SIBUR-NEFTEKHIM JSC

SAFETY DATA SHEET

According to Regulations (EC) 1907/2006 (REACH), (EC) 1272/2008 (CLP) & (EU) 2015/830

ETHYLENE OXIDE

VERSION: 3.0
UPDATED: 30/01/2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

1.1. Product identifier

Product form:	Substance
Substance name:	Ethylene oxide
Chemical name:	1,2-Epoxyethane
EC index No.:	603-023-00-X
EC No.:	200-849-9
CAS-No.:	75-21-8
REACH registration No:	01-2119432402-53-0256
Formula:	C2H4O
Synonyms:	Oxirane
Trade names:	Ethylene oxide

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

1.2.1. Relevant identified uses

Use of the substance/mixture:	Manufacture and distribution of the substance Polymer production Use as an intermediate Use as a laboratory reagent *See Section 16 for a complete list of uses for which an ES is provided as an Annex.*
Most common technical function of substance:	Intermediates

1.2.2. Uses advised against

Restrictions on use:	Uses other than those given in section 1.2.1 are not recommended unless an assessment is completed, prior to commencement of that use, which demonstrates that the use will be controlled

1.3.Details of the supplier of the safety data sheet

Only representative

Company name:	Gazprom Marketing and Trading France
Address:	68 avenue des Champs-Elysées, 75008, Paris, France
Contact Telephone:	+33 1 42 99 73 50
Fax:	+33 1 42 99 73 99
Email Address:	didier.lebout@gazprom-mt.com

Manufacturer

Company name:	SIBUR-NEFTEKHIM JSC
Address:	Building 390, Eastern Industrial Zone, Dzerzhinsk,

	Nizhniy Novgorod region, 606000, Russian Federation
Contact phone:	+7 8313 27-59-09
Fax:	+7 8313 27-59-99
Email Address:	infosnh@snh.sibur.ru
Emergency Telephone:	+7 8313 27-52-98 (office hours only, GMT+3)

1.4. Emergency telephone number

Emergency phone in the country of delivery	**112** (*Please note that emergency numbers may vary depending upon the country of delivery though 112 remains valid as universal number*

SECTION 2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

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

Flam.Gas1, Chem. Unst. Gas A	H220, H230
Liquefied gas	H280
Acute Tox.3 (oral)	H301
Acute Tox.3 (inhalation)	H331
Skin Corr. 1	H314
Eye Dam. 1	H318
Repr. 1B	H360Fd
Muta. 1B	H340
Carc. 1B	H350
STOT SE3 (respiratory tract)	H335
STOT SE 3 (nervous system)	H336
STOT RE 1 (nervous system)	H372

Full text of hazard classes and H-statements : see section 16

2.2. Label elements

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

Hazard pictograms (CLP):


GHS02


GHS08


GHS06


GHS04


GHS05

Signal word (CLP): **Danger**

Hazard statements (CLP):
H220: Extremely flammable gas.
H230: May react explosively even in the absence of air.
H280: Contains gas under pressure; may explode if heated.
H301: Toxic if swallowed.
H331: Toxic if inhaled.
H314: Causes severe skin burns and eye damage.
H360Fd: May damage fertility. Suspected of damaging the unborn child. (Specific effect: fertility and perhaps development).
H340: May cause genetic defects. (Route of exposure: Inhalation).
H350: May cause cancer. (Route of exposure: Inhalation).
H335: May cause respiratory irritation. (Affected organs: respiratory tract. Route of exposure: Inhalation)
H336: May cause drowsiness or dizziness. (Affected organs: nervous system. Route of exposure: Inhalation)
H372: Causes damage to organs through prolonged or repeated exposure. (Affected organs: nervous system).

Precautionary statements (CLP):	P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P260: Do not breathe dust/fume/ gas/mist/vapours/spray. P280: Wear protective gloves/ protective clothing/eye protection/face protection. P301 + P330 + P331 + P310: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER/doctor P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower]. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor. P410 + P403 + P233: Protect from sunlight. Store in a well-ventilated place. Keep container tightly closed.
EUH-statements:	Not applicable

2.3. Other hazards

Other hazards not contributing to the classification:	No other hazards identified.
Assessment PBT / vPvB:	According to Annex XIII of Regulation (EC) No.1907/2006 (REACH): - not fulfilling PBT (persistent/bioaccumulative/toxic) criteria; - not fulfilling vPvB (very persistent/very bioaccummulative) criteria.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Name	Product identifier	%	Classification Regulation (EC) No 1272/2008 (CLP)
Ethylene oxide	(CAS-No.) 75-21-8 (EC No.) 200-849-9 (EC index No.) 603-023-00-X (REACH-no) 01-2119432402-53-0256	99.9 −100.0	H220; H230; H280; H301; H331; H314; H318; H360Fd; H340; H350; H335; H336; H372

The product does not contain impurities or additives that could affect product's labelling and classification according to Regulation (EC) No 67/548/EEC and Regulation (EC) No 1272/2008 (CLP).

3.2. Mixtures

Not applicable

SECTION 4. FIRST-AID MEASURES

4.1. Description of first aid measures

Product-specific hazards and other issues

Ethylene oxide is may be fatal if inhaled or absorbed through skin. It causes irritation to respiratory tract, skin, and eyes. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. It is classified as a carcinogenic to humans. Carcinogenic compounds are chronic toxins with long latency periods that can cause damage after repeated or long duration exposures and often do not have

immediate apparent harmful effects. Users can be exposed to these compounds through inhalation, ingestion, and/or dermal absorption. Dermal absorption may cause the same toxic effects as inhalation or ingestion.
Ethylene oxide may cause genetic defects.
Warning: Ethylene oxide is corrosive to moist tissues.

First-aid measures general

Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures. Take care to self-protect by avoiding becoming contaminated. Use adequate respiratory protection. Refer to Section 8.
Move contaminated patient(s) out of the dangerous area. Take off all contaminated clothing and shoes. Seek medical assistance - show the material safety data sheet or label if possible.
First aid personnel should pay attention to their own safety. If the patient is likely to become unconscious, place and transport in stable sideways position (recovery position). Immediately remove contaminated clothing in the absence of frostbite.

First-aid measures after inhalation

Keep patient calm, remove to fresh air. If breathing is difficult, give oxygen if possible or assisted ventilation, (do not use mouth to mouth). Immediately administer a corticosteroid from a controlled/metered dose inhaler. Seek immediate medical attention.

First-aid measures after skin contact

If liquid ethylene oxide is spilled on the skin, allow ethylene oxide to vaporize before washing thoroughly with soap and water.
Liquid ethylene oxide evaporates rapidly and may chill the skin causing frostbite. Do not tear off clothing frozen to the skin but thaw it off with lukewarm or cold water.
In the absence of frostbite, remove all contaminated clothing and wash immediately with soap and plenty of water for at least 15 minutes.
If skin irritation occurs or in all cases of doubt seek medical advice.

First-aid measures after eye contact

Following contact with expanded liquid from a compressed gas cylinder (-> frostbite) or with aqueous solutions or concentrated vapors:
- immediately wash affected eyes for at least 15 minutes under running water with eyelids held open;
-remove contact lenses, if present and easy to do, continue rinsing.
If eye irritation persists: Get medical advice/attention.

First-aid measures after ingestion

Under conditions encountered in practice, swallowing of the gas in toxicologically relevant amounts can nearly be excluded.
Following accidental intake of solutions with low concentrations:
Rinse the mouth and spit the fluids out.
If the casualty is conscious have him drink copious amounts of liquids (water).
Following intake of concentrated solutions, have the casualty immediately drink copious amounts of water.
Spontaneous vomiting will probably occur.
During spontaneous or provoked vomiting hold the head of the casualty low with the body in a prone position in order to avoid penetration of the vomit into the airways.
Get medical attention immediately.

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

Symptoms/effects after inhalation:	Inhalation may progressively cause mucous membrane and respiratory irritation, headache, vomiting, cyanosis, drowsiness, weakness, incoordination, CNS depression, lachrymation, nasal discharge and salivation, gasping, and labored breathing. Delayed effects may include

	nausea, diarrhea, edema of the lungs, paralysis, convulsions and possibly death. NOTE: Ethylene oxide has a high odor threshold (> 250 ppm) and the sense of smell does not provide adequate protection against its toxic effects.
Symptoms/effects after skin contact:	Skin contact with liquid ethylene oxide can cause a local erythema, edema, and formation of blisters. Response is more severe on damp skin. There may be a latency period of several hours prior to the onset of symptoms. Ethylene oxide may be absorbed by the skin, and sustained contact may produce adverse effects such as headache, dizziness, nausea and vomiting. Ethylene oxide is a skin sensitizer and some individuals may suffer an allergic skin reaction. Skin contact may also cause allergic contact dermatitis in some exposed individuals.
Symptoms/effects after eye contact:	Vapors may cause eye irritation, tearing, redness and swelling of the conjunctiva. Liquid ethylene oxide is severely irritating and corrosive to the eyes and contact can cause swelling of the conjunctiva and irreversible corneal injury. Contact with liquid ethylene oxide can cause frostbite.
Symptoms/effects after ingestion:	This relatively unlikely route of exposure is expected to cause severe irritation and burns of the mouth and throat, abdominal pain, nausea, vomiting, collapse and coma. Aspiration may occur during swallowing or vomiting, resulting in lung damage.

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

Advice to physician

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote, administer corticosteroid dose aerosol to prevent pulmonary edema.

SECTION 5. FIRE-FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media	Extinguish with alcohol foam, carbon dioxide, dry chemical or water spray, fog, or foam. Let burn unless leak can be stopped immediately
Unsuitable extinguishing media	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2. Special hazards arising from the substance or mixture

Fire hazard:	Extremely flammable gas. Flammable over a wide vapor-air concentration range.
Explosion hazard:	Vapor forms explosive mixtures with air over a wide range. Liquid is not detonable but the vapor may be readily initiated into explosive decomposition.
Hazardous decomposition products in case of fire:	Carbon monoxide and carbon dioxide.

5.3. Advice for firefighters

Firefighting instructions:	Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ensure adequate ventilation. In the case of fire advise fire fighters on the presence of gas cylinders. Heating causes a rise in pressure, risk of bursting and explosion.

	Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Only put out fire if the gas flow can be interrupted. Risk of explosion from gas accumulation and backfire. Possibly allow to burn out in controlled manner. Explosion danger by penetration into sewerage. Do not allow runoff to get into the sewage system.
Protection during firefighting:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Further information:	Do not approach containers. Cool containers by spraying them with water from a maximum distance. Vapor should be sprayed with water. May polymerize exothermically if heated or contaminated. If the polymerization takes place inside a container, the container may rupture violently.

SECTION 6. ACCIDENTAL RELEASE MEASURE

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures	Evacuate non-emergency personnel, isolate hazard area and deny entry Alert emergency personnel.

6.1.2. For emergency responders

Emergency procedures	The hazardous area may only be entered once suitable protective measures are implemented. Breathing protection required. Avoid contact with the skin, eyes and clothing. Avoid skin contact with leaking liquid (danger of frostbite!). Wear respiratory protection, eye protection, hand protection and body protection (see SECTION 8. Exposure controls/personal protection). Attempt to stop the gas from escaping. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may travel to source of ignition and flash back. Stay upwind. In enclosed spaces, provide adequate ventilation.

6.2. Environmental precautions

Discharge into the environment must be avoided. Severe hazard to waters. Avoid penetration into water, drainage, sewer, or the ground. Inform the responsible authorities about penetration of even small quantities.
Retain and dispose of contaminated wash water.

6.3. Methods and material for containment and cleaning up

Use water spray (fog) to reduce vapours or divert vapour cloud drift. Do not use water in a jet. Alcohol foam applied to surface of liquid pools may slow release of EO vapours into the atmosphere.

6.4. Reference to other sections

SECTION 8: Exposure controls/personal protection. SECTION 13: Disposal considerations.

SECTION 7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Precautions for safe handling	Ensure thorough ventilation of stores and work areas. Protect against moisture. Handle under dry inert gas. Protect against heat. Keep away from sources of ignition - No smoking. Refill and handle product only in closed system. Protection against fire and explosion: Prevent electrostatic charge - sources of ignition should be kept well clear - fire extinguishers should be kept handy. Vapours may form explosive mixture with air. Use non-sparking tools. Conditions for safe storage, including any incompatibilities: Further information on storage conditions: Keep container tightly closed and dry; store in a cool place. Protect against heat.
Hygiene measures	Avoid contact with skin, eyes and clothing. Do not breathe vapor. Smoking, eating and drinking during handling the product should be prohibited. Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	Prevent electrostatic charge - sources of ignition should be kept well clear - fire extinguishers should be kept handy. Vapours may form explosive mixture with air. Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Use non-sparking tools. Keep container tightly closed and dry; store in a cool place. Avoid contamination. Small amounts of polymer may form during extended storage. Do not store mixtures of this product and water to avoid potential for hazardous reaction.
Incompatible materials	Avoid contamination with organic bases, strong acids, ammonia, copper, silver, magnesium and their salts, anhydrous chlorides or iron, tin and aluminium, and alkali metal hydroxides. Avoid contact with oxidizing materials. Avoid contact with: Acids. Alkali metal alkoxides. Aluminum chloride. Water. Aluminum oxide. Amines. Bases. Iron chloride. Tin chloride. Organic compounds. Oxygen. Heat produced by the reaction with water will cause vaporization. Some reactions can be violent. Avoid contact with absorbent materials such as: Claybased absorbents.
Storage area	Ensure thorough ventilation of stores and work areas. Protect against moisture. Store under inert atmosphere in rust-free containers or equipment away from heat, spark and flame. Maintain inert atmosphere, even in empty ethylene oxide vessels.

	Keep away from sources of ignition - No smoking. Refill and handle product only in closed system. Storage Temperature: 30 °C / 86 °F maximum.
Packaging materials	Store in the following material(s): Stainless steel. Mild steel. Carbon steel Avoid prolonged storage in pipelines or small metal containers.

7.3. Specific end use(s)

Not applicable.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

8.1.1 Occupational Exposure Limits

Ethylene oxide (CAS-No.) 75-21-8

	LTEL TWA ppm	LTEL TWA mg/m³	STEL ppm	STEL mg/m³	Note
European Union	**1(1)**	**1,8(1)**			Bold-type: Indicative Occupational Exposure Limit Values and Limit Values for Occupational Exposure Binding Occupational Exposure Limit Value (1) Substantial contribution to the total body burden via dermal exposure possible
Austria	1	2	4	8	TRK value (based on technical feasibility)
Belgium	1	1,8			
Denmark	1	1,8	2	3,6	
Finland	1	1,8			
France	1		5		
Germany (AGS)	1(1)	2(1)	2(1)(3)	4(1)(3)	(1) Workplace exposure concentration corresponding to the proposed tolerable cancer risk. (2) Workplace exposure concentration corresponding to the proposed preliminary acceptable cancer risk. (3) 15 minutes average value
	0,1(2)	0,2(2)			
Hungary				1,8	
Ireland	5	10			
Israel	1 0,75(1)	1,8 1,4(1)			(1) women
Latvia		1			
Poland		1			
Spain	1	1,8			

Sweden	1	2	5(1)	9(1)	(1) 15 minutes average value
Switzerland	1	2			
The Netherlands		0,84			
United Kingdom	5	9,2			
GESTIS International Limit values: (https://limitvalue.ifa.dguv.de/)					

8.1.2 DNEL/ PNEC values

Ethylene oxide (CAS-No.) 75-21-8	
DNEL/DMEL (Workers)	
Acute - systemic effects, dermal	High hazard (no threshold derived)
Acute - systemic effects, inhalation	(DNEL) 10 mg/m³ neurotoxicity (By inhalation)
Acute - local effects, dermal	High hazard (no threshold derived)
Acute - local effects, inhalation	High hazard (no threshold derived)
Long-term - systemic effects, dermal	High hazard (no threshold derived)
Long-term - systemic effects, inhalation	(DMEL) 1.8 mg/m³ carcinogenicity (By inhalation)
Long-term - local effects, dermal	High hazard (no threshold derived)
Long-term - local effects, inhalation	(DMEL) 1.8 mg/m³ carcinogenicity
Eyes, local effects	Medium hazard (no threshold derived)
DNEL/DMEL (General population)	
Acute - systemic effects, dermal	hazard unknown but no further hazard information necessary as no exposure expected
Acute - systemic effects, inhalation	hazard unknown but no further hazard information necessary as no exposure expected
Acute - systemic effects, oral	hazard unknown but no further hazard information necessary as no exposure expected
Acute - local effects, dermal	hazard unknown but no further hazard information necessary as no exposure expected
Acute - local effects, inhalation	hazard unknown but no further hazard information necessary as no exposure expected
Long-term - systemic effects, dermal	hazard unknown but no further hazard information necessary as no exposure expected
Long-term - systemic effects, inhalation	hazard unknown but no further hazard information necessary as no exposure expected
Long-term - systemic effects,oral	hazard unknown but no further hazard information necessary as no exposure expected
Long-term - local effects, dermal	hazard unknown but no further hazard information necessary as no exposure expected
Long-term - local effects, inhalation	hazard unknown but no further hazard information necessary as no exposure expected
Eyes, local effects	hazard unknown but no further hazard information necessary as no exposure expected
PNEC (water)	
PNEC aqua (freshwater)	0.084 mg/L
PNEC aqua (marine water)	0.0084 mg/L
PNEC aqua (intermittent, freshwater)	0.84 mg/L
PNEC (Sediment)	
PNEC sediment (freshwater)	0.329 mg/kg sediment dw
PNEC sediment (marine water)	0.0329 mg/kg sediment dw

PNEC (Soil)	
PNEC soil	0.0165 mg/kg soil dw
PNEC (Oral)	
PNEC oral (secondary poisoning)	no potential for bioaccumulation
PNEC (STP)	
PNEC sewage treatment plant	13 mg/L
PNEC (Air)	
PNEC air	no hazard identified

8.2. Exposure controls

Appropriate engineering controls:

Ventilation: Hood with forced ventilation. Local exhaust to prevent accumulation above the exposure limit. Material should be handled in enclosed vessels and equipment, in which case general (mechanical) room ventilation should be sufficient. Local exhaust ventilation should be used at points where dust, mist, vapors or gases can escape into the room air. Additional ventilation or exhaust may be required to maintain air concentrations below recommended exposure limits.

Hand protection:

Use chemical resistant gloves classified under Standard EN374: Protective gloves against chemicals and micro-organisms. The gloves must be replaced immediately after direct contact with the liquid ethylene oxide. Use gloves with insulation for thermal protection, when needed. Do not wear rings, watches, or similar apparel because they can entrap material and cause a burn. Examples of preferred glove barrier materials include: Butyl rubber. When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended. When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended. NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Eye protection:

Use chemical goggles. Chemical goggles should be consistent with EN 166 or equivalent. If exposure causes eye discomfort, use a full-face respirator. Eye wash fountain should be located in immediate work area.

Skin and body protection:

Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task. Safety shower should be located in immediate work area. Remove contaminated clothing immediately, wash skin area with soap and water, and launder clothing before reuse or dispose of properly. Items which cannot be decontaminated, such as shoes, belts and watchbands, should be removed and disposed of properly. For high exposures, use only a total encapsulation suit impervious to this material, to avoid entrapment of liquid and vapor underneath garments.

Respiratory protection:

Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. When respiratory protection is required, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary selfcontained air supply. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply.

Environmental exposure controls:
Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Exhaust emission systems should be designed in accordance with local conditions; the air should always be moved away from the source of vapour generation and the person working at this point. Eye washes and showers for emergency use.
Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Exhaust emission systems should be designed in accordance with local conditions; the air should always be moved away from the source of vapour generation and the person working at this point. Firewater monitors and deluge systems are recommended. Eye washes and showers for emergency use.
Other information:
Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Examples of sources of recommended air monitoring methods are given below or contact supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of analytical Methods http://www.cdc.gov/niosh/nmam/nmammenu.html Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha-slc.gov/dts/sltc/methods/toc.html Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hsl.gov.uk/search.htm Berufsgenossenschaftliches Institut für Arbeitssicherheit (BIA), Germany http://www.hvbg.de/d/bia/pub/grl/grle.htm L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/indexnosdoss.html
For more information please see the relevant exposure scenario in Annex of this SDS.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical state at 20 °C and 1013 hPa	Gaseous
Colour:	Colourless
Odour:	Sweetish, ethereal
Melting / freezing point	-111.7 °C at 1013 hPa
Boiling point	10.7 °C at 1013 hPa
Relative density	0.88 g/cm^3 at 10 °C (liquid density at boiling point) 2.9 g/L at 20 °C (gas density)
Vapour pressure	1456 hPa at 20 °C
Surface tension	Not surface active
Water solubility	Miscible in all proportions
Partition coefficient n-octanol/water (log value)	-0.3 at 25 °C
Flash point	Not relevant Regardless of the substance being a gas at room temperature, and the

	flash point consequently being of no relevance under REACH, flash points of -57 to -17 °C are reported in the technical literature.
Flammability	Extremely flammable gas. The substance is not pyrophorice, and yields no flammable gases on contact with water. Given the flammability limits in air of 2.6 - 100 vol%, however, the substance is extrmely flammable. Aqueous solutions of ethylene oxide are flammable to highly flammable liquids, depending on the concentration.
Explosive properties	Non explosive
Self-ignition temperature	429 °C at 1013 hPa
Oxidising properties	No oxidising properties The Substance is incapable of reacting exothermically with combustible materials on the basis of the chemical structure.
Viscosity	Not applicable
Granulometry	Not applicable Substance is marketed or used in a non solid or granular form.
Stability in organic solvents and identity of relevant degradation products	Not applicable The stability of the substance is not considered as critical.
Stability: thermal, sunlight, metals	Gaseous ethylene oxide may decompose violently when coming in contact with an ignition source.
Dissociation constant	Not applicable The substance does not contain any ionic structure.
Gasses under pressure	Liquified gas

9.2. Other information

Not available.

SECTION 10. STABILITY AND REACTIVITY

10.1. Reactivity

No corrosive effect on metal.

10.2. Chemical stability

Stable under recommended storage and handling conditions. Unstable at elevated temperatures.

10.3. Possibility of hazardous reactions

Pure EO or EO vapour mixed with air or inert gases can decompose explosively. The violence of the explosion depends on pressure, temperature and concentration; the form and energy of the ignition source, and the type of container. Reacts exothermically with bases (eg caustic soda), ammonia, primary and secondary amines, alcohols, water and acids.
Dangerous polymerisation can occur on contact with highly catalytic surfaces. At high temperatures, for example fire conditions, exothermic polymerisation may occur causing possible container rupture.

10.4. Conditions to avoid

Avoid all sources of ignition: heat, flames and sparks. Prevent vapour accumulation.
Avoid temperatures above 450°C (842°F) Prevent heat buildup by avoiding flame or heat impingement on vessels and piping. Exposure to elevated temperatures can cause product to decompose. Avoid static discharge. Avoid open flames, welding arcs, or other high temperature sources which induce thermal decomposition. Do not store mixtures of this product and water to avoid potential for hazardous reaction. Rapid heating of vapor phase ethylene oxide in the presence of ethylene oxide polymer and certain forms of iron oxide has caused at least one significant industrial incident.

10.5. Incompatible materials

Avoid contamination with organic bases, strong acids, ammonia, copper, silver, magnesium and their salts, anhydrous chlorides or iron, tin and aluminium, and alkali metal hydroxides.
Avoid contact with oxidizing materials. Avoid contact with: Acids. Alkali metal alkoxides. Aluminum chloride. Water. Aluminum oxide. Amines. Bases. Iron chloride. Tin chloride. Organic compounds. Oxygen. Heat produced by the reaction with water will cause vaporization. Some reactions can be violent. Avoid contact with absorbent materials such as: Claybased absorbents.

10.6. Hazardous decomposition products

Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute toxicity — CLP classification (Regulation (EC) No 1272/2008):
Inhalation route (vapour): Acute Category 3. Toxic if inhaled.
Ingestion: Acute Tox. 3. Toxic if swallowed.

Ethylene oxide (CAS-No.) 75-21-8	
LD50, oral, guinea pig, male/female	270 mg/kg bw (OECD Guideline 401)
LD50, oral, rat, male	330 mg/kg bw (OECD Guideline 401)
LC50, inhalation, mouse, female	660 ppm (corr. to 1189 mg/m3 air) (4h) (OECD Guideline 403)
LC50, inhalation, rat	2.767 mg/L (4h) (female) (OECD Guideline 403) 3.55 mg/L (4h) (male) (OECD Guideline 403)

Skin corrosion/irritation — Adverse effect observed (corrosive). CLP classification (Regulation (EC) No 1272/2008): Skin corrosion/irritation: Category 1

Serious eye damage/irritation — Adverse effect observed (irreversible damage). CLP classification (Regulation (EC) No 1272/2008): Serious eye damage/eye irritation: Category 1

Respiratory or skin sensitisation — Skin sensitisation : no adverse effect observed (not sensitising). CLP classification (Regulation (EC) No 1272/2008): no classification required.
Respiratory sensitisation: No study available.

Germ cell mutagenicity — Genetic toxicity: adverse effect observed (positive). CLP classification (Regulation (EC) No 1272/2008): mutagen of category 1B, H340 May cause genetic defects. (Route of exposure: Inhalation).
in vitro studies: Positive.
Experimental result. Bacterial reverse mutation assay (Ames test, gene mutation) mammalian cell gene mutation assay (gene mutation)
in vivo studies: Positive.
Experimental result. Rodent dominant lethal assay (chromosome aberration) rat, mouse /inhalation

Carcinogenicity — Adverse effect observed. CLP classification (Regulation (EC) No 1272/2008): Carcinogenicity: Carc. Cat. 1B, H350 May cause cancer. (Route of exposure: Inhalation)

Ethylene oxide (CAS-No.) 75-21-8	
LOAEC, inhalation, rat (male/female)	18 mg/m³ (chronic) (OECD Guideline 453)

Toxicity for reproduction	Adverse effect observed. CLP classification (Regulation (EC) No 1272/2008): Reproductive toxicant category 1B, H360Fd May damage fertility. Suspected of damaging the unborn child. (Specific effect: fertility and perhaps development).

Ethylene oxide (CAS-No.) 75-21-8	
NOAEC (effects on fertility), inhalation, rat, male/female	54 mg/ m³ air (subchronic) (OECD Guideline 415)
NOAEC (developmental toxicity), inhalation, rat	180 mg/ m³ air (subacute)(OECD Guideline 414)
NOAEC (developmental toxicity), inhalation, NZW rabbit	270 mg/ m³ air

STOT-single exposure	STOT Single Exp. 3. H335: May cause respiratory irritation. Affected organs: Respiratory tract. Route of exposure: Inhalation STOT Single Exp. 3. H336: May cause drowsiness or dizziness. Affected organs: nervous system. Route of exposure: Inhalation
Repeated dose toxicity	Adverse effect observed. CLP classification (Regulation (EC) No 1272/2008): Specific Target Organ Toxicity: Repeated Exposure 1. H372: Causes damage to organs through prolonged or repeated exposure. (Affected organs: nervous system).

Ethylene oxide (CAS-No.) 75-21-8	
NOAEC chronic, inhalation, rat, male/female	18 mg/m³(OECD Guideline 453)

Aspiration hazard	Not available

SECTION 12. ECOLOGICAL INFORMATION

12.1. Toxicity

Ethylene oxide (CAS-No.) 75-21-8

Fish (Short-term toxicity)

LC50 (96h)	84 mg/L (*Pimephales promelas*) (freshwater) (EPA-660/3-75-009) Acutely harmful to fish.

Fish (Long-term toxicity)

No relevant information available.

Aquatic invertebrates (Short-term toxicity)

LC 50 (48 h)	212 mg/L(*Daphnia magna*) (freshwater) (static) (EPA-660/3-75-009)

Aquatic invertebrates (Long-term toxicity)

No relevant information available.

Algae and aquatic plants

EC50 (96 h)	240 mg/L (*Pseudokirchneriella subcapitata*) (freshwater) (EPA-660/3-75-009)

Toxicity to aquatic micro-organisms

EC10 (180 min)	130 mg/L (*activated sludge, domestic*) (freshwater) (static) (OECD Guideline 209)

12.2. Persistence and degradability

Abiotic degradation:	Hydrolysis In contact with water ethylene oxide will hydrolyse slowly. At neutral pH values (7.4) and at 25 °C a half-life of ethylene oxide in distilled water of 12.2 days was determined. In natural river water the half-life was 14.9 d and in 3% salt water the half-life was about 9 d. Ethylene oxide hydrolyses to ethylene glycol. Phototransformation/ photolysis in air Half-life (DT50): 57 days (QSAR data)
Biodegradation	Biodegradation in water Readily biodegradable: % Degradation of test substance: 107% after 28 d (O_2 consumption) (OECD Guideline 301 C)
Persistence and degradability	Direct photodegradation of ethylene oxide is negligible since the mole cule lacks a suitable chromophore for absorbing the low-energy UV radiation in the lower troposphere. After evaporation or exposure to the air, the product will slowly degrade by indirect photochemical processes. Ethylene oxide is readily biodegradable according to OECD criteria.

12.3. Bioaccumulative potential

Aquatic bioaccumulation:	Regarding the 1-octanol/water partition coefficient, accumulation of the test substance in organisms is not to be expected
Secondary poisoning:	Not available

12.4. Environmental distribution

Adsorption/desorption soil	Based on calculated log Koc values adsorption of ethylene oxide to the solid soil phase is not expected. Adsorption coefficient: log Koc: 0.51 - 0.67 (QSAR)
Volatilization	Ethylene oxide will slowly evaporate from the water surface into the atmosphere. Henry's Law constant H: 15 Pa m³/mol at 25 °C (QSAR)
Environmental distribution	Percent distribution in media: Air (%): 7.75-21.8 Water (%): 40.5-92.23 Soil (%): 0-37.6 Sediment (%): 0-0.08

12.5. Results of PBT and vPvB assessment

Regarding all available data on biotic and abiotic degradation, bioaccumulation and toxicity it can be stated that the substance does not fulfill the PBT criteria (not PBT) and not the vPvB criteria (not vPvB).

12.6. Other adverse effects

Not available.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste disposal recommendations	This product, when being disposed of in its unused and uncontaminated state should be treated as a hazardous waste according to EC Directive 91/689/EEC. Any disposal practices must be in compliance with all national and provincial laws and any municipal or local by-laws

	governing hazardous waste. For used, contaminated and residual materials additional evaluations may be required. Do not dump into any sewers, on the ground, or into any body of water. Methods for cleaning up or taking up: Suppress gases/vapours/mists with water spray jet. Dilute with plenty of water. Retain and dispose of contaminated wash water. Waste treatment methods Incinerate in suitable incineration plant, observing local authority regulations. Contaminated packaging: Uncleaned empties should be disposed of in the same manner as the contents. Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.
EPA Hazardous Waste Codes	U115 (Ethylene oxide. Toxic (Non-Acute)Hazardous Waste)
European List of Waste (LoW) code	16 05 04* gases in pressure containers (including halons) containing dangerous substances.

SECTION 14. TRANSPORT INFORMATION

14.1. Land transport (ADR/ RID)

UN-No.	UN 1040
Proper Shipping Name:	ETHYLENE OXIDE
Hazard class:	2.3 (2.1)
Packing group:	None
Hazard label:	Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas)
Classification Code:	2TF
Hazard identification number (HIN):	263
Tunnel restriction code (ADR)	B/D
Environmental hazard:	No

14.2. Inland waterway transport (ADN)

UN-No.	UN 1040
Proper Shipping Name:	ETHYLENE OXIDE
Hazard class:	2.3 (2.1)
Packing group:	None
Hazard label:	Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas)
Classification Code:	2TF
Hazard identification number (HIN):	263
Environmental hazard:	No

14.3. Sea transport (IMDG)

UN-No.	UN 1040
Proper Shipping Name:	ETHYLENE OXIDE
Hazard class:	2.3 (2.1)
Packing group:	None

Hazard label:	Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas)
EmS-No. (Fire)	FD
EmS-No.(Spillage)	SU
Marine pollutant:	No

14.4.Air transport (IATA/ICAO)

UN-No.	UN 1040
Proper Shipping Name:	ETHYLENE OXIDE
Hazard class:	2.3 (2.1)
Packing group:	None
Hazard label:	Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas)
Emergency Action Code	2PE
Environmental hazard:	No
Cargo Packing Instructions	200

14.5. Special precautions for user

Always transport in closed containers. Ensure that persons transporting the product know what to do in the event of an accident or spillage. For information regarding Exposure Controls/Personal Protection see Section 8 of the SDS

14.6. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

SECTION 15. REGULATORY INFORMATION

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

15.1.1. EU-Regulations

Authorisations and/or restrictions on use (Annex XVII): Listed in Annex XVII. Listed .
Entry 28: Restriction on supply of substances and mixtures to the general public, if classified as Carc. 1A or 1B. Exemptions: Mineral oil products intended for use in mobile or fixed combustion plants, fuels sold in closed systems (e.g. liquid gas bottles), substances and their exempt uses listed in Appendix 11;
Entry 29: Restriction on supply of substances and mixtures to the general public, if classified as Muta. 1A or 1B. Exemptions: Mineral oil products intended for use in mobile or fixed combustion plants, fuels sold in closed systems (e.g. liquid gas bottles), substances and their exempt uses listed in Appendix 11;
Entry 40: Restricted in aerosol dispensers intended for supply to the general public for entertainment and decorative purposes)

Ethylene oxide (CAS-No.) 75-21-8 is not on the REACH Candidate List.
Ethylene oxide (CAS-No.) 75-21-8 is not on the REACH Annex XIV List.

Other information, restriction and prohibition regulations	Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I and Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer. Annex II - Not listed. Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances- (SEVESO III): Listed. Annex I. Part2 – Categories of dangerous substances. Physical Hazard – P2 - Flammable gases. Lower tier requirements qualifying quantity = 5 tonnes; Upper-tier requirements qualifying quantity = 50 tonnes.

Directive 2013/39/EU priority substances in the field of water policy (amending Directive 2006/60/EC – Water Framework Directive and Directive 2008/105/EC on environmental quality standards in the field of water policy): Not listed.

Regulation (EC) No 850/2004 on persistent organic pollutants: Annex III – Not listed.

Regulation (EC) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of dangerous chemicals:
Ethylene oxide is listed in List of chemicals subject to export notification procedure (CN code: 2910 10 00, Subcategory: p(1), Use limitation: b; Countries for which no ratification is required (PIC circular at www.pic.int)).

Industrial Emissions Directive 2010/75/EU (IED): Listed , VOC - Annex II (Air polluting substance)

Toy Safety Directive 2009/48/EC (TSD): Listed. Prohibited CMR under Annex II, part 3, although exemptions may apply when the conditions laid down in Annex II, part 3 are met.

Cosmetic Products Regulation (EC) No. 1223/2009: Listed. Prohibited CMR under Article 15; Banned, Annex II

Prior Informed Consent (PIC): Listed in Annex I, Parts 1 & 3

E-PRTR Regulation (EC) No. 166/2006: Listed. Yes (Annex II - Threshold for releases (kg/year): 1000 (air); 10 (water); 10 (land)) Commission Regulation (EU) No. 10/2011) (Plastics in contact with food Regulation): Listed. Yes (Annex I. Use as additive or polymer production aid = no. Use as monomer or other starting substance or macromolecule obtained from microbial fermentation = yes. FRF applicable = no. SML = ND = 0,01 mg/kg. Restrictions and specifications = 1 mg/kg in final product)

Carcinogens or mutagens at work Directive 2004/37/EC: Listed.
Annex III: LTEL (8 hr) (ppm): 1LTEL (8 hr) (mg/m³): 1.8
Note: Substantial contribution to the total body burden via dermal exposure possible.

15.1.2. National regulations

Germany	Ordinance on facilities for handling substances that are hazardous to water (Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen (AwSV)) of 18 April 2017 (BGBl 2017, Teil I, Nr. 22, Seite 905). Kennummer: 253 Water hazard class (WGK 3 - severe hazard to waters)

	Ordinance on the Protection against Hazardous Substances (GefStoffV): Listed. Annex 1, Number 4 Reccomendations for Food Contact Materials (BfR) II. Plasticizer-free polyvinyl chloride, plasticizer-free copolymers of vinyl chloride and mixtures of these polymers with other copolymers and chlorinated polyolefins containing mainly vinyl chloride in the total mixture III. Polyethylene VII. Polypropylene XIV. Polymer Dispersions XXXVI. Paper and Board for Food Contact XXXIX. Commodities Based on Polyurethanes XLI. Linear Polyurethanes for Paper Coatings LI. Temperature Resistant Polymer Coating Systems for Frying, Cooking and Baking Utensils UBA Master List: Listed Group 1: CMR substances Categories 1 and 2
The Netherlands	ZZS plant protection product and/or biocide; ZZS oxirane. Dust class air emissions: MVP2. Boundary mass flow: 2,5 g/hour. Annual mass flow exemption limit: 1,25 kg/year. Emission limit value: 1 mg/Nm3.
Norway	Restrictions. Listed VOC – Chapter 2-25. Volatile organic compounds in paint and varnish products; Chapter 2-30. Substances, preparations and products that are covered by Annex XVII of the REACH Regulation.
Sweden	KEMI Prio database; Listed. Priority Level: Phase-out substance; Criteria: CMR (Category 1A and 1B). Carcinogenic; CMR (category 1A and 1 B), Mutagenic)
Switzerland	Packaging inks Annex 10. Listed. Part A:evaluated substances. List 1. Specific migration limit=No detectable (Detection limit=0,01 mg/kg)

15.2. Chemical safety assessment

Chemical Safety Report has been performed for *Ethylene oxide (CAS-No.) 75-21-8.*

SECTION 16. OTHER INFORMATION

16.1 Indication of changes

Version	Date of change	Section	Description of changes
Version:2.1	02/08/2011	All	Issued by HS&E Manager
Version:2.2	01/02/2016	All	Format of all sections was modified. Classification H230 and H372 was added.
Version:2.3	14/06/2017	1	Contact details of the manufacturer and the Only Representative were modified.
Version:3.0	30/01/2020	1-16, Annex	Contact details of the Only Representative were modified. SDS have been corrected in according to new data of Registration dossier, Chemical Safety Report, and new Transport information.

			Classification H318, H336 and H360Fd was added. Classification H301, H314 and H319 was modified. Labelling GHS05 was added.

16.2 Abbreviations and acronyms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
AGS	The German Committee on Hazardous Substances (Ausschuss für Gefahrstoffe – AGS)
BCF	Bioconcentration factor
DFG	Germany Research Foundation
DNEL	Derived No Effect Level
IMDG	International Maritime Dangerous Goods
ICAO-TI	Technical Instructions for the Safe Transport of Dangerous Goods by Air
K_{oc}	Adsorption coefficient
Kow	octanol-water partition coefficient
LC50	Lethal Concentration to 50 % of a test population
LD50	Lethal Dose to 50% of a test population (Median Lethal Dose)
LOAEC	Lowest Observable Adverse Effect Concentration
LTEL	Long Term Exposure Limit
NIOSH	National Institute for Occupational Safety and Health *(USA CDC)*
NOEC	No Observed Effect Concentration
NOAEL	No Observed Adverse Effect Level
OECD	Organization for Economic Co-operation and Development
OSHA	Occupational Safety & Health Administration *(USA)*
PNEC	Predicted No Effect Concentration
PBT	Persistent, bioaccumulative, toxic chemical
vPvB	Very Persistent, Very Bioaccumulative
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SCOEL	Scientific Committee on Occupational Exposure Limits
STEL	Short Term Exposure Limit
STP	sewage treatment plant
STOT	Specific Target Organ Toxicity
(STOT) RE	Repeated Exposure
(STOT) SE	Single Exposure
TWA	Time Weighted Average
UN	United Nations
WGK	Wassergefährdungsklasse *(German: Water Hazard Class)*

16.3. Full text of H- and EUH-statements:

H220	Flam.Gas1	Extremely flammable gas.
H230	Unst. Gas A	May react explosively even in the absence of air.
H280	Liquefied gas	Contains gas under pressure; may explode if heated.
H301	Acute Tox.3 (oral)	Toxic if swallowed.
H331	Acute Tox.3 (inhalation)	Toxic if inhaled.
H314	Skin Corr. 1	Causes severe skin burns and eye damage.

H360Fd	Repr. 1B.	May damage fertility. Suspected of damaging the unborn child. (Specific effect: fertility and perhaps development).
H340	Muta. 1B	May cause genetic defects (Route of exposure: Inhalation).
H350	Carc. 1B	May cause cancer (Route of exposure: Inhalation).
H335	STOT SE3 (respiratory tract)	May cause respiratory irritation (Affected organs: respiratory tract. Route of exposure: Inhalation).
H336	STOT SE 3 (nervous system)	May cause drowsiness or dizziness. (Affected organs: nervous system. Route of exposure: Inhalation).
H372	STOT RE 1 (nervous system)	Causes damage to organs through prolonged or repeated exposure (Affected organs: nervous system).

16.4 List of ES (exposure scenario) given in Annex to the extended SDS

ES1	M-1: Manufacture and distribution of the substance
ES2	IW-2: Polymer production
ES3	IW-3: Use as an intermediate
ES4	PW-4: Use as a laboratory reagent

16.5. Key literature references and sources

DOCUMENTS, PROVIDED BY FERC CONSORTIUM:
CHEMICAL SAFETY REPORT to *Ethylene oxide (CAS-No.) 75-21-8*

EU DIRECTIVES
REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

Regulation (EC) No 1272/2008 REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Regulations. Commission regulation (EU) no 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

Training advice
Personnel handling the product has to be acquainted demonstrably with its hazardous properties, with health and environmental protection principles related to the product and first aid principles.

DISCLAIMER

This information is based on our current level of knowledge. This information may be subject to revision as new knowledge and experience becomes available, and SIBUR makes no warranties and assumes no liability in connection with any use of this information. Since SIBUR cannot be aware of all aspects of your business and the impact the REACH Regulation has for your company, SIBUR strongly encourages you to get familiar with the REACH Regulation in order to comply with its requirements and timelines.

ANNEX. EXPOSURE SCENARIOS

Exposure Scenario 1 (ES1): M-1: Manufacture and distribution of the substance

Free short title	**Manufacture and distribution of the substance**
Systematic title based on use descriptor	ERC 1; PROC 1, 2, 3, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 1 - Production of chemicals
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 1 - Use in closed process, no likelihood of exposure PROC 1 - Use in closed process, no likelihood of exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories PROC 15 - Use of laboratory reagents in small scale laboratories
Contributing Scenario (1) controlling environmental exposure for ERC 1	
As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.	
Contributing Scenario (2) controlling industrial worker exposure for PROC 1	
Name of contributing scenario	1 - Use in closed process, no likelihood of exposure
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gas alarms are installed Ensure that the worker is in a separated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	

Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (3) controlling industrial worker exposure for PROC 1	
Name of contributing scenario	1 - Use in closed process, no likelihood of exposure
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week

Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (4) controlling industrial worker exposure for PROC 2	
Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	

Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (5) controlling industrial worker exposure for PROC 2	
Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (6) controlling industrial worker exposure for PROC 3	
Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (7) controlling industrial worker exposure for PROC 3	
Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (8) controlling industrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial

Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (9) controlling industrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	

Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (10) controlling industrial worker exposure for PROC 9	
Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization	

(e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (11) controlling industrial worker exposure for PROC 9	
Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (12) controlling industrial worker exposure for PROC 15	

Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Store substance within a closed system. Provide specific employee training to prevent/minimize exposures. Local exhaust ventilation Wear suitable respiratory protection.
Dermal	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	97.5 % *(justification: RP 97.5% (full face shield))*
Local Exhaust ventilation	inhalation: 99 % *(justification: Appropriate local exhaust ventilation: Effectiveness: 99%)*
Contributing Scenario (13) controlling industrial worker exposure for PROC 15	
Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Store substance within a closed system. Provide specific employee training to prevent/minimize exposures. Local exhaust ventilation Wear suitable respiratory protection.
Dermal	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour

Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	97.5 % *(justification: RP 97.5% (full face shield))*
Local Exhaust ventilation	inhalation: 99 % *(justification: Appropriate local exhaust ventilation: Effectiveness: 99%)*

Exposure Scenario 2 (ES2): IW-2: Polymer production

Free short title	**Polymer production**
Systematic title based on use descriptor	ERC 6C; PROC 1, 2, 3, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6C - Production of plastics
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 1 - Use in closed process, no likelihood of exposure PROC 1 - Use in closed process, no likelihood of exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories PROC 15 - Use of laboratory reagents in small scale laboratories
Contributing Scenario (1) controlling environmental exposure for ERC 6C	
As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.	
Contributing Scenario (2) controlling industrial worker exposure for PROC 1	
Name of contributing scenario	1 - Use in closed process, no likelihood of exposure
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	

General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (3) controlling industrial worker exposure for PROC 1	
Name of contributing scenario	1 - Use in closed process, no likelihood of exposure
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	

General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (4) controlling industrial worker exposure for PROC 2	
Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	

General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (5) controlling industrial worker exposure for PROC 2	
Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed

	Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (6) controlling industrial worker exposure for PROC 3	
Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air

	supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (7) controlling industrial worker exposure for PROC 3	
Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply

	Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (8) controlling industrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	

General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (9) controlling industrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	

General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (10) controlling industrial worker exposure for PROC 9	
Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	

General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (11) controlling industrial worker exposure for PROC 9	
Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	

General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (12) controlling industrial worker exposure for PROC 15	
Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Store substance within a closed system. Provide specific employee training to prevent/minimize exposures. Local exhaust ventilation Wear suitable respiratory protection.
Dermal	Use suitable chemically resistant gloves.

Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	97.5 % *(justification: RP 97.5% (full face shield))*
Local Exhaust ventilation	inhalation: 99 % *(justification: Appropriate local exhaust ventilation: Effectiveness: 99%)*
Contributing Scenario (13) controlling industrial worker exposure for PROC 15	
Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Store substance within a closed system. Provide specific employee training to prevent/minimize exposures. Local exhaust ventilation Wear suitable respiratory protection.
Dermal	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	

Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	97.5 % *(justification: RP 97.5% (full face shield))*
Local Exhaust ventilation	inhalation: 99 % *(justification: Appropriate local exhaust ventilation: Effectiveness: 99%)*

Exposure Scenario 3 (ES3): IW-3: Use as an intermediate

Free short title	**Use as an intermediate**
Systematic title based on use descriptor	ERC 6A; PROC 1, 2, 3, 8B, 9, 15
Name of contributing environmental scenario and corresponding ERC	ERC 6A - Industrial use of intermediates
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 1 - Use in closed process, no likelihood of exposure PROC 1 - Use in closed process, no likelihood of exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 2 - Use in closed, continuous process with occasional controlled exposure PROC 3 - Use in closed batch process (synthesis or formulation) PROC 3 - Use in closed batch process (synthesis or formulation) PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 9 - Transfer of chemicals into small containers (dedicated filling line) PROC 15 - Use of laboratory reagents in small scale laboratories PROC 15 - Use of laboratory reagents in small scale laboratories
Contributing Scenario (1) controlling environmental exposure for ERC 6A	
As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.	
Contributing Scenario (2) controlling industrial worker exposure for PROC 1	
Name of contributing scenario	1 - Use in closed process, no likelihood of exposure
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid

Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (3) controlling industrial worker exposure for PROC 1	
Name of contributing scenario	1 - Use in closed process, no likelihood of exposure
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	

Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (4) controlling industrial worker exposure for PROC 2	
Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	

Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (5) controlling industrial worker exposure for PROC 2	
Name of contributing scenario	2 - Use in closed, continuous process with occasional controlled exposure
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification:*

	Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (6) controlling industrial worker exposure for PROC 3	
Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-*

	10 minutes and never exceed a total of 2 hours per day.)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (7) controlling industrial worker exposure for PROC 3	
Name of contributing scenario	3 - Use in closed batch process (synthesis or formulation)
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages. Wear suitable helmets during monitoring. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity has been considered linearly *(justification: Short monitoring tours and sampling processes which take no longer than 5-*

	10 minutes and never exceed a total of 2 hours per day.)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (8) controlling industrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Eyes	Use suitable eye protection.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week

Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (9) controlling industrial worker exposure for PROC 8B	
Name of contributing scenario	8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	

Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (10) controlling industrial worker exposure for PROC 9	
Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no

Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**
* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (11) controlling industrial worker exposure for PROC 9	
Name of contributing scenario	9 - Transfer of chemicals into small containers (dedicated filling line)
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Ensure that gasalarms are installed Ensure that the worker is in a seperated (control) room with independent air supply Provide specific employee training to prevent/minimize exposures. Wear suitable face shield Wear safety shoes during all process steps Wear suitable respiratory protection. Transfer via enclosed lines Ensure material transfers are under containment or extract ventilation In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase. Pumps and sampling stations are additionally isolated with a circumfluent water film. Workers should wear portable gas sensors.
Dermal	Use suitable chemically resistant gloves. Wear suitable coveralls to prevent exposure to the skin.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	no
Use of external/measured value inhalation	Actual measured values* from regular external audits of facilities were used**

* collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV).	
**Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)	
Contributing Scenario (12) controlling industrial worker exposure for PROC 15	
Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Store substance within a closed system. Provide specific employee training to prevent/minimize exposures. Local exhaust ventilation Wear suitable respiratory protection.
Dermal	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	97.5 % *(justification: RP 97.5% (full face shield))*
Local Exhaust ventilation	inhalation: 99 % *(justification: Appropriate local exhaust ventilation: Effectiveness: 99%)*
Contributing Scenario (13) controlling industrial worker exposure for PROC 15	
Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Store substance within a closed system. Provide specific employee training to prevent/minimize exposures. Local exhaust ventilation Wear suitable respiratory protection.
Dermal	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid

Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	97.5 % *(justification: RP 97.5% (full face shield))*
Local Exhaust ventilation	inhalation: 99 % *(justification: Appropriate local exhaust ventilation: Effectiveness: 99%)*

Exposure Scenario 4 (ES4): PW-3: Use as a laboratory reagent

Free short title	**Use as a laboratory reagent**
Systematic title based on use descriptor	ERC 8B; PROC 15
Name of contributing environmental scenario and corresponding ERC	ERC 8B - Wide dispersive indoor use of reactive substances in open systems
Name(s) of contributing worker scenarios and corresponding PROCs	PROC 15 - Use of laboratory reagents in small scale laboratories PROC 15 - Use of laboratory reagents in small scale laboratories
Contributing Scenario (1) controlling environmental exposure for ERC 8B	
As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.	
Contributing Scenario (2) controlling professional worker exposure for PROC 15	
Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Exposure type	Inhalation: Long-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Store substance within a closed system. Provide specific employee training to prevent/minimize exposures. Local exhaust ventilation Wear suitable respiratory protection.
Dermal	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week

Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	97.5 % *(justification: RP 97.5% (full face shield))*
Local Exhaust ventilation	inhalation: 99 % *(justification: Appropriate local exhaust ventilation: Effectiveness: 99%)*
Contributing Scenario (3) controlling professional worker exposure for PROC 15	
Name of contributing scenario	15 - Use of laboratory reagents in small scale laboratories
Exposure type	Inhalation: Short-term systemic Dermal: Qualitative Risk Assessment
Qualitative Risk Assessment	
General	Store substance within a closed system. Provide specific employee training to prevent/minimize exposures. Local exhaust ventilation Wear suitable respiratory protection.
Dermal	Use suitable chemically resistant gloves.
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	high
Frequency and duration of use	
Duration of activity	15 mins to 1 hour
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	professional
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	no
Conditions and measures related to personal protection, hygiene and health evaluation	
Respiratory protection	97.5 % *(justification: RP 97.5% (full face shield))*
Local Exhaust ventilation	inhalation: 99 % *(justification: Appropriate local exhaust ventilation: Effectiveness: 99%)*

END OF SAFETY DATA SHEET