible human exposure. The areas where the substance is stored and manipulated must be equipped with impermeable floors and retaining tanks in case of emergency leaks. It is necessary to ensure global as well as local ventilation and efficient suction.

8.2.2. Individual protective measures
If an accident or extraordinary event causes increased exposure, employees must have access to personal protective measures (PPM) for the protection of airways, eyes, hands and skin, depending on the nature of the performed activities. Suitable protection for airways must also be available where it is not technically possible to ensure the adherence of exposition limits identified for the work environment or ensure that exposure via airways will not affect the health of people. During non-stop use of these measures during permanent work, it is necessary to include safety breaks if the nature of the PPM requires them. All PPM need to be kept in usable condition and damaged or contaminated ones need to be immediately replaced**.**

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE):
*(*the specific type of protective equipment must be chosen according to the type of activity being carried out and the quantity and concentration of the dangerous substance / mixture at the workplace)

- *Respiratory protection:* Use the insulation breathing apparatus use in case of insufficient ventilation and / or local exhaustion and product leakage;
- *Eye/face protection:* Protective chemical goggles compliant with EN 166 or protective face shield;
- *Hand protection:* Protective gloves against cold and possible frostbite;
  the follow materials protect from the chemical effects of the substance:

	Glove material	*Material thickness*	*Penetration time*
Regular work activities (staining risk)	nitrile	0.4 mm	60 minutes
Leak / accident liquidation	Viton	0.7 mm	480 minutes

- *Protection of other body parts:* Antistatic, inflammable protective clothes, antistatic shoes;
- *Thermal risk:* Not relevant for the given manner of the use.

8.2.3. Environmental exposure controls
Avoid product leakage to the environment with all available means. See section 6.2.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties
The information is taken from the registration dossier of substance (CSR) unless otherwise stated.

CHARACTERISTIC	UNIT	VALUE	SOURCE	NOTE
Physical state		Gas		at 20°C; 101,3 kPa
Colour		Colorless		
Odour		Sweet	HSDB	CSR does not specify
Odour threshold	[ppm]	260	UAKRON	
Melting point/freezing point	[°C]	-169.15		at 101,3 kPa
Boiling point or Initial boiling point / boiling range	[°C]	-103.77		at 101,3 kPa
Flammability (solid, gas, liquid)		Extremely flammable		
Upper flammability / explosive limits	[% obj]	36		
Lower flammability / explosive limits	[% obj]	2.7		
Flash point	[°C]	Irrelevant	CSR - DW	
Auto-ignition temperature	[°C]	450		at 101,3 kPa
Decomposition temperature	[°C]	Does not decompose at normal usage temperatures		CSR does not specify
pH value		Irrelevant		CSR does not specify
Kinematic viscosity	[mm^2/s]	-	CSR - DW	
Solubility in water	[$mg.l^{-1}$]	131		at 25°C
Partition coefficient: n-octanol/water	[log Kow]	1.13		at 20°C
Vapour pressure	[hPa]	2 124		at -90°C
Relative density		0.5678		at 20°C
Particle characteristics		Irrelevant		Not applicable - this is a gas.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

CHARACTERISTIC	UNIT	VALUE	SOURCE	NOTE
Explosive properties		Substance is not explosive	CSR - DW	
Oxidising properties		None	CSR - DW	

9.2.2. Other safety characteristics

CHARACTERISTIC	UNIT	VALUE	SOURCE	NOTE
Henry's constant (volatility)	Pa m^3/mol	9 910	CSR-QSAR	at 25°C
Dynamic viscosity	[µP]	10.4	CSR	at 25°C

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

No risk assuming adherence to the conditions for manipulation and storage listed in Section 7 The product can polymerize at temperatures exceeding 600°C, and in the presence of catalyzer substances the polymerization temperature can drop lower (e.g. copper allows polymerization at 400°C).

10.2. Chemical stability

The product is chemically stable assuming storage and manipulation under the conditions listed in Section 7.

10.3. Possibility of hazardous reactions

Polymerization can occur at higher temperatures. Dangerous reactions occur after contact with oxidizers.

10.4. Conditions to avoid

Ignition sources (including static energy), high temperature, sunshine.

10.5. Incompatible materials

Oxidizers.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide might be produced during heat decomposition at high temperatures.

SECTION 11: TOXIKOLOGICAL INFORMATION

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

11.1.1. Toxicological effects of the substance

HAZARD CLASS	DATA FROM REGISTRATION DOCUMENTATION		EVALUATION
	DESCRIPTION	RESULT	
Acute toxicity	1/ Oral and Dermal: 2/ Inhalation:	1/ Not feasible - the substance is a gas at room temperature (Dw/nf) 2/ No adverse effect observed (low acute toxicity) LC50 > 57 000ppm(rat, male) LC50: > 65 400 mg/m³ air	Does not meet the classification criteria
Skin corrosion/irritation		Not feasible - the substance is a gas at room temperature (Dw/nf)	Does not meet the classification criteria
Serious eye damage/irritation		Not feasible - the substance is a gas at room temperature (Dw/nf)	Does not meet the classification criteria
Sensitisation		Not feasible - the substance is a gas at room temperature (Dw/nf)	Does not meet the classification criteria
Germ cell mutagenicity	1/ in vitro: 2/ in vivo:	1/ No adverse effect observed (negative) 2/ No adverse effect observed (negative)	Does not meet the classification criteria
Carcinogenicity	1/ Oral and Dermal: 2/ Inhalation: OECD 453 (rat)	1/ No study available / No effects 2/ No adverse effect observed (NOAEC = 3 445 mg/m³ (chronic)	Does not meet the classification criteria
Reproductive toxicity	1/ OECD 421 fertility tests (all routes of exposure) 2/ developmental toxicity tests (inhalation)	1/ No effects 2/ No effects (NOAEC= 5 737 mg/m³, rat)	Does not meet the classification criteria
STOT-single exposure	1/ Oral and Dermal: 2/ Inhalation:	1/ Not feasible (Dw/nf) 2/ To 57 000 ppm no toxic effects	Does not meet the classification criteria

HAZARD CLASS	DATA FROM REGISTRATION DOCUMENTATION		EVALUATION
	DESCRIPTION	RESULT	
STOT-repeated exposure	1/ Oral and Dermal: 2/ Inhalation: OECD 413 (10 000 ppm, 13 weeks, rat):	1/ Not feasible - the substance is a gas at room temperature (Dw/nf) 2/ No effects (NOAEC=10 000 ppm / 11 473 mg/m^3, systematic effects; LOAEC=10 ppm /11.47mg/m³; local effects;)	Does not meet the classification criteria
Aspiration hazard		If swallowed and when entering into the respiratory system, does not cause lung damage or cause death	Does not meet the classification criteria

11.1.2. Information on likely routes of exposure
Inhalation is the most significant type of exposure.

11.1.3. Delayed and immediate effects as well as chronic effects from short and long-term exposure
The product displaces oxygen. Lack of oxygen may cause exhaustion, drowsiness, weariness, dizziness, nausea, vomiting, loss of coordination, problems with attention and reasoning, and general confusion. The victim may not even notice he is suffocating, and may fall unconscious and suffocate quickly without warning. Frostbites may develop from contact with cooled liquefied gas. Frostbitten areas appear pale, cold and insensitive, and may later change to red, swell, tingle, burn and hurt.
The product itself could also cause sleepiness and dizziness, however these narcotic effects only occur at very high concentrations of circa 80% volume (quivalent dose 800,000 ppm or 917,857 mg/m^3), which highly exceed the values of work exposure. This shows that ethylene is not dangerous for human health.

11.1.4. Interactive effects
There are no interactions for identified use.

11.1.5. Toxicokinetics
The product is metabolized and detoxicated very quickly after inhalation.

11.2. Information on other hazards

The substance is not included in the candidate list pursuant to Article 59 (Paragraph 1) of the REACH Directive due to the characteristics that can compromise endocrine activities or due to any other reason according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ethylene forms a gas under normal pressures and temperatures, and during toxicity testing it is technically difficult to keep its designated concentration in water, as was shown in tests performed on seaweed and algae. Thus, the results of such tests might not be relevant. For this reason the tests were replaced by the QSAR mathematical model method - ECOSAR, Target lipid model (TLM).

Substance is a gas and is extremely unlikely to reside in the aquatic or terrestrial compartment. Deriving a PNEC for a gas is unreasonable and technically of little use for risk assessment as the substance will not be present in the aquatic or terrestrial environment.

Water environment	Fish	LC_{50} (96 h) = 115 mg/l	QSAR
		EC_{10}/CnV(21 d) = 12.39 mg/l	QSAR

	Invertebrates	Short-term: LC_{50} (48 h) = 72,989 mg/l	QSAR
		Long-term: EC_{10} (16d)= 5,69 mg/l	QSAR
	Algae	EC_{50} (96 h) = 30,004 mg/l	QSAR
		EC_{10} = 8,541 mg/l	QSAR
Terrestrial environment	Soil organisms	LC_{50} (28d, earthworms) = 29,84 mg/kg sediment dw	QSAR
	Terrestrial plants	Short-term: EC50 or LC50: 48,65 mg/kg soil dw Long-term EC10/LC10 or NOEC: 9,32 ng/kg soil dw	QSAR
Microbiological activity (STP)	Activated sludge	The estimated 72-hr EL50 value for activated sludge is 1760.893 mg/L.	QSAR

Note: An explanation of the meaning of the abbreviations is in section 16.

12.2. Persistence and degradability

Biological degradability: due to the fact that ethylene forms a gas under normal temperature and pressure, standard biodegrability tests are technically difficult to perform and the results might not be relevant. The (Q)SAR method has lead to the conclusion that ethylene is well bio-degradable in water or soil.

Abiotic degradability:

- hydrolysis as a function of pH: the product is unaffected by hydrolysis (due to the lack of hydrolyzable functional groups)
- photolysis: the product is unaffected by photolysis
- atmospheric oxidation: easy decomposition is assumed via indirect photolysis in the air

12.3. Bioaccumulative potential

With regards to the fact that the value of the distribution coefficient n-octanol/water (log Kow) is lower than 3, no bioaccumulation of the product is expected.

The Bioconcentration Factor (BFC) for this substance has been estimated using the EPISUITE program and based on the methodologies developed by Arnot-Gobas et al. The estimated BCF for this substance is 0,9752 L/kg (aquatic species).

12.4. Mobility in soil

With regards to low value of the distribution coefficient n-octane/water (low Kow < 3) no sorption of the product into sediment or soil is expected.

The estimated Log Koc of this substance is 0.980; log Kow is 1,13 at 20˚C.

12.5. Results of PBT and vPvB assessment

The product does not fulfill the criteria of persistence, bioaccumulation and toxicity, or the criteria of high persistence and high bioaccumulation in accordance with Annex XIII of EC Regulation No 1907/2006 REACH, and so is not identified as a PBT substance (Persistent, Bioaccumulative, Toxic) or a vPvB (very Persistent, very Bioaccumulative) substance.

B: Ethylene has a log Kow of 1.13 and therefore it is not B/vB according to REACH regulations.

T: The information indicates that ethylene is of low toxicity to environmental receptors.

P: The results of the QSAR BioHCwin for ethylene indicate that they are expected to biodegrade rapidly, with a half-life of 2.91 days (in water and sediment).

Conclusion: Ethylene is not expected to persist in the environment because it is predicted to degrade rapidly, has a low potential for adsorption to organic matter and has a low potential for bioaccumulation. Therefore ethylene is considered to be not PMT or P/vP and not B/vB.

12.6. Endocrine disrupting properties

The substance is not included in the candidate list pursuant to Article 59 (Paragraph 1) of the REACH Directive due to the characteristics that can compromise endocrine activities or due to any other reason according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

12.7. Other adverse effects

Pursuant to Appendix 1 of the Water Act No. 254/2001 Coll., the product is not considered a hazardous and harmful substance.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

In the event that it is necessary to dispose of the rest of the product (eg unused or leaked product), the applicable European Union legislation as well as applicable national and local regulations must be observed. Dispose of waste at a waste disposal facility.

Recommended waste classification pursuant to COMMISSION DECISION of 18 December 2014, amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council:

13.1.1. Catalogue number

Gases, which are not delivered in pressurized bottles, cannot be put in waste and assigned a number in accordance with the catalogue.

13.1.2. Recommended waste removal method

Burn the unusable remainder of the product with a suitable burner equipped with protection against flame blow-back.

13.1.3. Recommended methods of contaminated containers disposal

Not relevant. The product is not packed, it is transported via piping and tank cars.

13.1.4. Measures for limiting exposure when handling waste

Never release the rest of the product to be disposed into an environment where an explosive mixture with air could form. Do not flush leaked cooled liquefied product during an emergency event or accident into sewage. Proceed in accordance with instructions provided in Section 6 („Accidental release measures“) and in Subsection 8.2 („Limiting exposure“) and adhere to all valid legal regulations for the protection of people, air and water.

WARNING: The stated information is of a recommendation character. It is related to the delivered, still unused material. Pursuant to the Waste Act all responsibilities for managing the waste, including its assignment based on its type and category, are responsibilities of the waste originator.

SECTION 14: TRANSPORT INFORMATION

Pressurized ethylene in the gas phase is transported by pipes and thus is not adjusted by regulations for land, water or air transportation of dangerous items.

Deeply refrigerated liquefied ethylene is transported by tank cars. The listed information applies to road transport (ADR) and rail (RID) transport of dangerous goods:

14.1. UN number or ID number	1038
14.2. UN proper shipping name	ETHYLENE, DEEP COOLED, LIQUID
14.3. Transport hazard class(es)	2
14.4. Packing group	not listed
14.5. Environmental hazards	the product is not harmful to the environment
14.6. Special precautions for user	none

14.7. Maritime transport in bulk according to IMO instruments: the product is not designated for bulk transport pursuant to the International Maritime Organization (IMO) documents

14.8. Other information

Hazard identification number:	223
Classification code:	3F
Labels:	2.1 + (13)*

Note: *Safety sign for displacement „move with care“ (only valid for RID)

SECTION 15: REGULATORY INFORMATION

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

15.1.1. European Union

Regulation of the European Parliament and Council (EC) No. 1907/2006 (REACH), as amended

REGISTRATION (TITLE II OF THE REACH REGULATION)

the product was fully registered as a substance

AUTORISATION (TITLE VII OF THE REACH REGULATION)

the product is not listed in the list of substances in Annex XIV of EC Regulation No 1907/2006 REACH, and so no licensing obligation applies

RESTRICTION (TITLE VIII OF THE REACH REGULATION)

the product shall not be used in aerosol dispensers for amusement and decorative purposes intended for sale to the public(annex XVII, point 40)

Regulation of the European Parliament and Council (EC) No. 1272/2008 (CLP), as amended

the product has been classified in compliance with the stated regulation, packaging and labeling obligations of dangerous chemicals only apply to the product if it is marketed in packaging subject to its labelling according to CLP regulation

Regulation of the European Parliament and Council (EC) No. 649/2012 on the export and import of dangerous chemicals, as amended

the product is not subject to special import or export restrictions

Commission decision 2014/955/EU of 18 December 2014, amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council

EP and Council Regulation (EC) No. 2019/1148 (explosives precursors), as amended

Annex I - EXPLOSIVES PRECURSORS SUBJECT TO RESTRICTIONS - *Substance not contained.*

Annex II - EXPLOSIVE PRECURSORS SUBJECT TO NOTIFICATION - *Substance not contained.*

The Seveso III Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances – *product listed*

15.1.2. Czech Republic

Act No. 350/2011 Coll. on Chemical Substances and Chemical Mixtures, as amended

the product is not subject to the obligation of notification to the PCN (Poison centres notification)

Act No. 258/2000 Coll. on the Protection of Public Health, as amended

Act No. 254/2001 Coll., on Water, as amended

Act No. 201/2012 Coll., on Air Protection, as amended

Act No. 541/2020 Coll., on Waste, as amended

Regulation No. 8/2021 Coll., on the Waste Catalogue and on Assessing Waste Characteristics, as amended

Governmental decree no. 361/2007 Coll., laying down occupational health and safety conditions

product has no exposure limit; the product is not subject to the obligation to establish a controlled zone

Act no. 224/2015 Coll., on prevention of serious accidents caused by selected dangerous chemical substances or mixtures

15.2. Chemical safety assessment

Chemical safety assessment was performed when the substance was registered. The substance fulfils the criteria for classification as dangerous in accordance with EC Regulation No 1272/2008 CLP for physicochemical properties but does not meet the criteria for classification as a dangerous for human health and the environment, is not carcinogenic, mutagenic or toxic for reproduction (CMR), and is not identified as a PBT or vPvB substance.

Information on the safe handling of the substance is incorporated into the body of the safety data sheet (section 1-16) or listed in Article 9.0.4. attachments – Exposure scenarios.

An exposure assessment and a subsequent risk characterization step were performed. Exposure scenarios according to Article 31 of the European Parliament and Council Regulation (EC) No. 1907/2006 (REACH) are attached to the safety data sheet.

SECTION 16: OTHER INFORMATION

Changes adopted as a part of the revision process

30/11/2021: Revision (10): – Overall modification of the document in relation to the update of Appendix II of Directive (EC) No. 1907/2006 REACH, by Directive of the Council (EC) No. 2020/878;
Data modification in Sections 13 and 15 - update of the legal regulations;
Data modification in Section 1 – change of the company name;

22/ 04/2024: Revize (11): Overall modification of the document in connection with the update of the Safety Report (CSR) and replacement of the annex – Exposure scenarios;

10/ 07/2025: Revize (12): Overall modification of the document in connection with the update of the Safety Report (CSR) and replacement of the annex – Exposure scenarios;

Acronyms and abbreviations used in the text

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
CAS	Registration number assigned to the substance by the Chemical Abstracts Service of the American Chemical Society
CLP	EU Directive No. 1272/2008 on Classification, Labeling and Packaging of chemical substances and mixtures, which is implemented into the European legislature by the means of GHS (United Nations´ Globally harmonized System) for classifying and labeling chemical substances
CMR	Carcinogenic, mutagenic or toxic for reproduction
ČSN EN (ISO)	European standard incorporated into the Czech technical standards
CSR	Chemical Safety Report
DMEL	Derived minimal effect level - an exposure level that corresponds to a low and possibly theoretical risk, which should be considered as an acceptable risk (for threshholdless effects, i.e. there is no exposure level without effect)
DNEL	Derived no-effect level - level of exposure derived from toxicological data that does not produce any adverse effects on human health
DW	Data waiving
EC_{50}	Effective concentration EC_{50} is the concentration of substance that causes immobilization of 50% of individuals
ErC_{50}	Effective concentration EC_{50} is the concentration of substance that causes 50 % decrease of Algea growth
ECHA	European Chemicals Agency
ES	Official number of the chemical substance in the European Union: EINECS from the European Inventory of Existing Commercial Substances, or ELINCS from the European List of Notified Chemical Substances, or NLP from the No Longer Polymer list
HSDB	Hazardous Substances Data Bank
IATA	International Air Transport Association
IBC	Intermediate Bulk Container
IC_{50}	Inhibition concentration IC_{50} that causes inhibition of 50% of individuals
ICAO	International Civil Aviation Organization
ICE	"Intervention in Chemical Transport Emergencies" system providing both professional and practical assistance in dealing with emergency situations related to the transport and storage of hazardous chemicals
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organisation
ISO	International Organization for Standardization
LC_{50}/LD_{50}	Lethal concentration/level is the concentration/level of substance that causes mortality of 50 % individuals
LOEC/LOEL	Lowest Observed Effect Concentration/Level
log Kow	Logarithm of distribution coefficient n-octanol/water
nf	Not feasible
NOAEC/NOAEL	No Observed Adverse Effect Concentration/No Observed Adverse Effect Level

NOEC/NOEL	No Observed Effect Concentration/No Observed Effect Level
NPK-P	The highest permitted concentration of the chemical substance in the air (the concentration of the substance that a worker may be exposed to for a maximum of 15 minutes but which must never be exceeded)
OECD	Organization for Economic Co-operation and Development
OOP	Recommended personal protective aids
OSN	United Nations
(Q)SAR	Quantitative Structure-Activity Relationship
PBT, vPvB	Persistent, bioaccumulative and toxic; high persistent and high bioaccumulative
PCN	Poison Centres Notification – international system for the notification of dangerous mixtures
PEL	Permitted exposure limit of the chemical substance in the air (the exposure value that an employee may be exposed to during the entire working shift (8 hours), without endangering his health during lifetime occupational exposure)
PMT, vPvM	Persistent, mobile and toxic, very persistent and very mobile
PNEC	Predicted No Effect Concentration
REACH	EU Directive No. 1907/2006 on Registration, Evaluation and Authorization of Chemicals
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
STOT	Specific Target Organ Toxicity
STP	Sewage treatment plant
su	Scientifically Unjustified
TRINS	Transport Information and Accident System of the Czech Republic, providing professional and practical assistance in dealing with emergency situations related to transport and storage of hazardous chemical substances, included in ICE
UACRON	Chemical database (The University of Akron).
UFI code	Unique identifier of the composition of the product containing the dangerous mixture (s).
UN	The four-digit identification number of the substance or object identifying hazardous material in international transport
UVCB	Substances of Unknown or Variable composition, Complex reaction products or Biological materials

Data sources used for preparing the material safety sheet

Annexes I, IV, VI and VII to Regulation (EC) No. 1272/2008 CLP, as amended;
Principles for providing first aid upon being exposed to chemical substances;
Substance registration documentation pursuant to Regulation (EC) No. 1907/2006 REACH;
Decision of the European Chemicals Agency (ECHA) No. SUB-D-2114129354-54-01/F on registration pursuant to Directive (EC) No. 1907/2006 REACH;
Research data sources (Hazardous Substances Data Bank HSDB, University of Akron Chemical UAKRON, Hygienické limity Gestis);

Full text of H-/ EUH-sentences and abbreviations of hazard classes stated in Section 2 and/or 3

H 220	Extremely flammable gas.
H 280	Contains gas under pressure; may explode if heated.
H 281	Contains refrigerated gas; may cause cryogenic burns or injury.
H 336	May cause drowsiness or dizziness.
Flam. Gas.	Flammable gas
Press Gas	Gases under pressure
STOT SE	Specific target organ toxicity — single exposure

Identified uses (Exposure scenarios)

ES1 (M-1)	Manufacture of substance
ES2 (F-1)	Formulation & (re)packing of substances and mixtures
ES3 (IW-1)	Use as an intermediate
ES4 (IW-2)	Use in process chemicals

ES5 (IW-3)	Use in fuel
ES6 (IW-4)	Use in functional fluids
ES7 (IW-5)	Use in laboratories
ES8 (IW-6)	Use in polymer processing
ES9 (IW-7)	Use in polymer production
ES10 (PW-1)	Use in agrochemicals
ES11 (PW-2)	Use in fuel
ES12 (PW-3)	Use in laboratories
ES13 (PW-4)	Use in polymer processing

Training instructions

Persons handling the product must be advised of the risks involved in handling the product and the health and environmental protection requirements (see applicable provisions of the Labor Code).

Access to information

Pursuant to Article 35 of Directive (EC) No. 1907/2006 REACH, every employer is obliged to allow access to the information stated on the given material safety sheet to all workers who use this product or are exposed to its impacts while working, and also to representatives of these workers.

Occupational exposure limit values for EU countries (see point 8.1.1.)

data for ethylene (number CAS 74-85-1)

	8-hour limit [mg.m^{-3}]	Short-term limit [mg.m^{-3}]
European Union (Regulation No. 2000/39/EC)	not specified	not specified
Belgium	233(1)	not specified
Italy	not specified	not specified
Germany	not specified	not specified
Slovakia	not specified	not specified
France	not specified	not specified
Spain	not specified	not specified
Sweden	330	1200
Great Britain	not specified	not specified
Latvia	100	not specified
Switzerland	11 500	not specified

8-hour limit: *Measured or calculated in relation to the 8-hour reference period as a timely weighted average*
Short-term limit: *Exposure limit value, which shall not be exceeded and which corresponds to a 15-minute period*

(1) *This agent releases gas or vapor which has no physiological effect but lowers the oxygen content in the air. When the oxygen content is below 17-18% (vol/vol) it causes suffocation without a warning preceding it.*

Emergency telephone number for EU countries (see subsection 1.4.)

National Centers		TELEFONE	LANGUAGE	Institution / website / email
Belgium		☎+070245245	German	http://www.poisoncentre.be Centre Antipoisons, c/o Hôpital Militaire Reine Astrid Rue Bruyn 1, 1120 Bruxelles
Czech Republic		☎+420/224-919293; 915402	Czech	http://www.tis-cz.cz Toxikologické informační středisko (TIS) Na bojišti 1, 120 00 Praha 2 e-mail: tis@vfn.cz
France – Orfila (INRS)		☎+33/0145425959	French	"Centres Antipoison et de Toxicovigilance (CapTv) Hôpital Fernand Widal" 200 rue du Faubourg Saint Denis 75010 PARIS viviane.damboise@lrb.aphp.fr
France - Angers		☎+33/241482121	French	http://www.centres-antipoison.net/angers/index.html
France - Bordeaux		☎+33/556964080	French	http://www.centres-antipoison.net/bordeaux/index.html
France - Lille		☎+33/0800595959	French	http://www.centres-antipoison.net/lille/index.html

National Centers	TELEFONE	LANGUAGE	Institution / website / email
France - Lyon	☎+33/472116911	French	http://www.centres-antipoison.net/lyon/index.html
France - Marseille	☎+33/491752525	French	http://www.centres-antipoison.net/marseille/index.html
France - Nancy	☎+33/383225050	French	http://www.centres-antipoison.net/nancy/index.html
France - Paris	☎+33/140054848	French	http://www.centres-antipoison.net/paris/index.html
France - Strasbourg	☎+33/388373737	French	http://www.centres-antipoison.net/strasbourg/index.html
France - Toulouse	☎+33/561777447	French	http://www.centres-antipoison.net/toulouse/index.html
Ireland	☎+353/18092166	English	http://www.poisons.ie/Public
Italy - Bergamo	☎+39/800883300	Italian	Istituto Superiore di sanitá – Preparati Pericolosi
Italy - Firenze	☎+39/0557947819	Italian	
Italy - Milano	☎+39/02-66101029	Italian	
Italy - Pavia	☎+39/0382-24444	Italian	
Italy - Napoli	☎+39/081-5453333	Italian	
Italy - Foggia	☎+39/800183459	Italian	
Italy - Verona	☎+39/800011858	Italian	
Italy - Roma	☎+39/06-49978000, ☎+39/06-3054343	Italian	
Germany	☎+49/112, ☎+49/116117	German	
Germany - Berlin	☎+49/3019240	German	https://giftnotruf.charite.de
Germany - Bonn	☎+49/22819240	German	http://www.gizbonn.de/index.php?id=272
Germany - Erfurt	☎+49/361730730	German	https://www.ggiz-erfurt.de/home.html
Germany - Freiburg	☎+49/076119240	German	https://www.uniklinik-freiburg.de/giftberatung.html
Germany - Göttingen	☎+49/55119240	German	https://www.giz-nord.de/cms/index.php
Germany – Homburg/Saar	☎+49/684119240	German	http://www.uniklinikum-saarland.de/de/einrichtungen/kliniken_institute/kinder_und_jugendmedizin/informations_und_behandlungszentrum_fuer_vergiftungen_des_saarlandes
Germany – Mainz	☎+49/613119240	German	http://www.giftinfo.uni-mainz.de/index.php?id=24807
Germany - München	☎+49/8919240	German	http://www.toxinfo.med.tum.de
Netherlands	☎+31/302748888	Dutch	http://www.productnotification.nl/
Poland - Kraków	☎+48/124119999	Polish	http://www.oit.cm.uj.edu.pl
Poland – Gdansk	☎+48/586820404	Polish	http://www.pctox.pl/news.php
Poland – Poznaň	☎+48/618476946	Polish	http://www.raszeja.poznan.pl/oddzialy/oddzialtoksykologiczny
Poland - Warszawa	☎+48/607218174	Polish	okzit@burdpi.pol.pl
Austria	☎+43/14064343	German	Austrian Poison Information Centre (Vergiftungsinformationszentrale-VIZ)
Slovakia	☎+421/254652307	Slovak	http://www.ntic.sk
Spain	☎+34/915620420	Spanish	Servicio de Información Toxicológica (SIT) Instituto Nacional de Toxicología y Ciencias Forenses (INTCF) C/José Echegaray nº4, 28232 Las Rozas de Madrid Madrid sit@mju.es / intcf@justicia.es

Prohlášení: *The material safety sheet has been prepared in compliance with Directive (EC) No. 1907/2006 REACH. It includes data that are necessary for securing occupational health and safety and the protection of the environment. These data have been provided in good faith, correspond to the current state of knowledge and experience and are in accordance with our valid legal regulations The data provided does not replace the quality specification and can not be considered as a guarantee of the suitability and usability of this product for a specific application. It is the responsibility of the product user to assess the accuracy of the information in a particular application where the product's properties can influence different factors. The consumer is responsible for compliance with the appropriate, regionally valid legal regulations.*

ANNEX OF MATERIAL SAFETY DATA SHEET

EXPOSURE SCENARIOS ACCORDING TO ARTICLE 31 OF REGULATION (EC) NO 1907/2006 (REACH) OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

The Annex contains exposure scenarios contained in **Chapter 9** of the chemical safety report dated 15.4.2025 (**numbering from CSR is maintained here below**) for identified uses of the substance generated by Chesar v3.8.

9.0.3. Introduction to the assessment for the environment

9.0.3.1. Tonnage

Assessed tonnage: 1.79E7 tonnes/year based on:

- 1.5E7 tonnes/year manufactured
- 2.96E6 tonnes/year imported
- 6.54E4 tonnes/year directly exported

The following table provides the tonnage per use and the local tonnages used in the assessment for each environmental contributing activity. The local tonnage corresponds to a tonnage at the site for uses taking place at industrial sites and to a tonnage assumed for a town of 10 000 inhabitants for widespread uses.

Table 9.1. Tonnage for assessment

ES#	Exposure scenario (ES) name and related environmental contributing scenarios	Tonnage per use (t/year)	Daily local tonnage (t/day)	Annual local tonnage (t/year)
ES1 (M)	Manufacture of substance	1.5E7		
	- Manufacture of the substance (ERC 1)		2E3	6E5
ES2 (F)	Formulation & (re)packing of substances and mixtures	1.89E6		
	- Formulation into mixture (ERC 2)		100	3E4
ES3 (IS)	Use as an intermediate	2.38E6		

ES#	Exposure scenario (ES) name and related environmental contributing scenarios	Tonnage per use (t/year)	Daily local tonnage (t/day)	Annual local tonnage (t/year)
	- Use as an intermediate (ERC 6a)		50	1.5E4
ES4 (IS)	Use in process chemicals	8.5E4		
	- Use in process chemicals (ERC 4)		50	1.5E4
ES5 (IS)	Use in fuel	9.07E4		
	- Use of functional fluid at industrial site (ERC 7)		5E3	9.07E4
ES6 (IS)	Use in functional fluids	7.28E4		
	- Use of functional fluid at industrial site (ERC 7)		0.5	10
ES7 (IS)	Use in laboratories	7.1E4		
	- Use of non-reactive processing aid at industrial site (no inclusion into or onto article) (ERC 4)		50	1.5E4
ES8 (IS)	Use in polymer processing	4.17E5		
	- Use of non-reactive processing aid at industrial site (no inclusion into or onto article) (ERC 4)		50	1.5E4
ES9 (IS)	Use in polymer production	9.15E6		
	- Polymer Production (ERC 6c)		3.05E3	9.15E5
ES10 (PW)	Use in agrochemicals	200		
	- Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor) (ERC 8d)		2.74E-5	-
ES11 (PW)	Use in fuel	9.05E4		
	- Widespread use of functional fluid (outdoor) (ERC 9b)		1.37E-5	-
ES12 (PW)	Use in laboratories	7.08E4		
	- Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor) (ERC 8a)		9.7E-3	-
ES13 (PW)	Use in polymer processing	1.61E5		
	- Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor) (ERC 8d)		0.022	-

9.0.3.2. Scope and type of assessment for the environment

Exposure assessment and risk characterisation are not required for the environment as no hazard has been identified for the environment.

9.0.3.3. Fate and distribution parameters

Physicochemical properties used for exposure estimation

The following substance properties are used in the fate estimation done by EUSES.

Table 9.2. Substance key phys-chem and fate properties

Substance property	Value
Molecular weight	>= 28.05

Substance property	Value
Molecular weight used for the assessment	28.05
Melting point at 101 325 Pa	-169. °C
Vapour pressure	212.4 kPa at -90 °C
Partition coefficient (Log Kow)	1.13 at 20 °C
Water solubility	131 mg/L at 25 °C
Henry's law constant (in Pa m3/mol)	9.91E3 at 25 °C
Biodegradation in water: screening tests	readily biodegradable
Bioaccumulation: BCF (aquatic species)	0.975 L/kg ww
Adsorption/Desorption: Koc at 20 °C	13.22

Caution: The exposure estimates have been obtained with EUSES although the following parameter(s) is/are outside the boundaries of the EUSES model:

- Bioaccumulation: BCF (aquatic species)
- Melting point at 101 325 Pa
- Molecular weight used for the assessment

Fate (release percentage) in the modelled biological sewage treatment plant

In a standard (modelled) biological STP, the emissions are distributed in the following way:

Release to water	3.817 %
Release to air	64.49 %
Release to sludge	0.119 %
Release degraded	31.57 %

The above fractions are calculated by the SIMPLETREAT model integrated in EUSES.

9.0.3.4. Comments on assessment approach for the environment

The local Predicted Exposure Concentrations (PECs) reported for each contributing scenario correspond to the sum of the local concentrations (Clocal) and the regional concentrations (PEC regional).

9.0.3.5. Scope and type of assessment for man via environment

Exposure assessment and risk characterisation are not required for man via the environment as no hazard has been identified for long term systemic effects.

9.0.4. Introduction to the assessment for workers

9.0.4.1. Scope and type of assessment for workers

Exposure assessment and risk characterisation are not required for workers as no hazard has been identified for human health.

9.0.4.2. Comments on assessment approach for workers

General information on risk management related to toxicological hazard:

INHALATION HAZARD (H336)

This qualitative Chemical Safety Assessment (CSA) approach aims to reduce/avoid contact when there is no basis for setting a DNEL or DMEL for a certain human health adverse effect, i.e. when the available data for this adverse effect do not provide quantitative dose-response information, but there exist toxicity data appropriate to allow a qualitative risk characterisation.

This general qualitative risk assessment approach aims to reduce/avoid contact or incidents with the substance. Implementation of the following RMMs and operational conditions will ensure that the likelihood of an event occurring due to the hazard of the substance is negligible, and the risk is considered to be controlled to a level of no concern. The substance is classified as H336 (inhalation). The following RMMs and operational conditions would ensure minimal risk for each of the respective hazards.

- INHALATION HAZARD (H336) - Avoid breathing dust/fume/ gas/mist/vapours/spray. Ensure area is well ventilated.

For inhalation hazard RMMs for good ventilation were implemented as part of the exposure assessment.

General information on risk management related to physicochemical hazard:

QUALITATIVE RISK ASSESSMENT OF RISK FROM FLAMMABLE GASES (H220)

For flammability a qualitative risk assessment was conducted and handling and storage risk management measures that are generally identified for flammability risks are outlined above. A review of these RMMs indicates that if the user complies with the following generic statement, risks due to flammability are considered to be controlled: "Risks are controlled by storage and use under conditions which avoid ignition sources."

9.0.5. Introduction to the assessment for consumers

Exposure assessment is not applicable as there are no consumer-related uses for the substance.

Exposure assessment and risk characterisation for workers (industrial and professional) and environment are not required (see scope under 9.0.3. and 9.0.4.) for the following exposure scenarios (ES) including all contributing scenarios (Env CS and Worker CS):

9.1. Exposure scenario 1: Manufacture – Manufacture of substance

Environment contributing scenario(s):			**SPERC**
CS 1	Manufacture of the substance	ERC 1	ESVOC SPERC 1.1.v2
Worker contributing scenario(s):			**SWED**
CS 2	General exposures (closed systems)	PROC 1	
CS 3	General exposures (closed systems); With sample collection	PROC 2	
CS 4	General exposures (closed systems); Batch process	PROC 3	
CS 5	General exposures	PROC 4	
CS 6	Process sampling	PROC 9	
CS 7	Laboratory activities	PROC 15	
CS 8	Bulk transfers; Closed systems	PROC 8b	
CS 9	Bulk transfers	PROC 8b	
CS 10	Bulk transfers	PROC 8b	
CS 11	Equipment cleaning and maintenance	**PROC 8a**, PROC 28	
CS 12	Storage	PROC 1	
CS 13	Storage	PROC 2	

Further description of the use:

Manufacture of the substance. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities [GES1_I].

9.2. Exposure scenario 2: Formulation or re-packing - Formulation & (re)packing of substances and mixtures

Environment contributing scenario(s):			**SPERC**
CS 1	Formulation into mixture	ERC 2	ESVOC SPERC 2.2.v2
Worker contributing scenario(s):			**SWED**
CS 2	General exposures (closed systems)	PROC 1	
CS 3	General exposures (closed systems); With sample collection	PROC 2	
CS 4	General exposures (closed systems); Batch process	PROC 3	
CS 5	General exposures	PROC 4	
CS 6	Batch process; Elevated temperature; Use in contained systems	PROC 3	
CS 7	Process sampling	PROC 9	
CS 8	Laboratory activities	PROC 15	
CS 9	Bulk transfers; Dedicated facility	PROC 8b	
CS 10	Mixing operations	PROC 5	
CS 11	Manual; Transfer from/pouring from containers; Non-dedicated facility	PROC 8a	
CS 12	Drum/batch transfers; Dedicated facility	PROC 8b	
CS 13	Tabletting, compression, extrusion or pelletisation	PROC 14	
CS 14	Drum and small package filling	PROC 9	
CS 15	Equipment cleaning and maintenance	**PROC 8a**, PROC 28	
CS 16	Storage	PROC 1	
CS 17	Storage	PROC 2	

Further description of the use:

Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities [GES2_I]

9.3. Exposure scenario 3: Use at industrial sites - Use as an intermediate

Environment contributing scenario(s):			**SPERC**
CS 1	Use as an intermediate	ERC 6a	ESVOC SPERC 6.1a.v2
Worker contributing scenario(s):			**SWED**
CS 2	General exposures (closed systems)	PROC 1	
CS 3	General exposures (closed systems); With sample collection	PROC 2	

CS 4	General exposures (closed systems); Batch process	PROC 3
CS 5	General exposures	PROC 4
CS 6	Process sampling	PROC 9
CS 7	Laboratory activities	PROC 15
CS 8	Bulk transfers; Closed systems	PROC 8b
CS 9	Bulk transfers	PROC 8b
CS 10	Bulk transfers	PROC 8b
CS 11	Equipment cleaning and maintenance	**PROC 8a**, PROC 28
CS 12	Storage	PROC 1
CS 13	Storage	PROC 2

Further description of the use:

This exposure scenario is for the use of the substance as an intermediate (not related to Strictly Controlled Conditions). It includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container). [GES1B_I]

9.4. Exposure scenario 4: Use at industrial sites - Use in process chemicals

Product category used: PC 40: Extraction agents

Environment contributing scenario(s):			**SPERC**
CS 1	Use in process chemicals	ERC 4	ESVOC SPERC 4.1.v2
Worker contributing scenario(s):			**SWED**
CS 2	General exposures (closed systems)	PROC 1	
CS 3	General exposures (closed systems); With sample collection	PROC 2	
CS 4	General exposures (closed systems); Batch process	PROC 3	
CS 5	General exposures	PROC 4	
CS 6	Process sampling	PROC 9	
CS 7	Laboratory activities	PROC 15	
CS 8	Bulk transfers; Closed systems	PROC 8b	
CS 9	Bulk transfers	PROC 8b	
CS 10	Bulk transfers	PROC 8b	
CS 11	Equipment cleaning and maintenance	**PROC 8a**, PROC 28	
CS 12	Storage	PROC 1	
CS 13	Storage	PROC 2	

Further description of the use:

Covers the use in process chemicals or extraction agents. Includes recycling/ recovery, material transfers, storage, maintenance, sampling and associated laboratory activities.

9.5. Exposure scenario 5: Use at industrial sites - Use in fuel

Product category used: PC 13: Fuels

Environment contributing scenario(s):			**SPERC**
CS 1	Use of functional fluid at industrial site	ERC 7	ESVOC SPERC 7.12a.v3
Worker contributing scenario(s):			**SWED**
CS 2	Bulk transfers; Dedicated facility	PROC 8b	
CS 3	Drum/batch transfers; Dedicated facility	PROC 8b	
CS 4	General exposures (closed systems)	PROC 1	
CS 5	General exposures (closed systems); With sample collection	PROC 2	
CS 6	Use of fuels; Closed systems	PROC 16	
CS 7	Equipment cleaning and maintenance	**PROC 8a**, PROC 28	
CS 8	Storage	PROC 1	
CS 9	Storage	PROC 2	

Further description of the use:

Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste [GES12_I].

9.6. Exposure scenario 6: Use at industrial sites - Use in functional fluids

Product category used: PC 16: Heat Transfer Fluids

Environment contributing scenario(s):			**SPERC**
CS 1	Use of functional fluid at industrial site	ERC 7	ESVOC SPERC 7.13a.v2
Worker contributing scenario(s):			**SWED**
CS 2	Bulk transfers; Closed systems	PROC 1	
CS 3	Bulk transfers; Closed systems	PROC 2	
CS 4	Drum/batch transfers; Dedicated facility	PROC 8b	
CS 5	Filling of articles/equipment; Closed systems	PROC 9	
CS 6	Filling of equipment from drums or containers; Non-dedicated facility	PROC 8a	
CS 7	General exposures (closed systems); With sample collection	PROC 2	
CS 8	General exposures (closed systems); Batch process	PROC 3	
CS 9	General exposures	PROC 4	
CS 10	Elevated temperature; General exposures	PROC 4	
CS 11	Remanufacture of reject articles	PROC 9	
CS 12	Equipment cleaning and maintenance	**PROC 8a**, PROC 28	
CS 13	Storage	PROC 1	
CS 14	Storage	PROC 2	

Further description of the use:

Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers [GES13_I].

9.7. Exposure scenario 7: Use at industrial sites - Use in laboratories

Product category used: PC 21: Laboratory Chemicals

Environment contributing scenario(s):			**SPERC**
CS 1	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)	ERC 4	ESVOC SPERC 4.1.v2
Worker contributing scenario(s):			**SWED**
CS 2	Laboratory activities; Handle in a fume cupboard or under extract ventilation.	PROC 15	
CS 3	Laboratory activities	PROC 15	

Further description of the use:

Use of the substance within laboratory settings, including material transfers and equipment cleaning [GES17_I].

9.8. Exposure scenario 8: Use at industrial sites - Use in polymer processing

Product category used: PC 32: Polymer Preparations and Compounds

Environment contributing scenario(s):			**SPERC**
CS 1	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)	ERC 4	ESVOC SPERC 4.21a.v2
Worker contributing scenario(s):			**SWED**
CS 2	Bulk transfers; Closed systems	PROC 1	
CS 3	Bulk transfers; Closed systems	PROC 2	
CS 4	Bulk transfers; Dedicated facility	PROC 8b	
CS 5	Bulk weighing; Closed systems	PROC 1	
CS 6	Bulk weighing; Closed systems	PROC 2	
CS 7	Small scale weighing	PROC 9	
CS 8	Additive premixing	PROC 3	
CS 9	Additive premixing	PROC 4	
CS 10	Additive premixing	PROC 5	
CS 11	Calendering (including Banburys); Elevated temperature	PROC 6	
CS 12	Production of articles by dipping and pouring	PROC 13	
CS 13	Masterbatches	PROC 14	
CS 14	Injection moulding of articles	PROC 14	
CS 15	Equipment maintenance	**PROC 8a**, PROC 28	
CS 16	Storage	PROC 1	
CS 17	Storage	PROC 2	

Further description of the use:

Processing of formulated polymers including material transfers, additives handling (e.g. pigments, stabilisers, fillers, plasticisers, etc.), moulding, curing and forming activities, material re-works, storage and associated maintenance. [GES23_I]

9.9. Exposure scenario 9: Use at industrial sites - Use in polymer production

Product category used: PC 32: Polymer Preparations and Compounds

Environment contributing scenario(s):		
CS 1	Polymer Production	ERC 6c
Worker contributing scenario(s):		
CS 2	General exposures (closed systems); Continuous process	PROC 1
CS 3	General exposures; Closed systems; Continuous process	PROC 8b
CS 4	Polymerisation; Continuous process; With sample collection	PROC 2
CS 5	Polymerisation; Batch process; With sample collection	PROC 3
CS 6	Polymerisation; Batch process; Elevated temperature; With sample collection	PROC 3
CS 7	Finishing operations; Batch process; With sample collection	PROC 3
CS 8	Intermediate Bulk Container; Storage	PROC 4
CS 9	Additivation; Stabilisation; Batch process; With sample collection	PROC 3
CS 10	Mixing or blending in batch processes; Vessel / container	PROC 5
CS 11	Tabletting, compression, extrusion or pelletisation	PROC 6
CS 12	Bulk transfers; Closed systems	PROC 8b
CS 13	Tabletting, compression, extrusion or pelletisation	PROC 14
CS 14	Equipment cleaning and maintenance	**PROC 8a**, PROC 28
CS 15	Storage	PROC 1
CS 16	Storage	PROC 2

Further description of the use:

Covers the use of the substance in the production of polymers. Includes manufacture of polymers from monomers in continuous and batch processes, sparging, discharging, and reactor maintenance and intermediate polymer product formation (i.e. compounding and pelletisation).

9.10. Exposure scenario 10: Widespread use by professional workers - Use in agrochemicals

Product category used: PC 27: Plant Protection Products

Environment contributing scenario(s):			**SPERC**
CS 1	Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)	**ERC 8d**, ERC 8a	ESVOC SPERC 8.11a.v2
Worker contributing scenario(s):			**SWED**
CS 2	Transfer from/pouring from containers; Non-dedicated facility	PROC 8a	
CS 3	Transfer from/pouring from containers; Dedicated facility	PROC 8b	
CS 4	Mixing operations (open systems)	PROC 4	
CS 5	Spraying or fogging; Manual	PROC 11	
CS 6	Spraying/fogging by machine application	PROC 11	
CS 7	Ad hoc manual application via trigger sprays, dipping, etc.	PROC 13	
CS 8	Equipment maintenance	**PROC 8a**, PROC 28	

CS 9	Storage	PROC 1
CS 10	Storage	PROC 2

Further description of the use:

Use as an agrochemical excipient for application by manual or machine spraying, smokes and fogging; including equipment clean-downs and disposal [GES11_P].

9.11. Exposure scenario 11: Widespread use by professional workers - Use in fuel

Product category used: PC 13: Fuels

Environment contributing scenario(s):			**SPERC**
CS 1	Widespread use of functional fluid (outdoor)	**ERC 9b**, ERC 9a	ESVOC SPERC 9.12b.v3
Worker contributing scenario(s):			**SWED**
CS 2	Bulk transfers; Dedicated facility	PROC 8b	
CS 3	Drum/batch transfers; Dedicated facility	PROC 8b	
CS 4	Refuelling	PROC 8b	
CS 5	General exposures (closed systems)	PROC 1	
CS 6	General exposures (closed systems)	PROC 2	
CS 7	Use of fuels; Closed systems	PROC 16	
CS 8	Equipment maintenance	**PROC 8a**, PROC 28	
CS 9	Storage	PROC 1	
CS 10	Storage	PROC 2	

Further description of the use:

Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste [GES12_P].

9.12. Exposure scenario 12: Widespread use by professional workers - Use in laboratories

Product category used: PC 21: Laboratory Chemicals

Environment contributing scenario(s):			**SPERC**
CS 1	Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor)	ERC 8a	ESVOC SPERC 8.17.v2
Worker contributing scenario(s):			**SWED**
CS 2	Laboratory activities; Handle in a fume cupboard or under extract ventilation.	PROC 15	
CS 3	Laboratory activities	PROC 15	

Further description of the use:

Use of small quantities within laboratory settings, including material transfers and equipment cleaning [GES17-P].

9.13. Exposure scenario 13: Widespread use by professional workers - Use in polymer processing

Product category used: PC 32: Polymer Preparations and Compounds

Environment contributing scenario(s):			**SPERC**
CS 1	Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)	**ERC 8d**, ERC 8a, ERC 9a	ESVOC SPERC 8.21b.v2
Worker contributing scenario(s):			**SWED**
CS 2	Bulk transfers; Closed systems	PROC 1	
CS 3	Bulk transfers; Closed systems	PROC 2	
CS 4	Material transfers; Dedicated facility	PROC 8b	
CS 5	Injection moulding of articles	PROC 6	
CS 6	Injection moulding of articles	PROC 14	
CS 7	Equipment maintenance	**PROC 8a**, PROC 28	
CS 8	Storage	PROC 1	
CS 9	Storage	PROC 2	

Further description of the use:

Processing of formulated polymers including material transfers, moulding and forming activities, material re-works and associated maintenance [GES23_P].