Safety Data Sheet

ammonia, anhydrous

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
SDS Reference Number: D-NH3-002
Issue date: 4/1/2015 Revision date: 3/10/2026 Supersedes version of: 1/12/2026 Version: 4.5

Danger

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

1.1. Product identifier

Trade name	:	ammonia, anhydrous
SDS no	:	D-NH3-002
Other means of identification	:	ammonia, anhydrous
	CAS-No.	: 7664-41-7
	EC-No.	: 231-635-3
	EC Index-No.	: 007-001-00-5
REACH registration No	:	01-2119488876-14
Chemical formula	:	NH_3

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

Relevant identified uses	:	See the list of identified uses and exposure scenarios in the annex of the safety data sheet. Perform risk assessment prior to use.
Uses advised against	:	Consumer use. Uses other than those listed above are not supported, contact your supplier for more information on other uses. Attention: These products must not be applied to humans or animals unless they are expressly designated as medical or medicinal gases!.

1.3. Details of the supplier of the safety data sheet

Messer Industriegase GmbH
Messer- Platz 1
D - 65812 Bad Soden am Taunus
Germany
T +49 (0) 6196 7760-200, F +49 (0) 6196 7760-280
SDB.de@messergroup.com, www.messer.de

1.4. Emergency telephone number

Emergency telephone number	:	Messer Produktionsgesellschaft mbH Salzgitter, +49 (0) 5341 21-9333, erreichbar Montags 0:00 bis Sonntags 24:00

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Physical hazards	Flammable gases, Category 2	H221
	Gases under pressure : Liquefied gas	H280

Health hazards	Skin corrosion/irritation, Category 1, Sub-Category 1B	H314
	Serious eye damage/eye irritation, Category 1	H318
	Acute toxicity (inhalation:gas) Category 3	H331
Environmental hazards	Hazardous to the aquatic environment – Acute Hazard, Category 1	H400
	Hazardous to the aquatic environment – Chronic Hazard, Category 2	H411

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS04 GHS05 GHS06 GHS09

Signal word (CLP) : Danger

Hazard statements (CLP) : H314 - Causes severe skin burns and eye damage.
H221 - Flammable gas.
H280 - Contains gas under pressure; may explode if heated.
H331 - Toxic if inhaled.
H410 - Very toxic to aquatic life with long lasting effects.
EUH071 - Corrosive to the respiratory tract.

Precautionary statements (CLP)

- Prevention : P280 - Wear eye protection, face protection, protective clothing, protective gloves.
P273 - Avoid release to the environment.
P260 - Do not breathe gas, vapours.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

- Response : P303+P361+P353+P315 - IF ON SKIN : (or hair) Take off immediately all contaminated clothing. Rinse skin with water or shower. Get immediate medical advice.
P304+P340+P315 - IF INHALED : Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice.
P305+P351+P338+P315 - IF IN EYES : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.

- Storage : P405 - Store locked up.
P403 - Store in a well-ventilated place.

2.3. Other hazards

Not classified as PBT or vPvB.
The substance/mixture has no endocrine disrupting properties.
Not classified as PMT or vPvM.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP] ATE, EUH-statements, M-Factors
ammonia, anhydrous	CAS-No.: 7664-41-7 EC-No.: 231-635-3 EC Index-No.: 007-001-00-5 REACH registration No: 01-2119488876-14	100	Flam. Gas 2, H221 Press. Gas (Liq.), H280 Skin Corr. 1B, H314 Eye Dam. 1, H318 Acute Tox. 3 (Inhalation:gas), H331 (ATE=2000 ppm/4h) Aquatic Acute 1, H400 Aquatic Chronic 2, H411

Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.
- Skin contact : Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
- Ingestion : Ingestion is not considered a potential route of exposure.

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

In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.
Prolonged exposure to small concentrations may result in pulmonary oedema.
May cause severe chemical burns to skin and cornea. Suitable first-aid treatment should be immediately available. Seek medical advice before using product.
Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.
See section 11.

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

Obtain medical assistance.
Treat with corticosteroid spray as soon as possible after inhalation.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog.
  Foam.
  Shutting off the source of the gas is the preferred method of control.
- Unsuitable extinguishing media : Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

Specific hazards	:	Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products	:	Nitric oxide/nitrogen dioxide.

5.3. Advice for firefighters

Specific methods	:	Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. If possible, stop flow of product. Use water spray or fog to knock down fire fumes if possible. Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire. Move containers away from the fire area if this can be done without risk.
Special protective equipment for fire fighters	:	Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. Standard EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	Act in accordance with local emergency plan. Try to stop release. Evacuate area. Ensure adequate air ventilation. Eliminate ignition sources. Stay upwind. See section 8 of the SDS for more information on personal protective equipment.
For emergency responders	:	Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Use chemically protective clothing. Monitor concentration of released product. Consider the risk of potentially explosive atmospheres. See section 5.3 of the SDS for more information.

6.2. Environmental precautions

Reduce vapour with fog or fine water spray.
Try to stop release.

6.3. Methods and material for containment and cleaning up

Ventilate area.
Hose down area with water.
Wash contaminated equipment or sites of leaks with copious quantities of water.

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Safe use of the product : Use only lubricants and sealings approved for the specific gas service.
Installation of a cross purge assembly between the container and the regulator is recommended.
Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service.
Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment.
Purge air from system before introducing gas.
Take precautionary measures against static discharge.
Keep away from ignition sources (including static discharges).
Consider the use of only non-sparking tools.
Ensure equipment is adequately earthed.
Avoid exposure, obtain special instructions before use.
The product must be handled in accordance with good industrial hygiene and safety procedures.
Only experienced and properly instructed persons should handle gases under pressure.
Consider pressure relief device(s) in gas installations.
Ensure the complete gas system was (or is regularily) checked for leaks before use.
Do not smoke while handling product.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
Avoid suck back of water, acid and alkalis.
Do not breathe gas.
Avoid release of product into work area.

Safe handling of the gas receptacle : Refer to supplier's container handling instructions.
Do not allow backfeed into the container.
Protect containers from physical damage; do not drag, roll, slide or drop.
When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders.
Leave valve protection caps, when provided, in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use.
If user experiences any difficulty operating valve discontinue use and contact supplier.
Never attempt to repair or modify container valves or safety relief devices.
Damaged valves should be reported immediately to the supplier.
Keep container valve outlets clean and free from contaminants particularly oil and water.
Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
Close container valve after each use and when empty, even if still connected to equipment.
Never attempt to transfer gases from one cylinder/container to another.
Never use direct flame or electrical heating devices to raise the pressure of a container.
Do not remove or deface labels provided by the supplier for the identification of the content of the container.
Suck back of water into the container must be prevented.
Open valve slowly to avoid pressure shock.

7.2. Conditions for safe storage, including any incompatibilities

Store locked up.
Segregate from oxidant gases and other oxidants in store.
All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere.
Observe all regulations and local requirements regarding storage of containers.
Containers should not be stored in conditions likely to encourage corrosion.
Container valve guards or caps, when provided, should be in place.
Containers should be stored in the vertical position and properly secured to prevent them from falling over.
Stored containers should be periodically checked for general condition and leakage.
Keep container below 50°C in a well ventilated place.
Store containers in location free from fire risk and away from sources of heat and ignition.
Keep away from combustible materials.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

ammonia, anhydrous (7664-41-7)	
Germany - Occupational Exposure Limits (TRGS 900)	
Local name	Ammoniak
AGW (OEL TWA)	14 mg/m³
	20 ppm
Peak exposure limitation factor	2(I)
Remark	DFG;EU;Y
Regulatory reference	TRGS900

ammonia, anhydrous (7664-41-7)	
DNEL: Derived no effect level (Workers)	
Acute - local effects, inhalation	36 mg/m³
Acute - systemic effects, inhalation	47.6 mg/m³
Long-term - local effects, inhalation	14 mg/m³
Long-term - systemic effects, inhalation	47.6 mg/m³
Acute - systemic effects, dermal	6.8 mg/kg bw/day
Long-term - systemic effects, dermal	6.8 mg/kg bw/day

ammonia, anhydrous (7664-41-7)	
PNEC: Predicted no effect concentration	
Aqua (freshwater)	0.0011 mg/l
Aqua (marine water)	0.0011 mg/l

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Provide adequate general and local exhaust ventilation.
Product to be handled in a closed system.
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Gas detectors should be used when toxic gases may be released.
Consider the use of a work permit system e.g. for maintenance activities.

8.2.2. Individual protection measures, e.g. personal protective equipment

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered:
PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection :
Wear goggles and a face shield when transfilling or breaking transfer connections.
Provide readily accessible eye wash stations and safety showers.
Standard EN 166 - Personal eye-protection - specifications.
Standard EN ISO 16321-1 - Eye and face protection for occupational use Part 1: General requirements.

• Skin protection

- Hand protection :
Wear chemically resistant protective gloves.
Standard EN 374 - Protective gloves against chemicals.
Consult glove manufacturer´s product information on material suitability and material thickness.
The breakthrough time of the selected gloves must be greater than the intended use period.
Permeation time: minimum >30min short term exposure: material / thickness [mm] Chloroprene rubber (CR) 0,5.
Permeation time: minimum >480min long term exposure: material / thickness [mm] Butyl rubber (IIR) 0,7.
Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risks, performance level 1 or higher.
Recommended types include wrist gloves from leather or synthetic material with equivalent performance, fabric gloves, fabric gloves with leather palms.
Standard EN 511 - Cold insulating gloves, performance level 1 or higher. Recommended types include insulated gauntlets or gloves specifically selected to prevent liquid penetration and ingress of cryogenic liquids and to provide mechanical resistance.

- Other :
Keep suitable chemically resistant protective clothing readily available for emergency use.
Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection	:	Recommended: Filter K (green). Keep self contained breathing apparatus readily available for emergency use. Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems. Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known. Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers. Gas filters do not protect against oxygen deficiency. Standard EN 14387 - Gas filter(s), combined filter(s) and standard EN136, full face masks . Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
• Thermal hazards	:	None in addition to the above sections.

8.2.3. Environmental exposure controls

Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance		
- Physical state at 20°C / 101.3kPa	:	Gas.
- Colour	:	Colourless.
Odour	:	Ammoniacal.
Melting point / Freezing point	:	-77.7 °C -77.7 °C
Boiling point	:	-33 °C
Flammability	:	Flammable gas.
Lower explosion limit	:	Not known.
Upper explosion limit	:	Not known.
Flash point	:	Not applicable for gases and gas mixtures.
Auto-ignition temperature	:	630 °C
Decomposition temperature	:	Not applicable.
pH	:	If dissolved in water pH-value will be affected.
Viscosity, kinematic	:	No reliable data available.
Water solubility [20°C]	:	517 g/l
Partition coefficient n-octanol/water (Log Kow)	:	Not known.
Vapour pressure [20°C]	:	8.6 bar(a)
Vapour pressure [50°C]	:	20 bar(a)
Density and/or relative density	:	Not applicable for gases and gas mixtures.
Relative vapour density (air=1)	:	0.6
Particle characteristics	:	Not applicable for gases and gas mixtures. Nanoforms are not relevant for gases and gas mixtures.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Explosive properties	:	Not applicable.

Flammability properties	:	15.4 – 33.6 Vol-%
Oxidising properties	:	Not applicable.
Critical temperature [°C]	:	132 °C

9.2.2. Other safety characteristics

Molar mass	:	17 g/mol
Evaporation rate	:	Not applicable for gases and gas mixtures.
Gas group	:	Press. Gas (Liq.).

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Can form explosive mixture with air.
May react violently with oxidants.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Avoid moisture in installation systems.

10.5. Incompatible materials

Reacts with water to form corrosive alkalis.
May react violently with acids.
Air, Oxidisers.
For additional information on compatibility refer to ISO 11114.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

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

Acute toxicity : Toxic if inhaled.

ammonia, anhydrous (7664-41-7)	
LC50 Inhalation - Rat [ppm]	2000 ppm/4h

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitisation : No known effects from this product.

Germ cell mutagenicity : No known effects from this product.

Carcinogenicity : No known effects from this product.

Toxic for reproduction : Fertility	:	No known effects from this product.
Toxic for reproduction : unborn child	:	No known effects from this product.
STOT-single exposure	:	May cause inflammation of the respiratory system. Severe corrosion to the respiratory tract at high concentrations.
Target organ(s)	:	Respiratory tract.
STOT-repeated exposure	:	No known effects from this product.
Aspiration hazard	:	Not applicable for gases and gas mixtures.

11.2. Information on other hazards

Other information	:	Inhalation of large amounts leads to bronchospasm, laryngeal oedema and pseudomembrane formation. The substance/mixture has no endocrine disrupting properties.

SECTION 12: Ecological information

12.1. Toxicity

Assessment	:	Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.
EC50 48h - Daphnia magna [mg/l]	:	101 mg/l
EC50 72h - Algae [mg/l]	:	No data available.
LC50 96 h - Fish [mg/l]	:	0.89 mg/l

12.2. Persistence and degradability

Assessment	:	The substance is readily biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Assessment	:	No data available.

12.4. Mobility in soil

Assessment	:	Because of its high volatility, the product is unlikely to cause ground or water pollution. Partition into soil is unlikely.

12.5. Results of PBT and vPvB assessment

Assessment	:	Not classified as PBT or vPvB.

12.6. Endocrine disrupting properties

Assessment	:	The substance/mixture has no endocrine disrupting properties.

12.7. Other adverse effects

Other adverse effects	:	May cause pH changes in aqueous ecological systems. Not classified as PMT or vPvM.
Effect on the ozone layer	:	No effect on the ozone layer.
Effect on global warming	:	No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Toxic and corrosive gases formed during combustion should be scrubbed before discharge to atmosphere.
Gas may be scrubbed in sulphuric acid solution.
Gas may be scrubbed in water.
Contact supplier if guidance is required.
Ensure that the emission levels from local regulations or operating permits are not exceeded.
Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at http://www.eiga.eu for more guidance on suitable disposal methods.
Must not be discharged to atmosphere.
Return unused product in original container to supplier.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended) : 16 05 04 *: Gases in pressure containers (including halons) containing hazardous substances.

13.2. Additional information

External treatment and disposal of waste should comply with applicable local and/or national regulations.

SECTION 14: Transport information

14.1. UN number or ID number

In accordance with ADR / RID / IMDG / IATA / ADN

UN-No. : 1005

14.2. UN proper shipping name

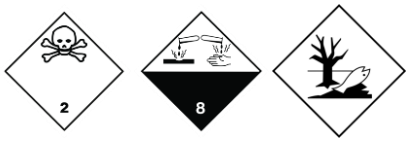
Transport by road/rail/inland waterways (ADR/RID/ADN) : AMMONIA, ANHYDROUS

Transport by air (ICAO-TI / IATA-DGR) : Ammonia, anhydrous

Transport by sea (IMDG) : AMMONIA, ANHYDROUS

14.3. Transport hazard class(es)

Labelling :



2.3 : Toxic gases.
8 : Corrosive substances.
Environmentally hazardous substances

Transport by road/rail/inland waterways (ADR/RID/ADN)

Class : 2

Classification code : 2TC

Hazard identification number : 268

Tunnel Restriction : C/D - Tank carriage : Passage forbidden through tunnels of category C, D and E. Other carriage : Passage forbidden through tunnels of category D and E

Transport by sea (IMDG)

Class / Div. (Sub. risk(s)) : 2.3 (8)

Emergency Schedule (EmS) - Fire	:	F-C
Emergency Schedule (EmS) - Spillage	:	S-U

14.4. Packing group

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	Not applicable.
Transport by air (ICAO-TI / IATA-DGR)	:	Not applicable.
Transport by sea (IMDG)	:	Not applicable.

14.5. Environmental hazards

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	Environmentally hazardous substance / mixture.
Transport by air (ICAO-TI / IATA-DGR)	:	Environmentally hazardous substance / mixture.
Transport by sea (IMDG)	:	Marine pollutant.

14.6. Special precautions for user

Packing Instruction(s)

Transport by road/rail/inland waterways (ADR/RID/ADN)	:	P200.
Transport by air (ICAO-TI / IATA-DGR)		
Passenger and Cargo Aircraft	:	Forbidden.
Cargo Aircraft only	:	Forbidden.
Transport by sea (IMDG)	:	P200.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment.
Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.
Before transporting product containers:
- Ensure there is adequate ventilation.
- Ensure that containers are firmly secured.
- Ensure valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

14.7. Maritime transport in bulk according to IMO instruments

Not applicable.

SECTION 15: Regulatory information

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

EU-Regulations

Restrictions on use	:	None.
Other information, restriction and prohibition regulations	:	None. Not listed on the PIC list (Regulation EU 649/2012). Not listed on the POP list (Regulation EU 2019/1021).
Seveso Directive : 2012/18/EU (Seveso III)	:	Listed.

Seveso III Part II (Named dangerous substances)	Qualifying quantity (tonnes)	
	Lower-tier	Upper-tier
35. Anhydrous Ammonia	50	200

National regulations

Water hazard class (WGK) : 2 - Significantly hazardous to water.

Kenn-Nr. : 211

Regulatory reference : Law on the Protection of Young People at Work (Jugendarbeitsschutzgesetz-JArbSchG)
Ordinance on Industrial Safety and Health (BetrSichV)
TRBS 3145/TRGS 745 - Transportable pressurized gas containers - Filling, holding, internal transport, emptying
TRGS 510 - Storage of hazardous substances in transportable containers
TRGS 407 - Activities with gases - Risk assessment
TRBS 2141 - Hazards due to steam and pressure - General requirements
The Ordinance on Installations for the Handling of Substances Hazardous to Water (AwSV)
Storage class according to TRGS 510: 2A Gases (without aerosol dispensers and lighters)
Technical Instructions on Air Quality Control (TA Luft).
Gesetz zum Schutz von Müttern bei der Arbeit, in der Ausbildung und im Studium (Mutterschutzgesetz – MuSchG)
Verordnung über Verbote und Beschränkungen des Inverkehrbringens gefährlicher Stoffe, Zubereitungen und Erzeugnisse nach dem Chemikaliengesetz (Chemikalien-Verbotsverordnung-ChemVerbotsV) .
TRGS 725 - Hazardous explosive atmospheres - Measuring, control and regulating devices within the framework of explosion protection measures.

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 2020/878.

Abbreviations and acronyms	:	ATE - Acute Toxicity Estimate. CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008. REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006. EINECS - European Inventory of Existing Commercial Chemical Substances. CAS# - Chemical Abstract Service number. PPE - Personal Protection Equipment. LC50 - Lethal Concentration to 50 % of a test population. RMM - Risk Management Measures. PBT - Persistent, Bioaccumulative and Toxic. vPvB - Very Persistent and Very Bioaccumulative. STOT- SE : Specific Target Organ Toxicity - Single Exposure. CSA - Chemical Safety Assessment. EN - European Standard. UN - United Nations. ADR - Agreement concerning the International Carriage of Dangerous Goods by Road. IATA - International Air Transport Association. IMDG code - International Maritime Dangerous Goods. RID - Regulations concerning the International Carriage of Dangerous Goods by Rail. WGK - Water Hazard Class. STOT - RE : Specific Target Organ Toxicity - Repeated Exposure. UFI : Unique Formula Identifier. ADN -International Carriage of Dangerous Goods by Inland Waterways. PROC -Process category. ERC – Environmental release category. PMT - Persistent, Mobile and Toxic. vPvM – very Persistent and very Mobile.
Training advice	:	Users of breathing apparatus must be trained. Ensure operators understand the flammability hazard. Ensure operators understand the toxicity hazard.
Further information	:	Classification in accordance with the procedures and calculation methods of Regulation (EC) 1272/2008 (CLP). Key literature references and sources of data are maintained in EIGA Doc 169 : 'Classification and Labelling Guide', downloadable at http://www.Eiga.eu .

Full text of H- and EUH-statements	
Acute Tox. 3 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 3
Aquatic Acute 1	Hazardous to the aquatic environment – Acute Hazard, Category 1
Aquatic Chronic 2	Hazardous to the aquatic environment – Chronic Hazard, Category 2
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Flam. Gas 2	Flammable gases, Category 2
Press. Gas (Liq.)	Gases under pressure : Liquefied gas
Skin Corr. 1B	Skin corrosion/irritation, Category 1, Sub-Category 1B
H221	Flammable gas.

H280	Contains gas under pressure; may explode if heated.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H400	Very toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.
EUH071	Corrosive to the respiratory tract.

DISCLAIMER OF LIABILITY : Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
Details given in this document are believed to be correct at the time of going to press.
Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

Annex to the safety data sheet

Table of contents of the Annex

1. EIGA002-1: Industrial uses, closed contained conditions

1.1. Title section

	Industrial uses, closed contained conditions	
	ES Ref.: EIGA002-1 Revision date: 4/25/2017	

Processes, tasks, activities covered	Industrial uses, including product transfers and associated laboratory activities within different closed or contained systems

Environment	Use descriptors
CS1	
CS2	
CS3	
CS4	
CS5	
CS6	

Worker	Use descriptors
CS7	
CS8	
CS9	
CS10	
CS11	
CS12	

Assessment method	ECETOC TRA 2.0 EUSES

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information

Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	950000 t/yr
Regional use tonnage:	6500000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m^3/d
Dilution of STP emissions at least:	10

1.2.2. Control of environmental exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	1000000 t/yr
Regional use tonnage:	3800000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m^3/d
Dilution of STP emissions at least:	10

1.2.3. Control of environmental exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	25000 t/yr
Regional use tonnage:	354000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m^3/d
Dilution of STP emissions at least:	10

1.2.4. Control of environmental exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	800000 t/yr
Regional use tonnage:	3800000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m^3/d
Dilution of STP emissions at least:	10

1.2.5. Control of environmental exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	25000 t/yr
Regional use tonnage:	354000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	

Flow rate of receiving water at least:	18000 m^3/d
Dilution of STP emissions at least:	10

1.2.6. Control of environmental exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	25000 t/yr
Regional use tonnage:	354000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m^3/d
Dilution of STP emissions at least:	10

1.2.7. Control of worker exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information

Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.8. Control of worker exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Ensure samples are obtained under containment or extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.9. Control of worker exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information

Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Ensure samples are obtained under containment or extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.10. Control of worker exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Ensure samples are obtained under containment or extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.11. Control of worker exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Fill containers at dedicated fill points supplied with local extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation

See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.12. Control of worker exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Fill containers at dedicated fill points supplied with local extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90

Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure:

Assessment method	EUSES

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.000133	0.0011	0.121	
Marine water	mg/l	0.0000315	0.0011	0.029	

1.3.2. Environmental release and exposure:

Assessment method	EUSES

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.0000497	0.0011	0.045	
Marine water	mg/l	0.000012	0.0011	0.011	

1.3.3. Environmental release and exposure:

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.0000108	0.0011	0.01	
Marine water	mg/l	0.0000231	0.0011	0.021	

1.3.4. Environmental release and exposure:

Assessment method	EUSES

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.0000837	0.0011	0.076	

Marine water	mg/l	0.0000205	0.0011	0.019	

1.3.5. Environmental release and exposure:

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.00000173	0.0011	0.002	
Marine water	mg/l	0.00000019	0.0011	≈ 0.00018	

1.3.6. Environmental release and exposure:

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.00000558	0.0011	0.005	
Marine water	mg/l	0.00000121	0.0011	0.001	

1.3.7. Worker exposure:

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.34 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.05
Inhalation - Long-term - systemic effects	0 mg/m³	Outdoor use, Indoor use, Without LEV	< 0.01
Dermal - Acute - systemic effects	0.34 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.05
Inhalation - Acute - systemic effects	0 mg/m³	Outdoor use, Indoor use, Without LEV	< 0.01
Acute - Local - Inhalation	0 mg/m³	Outdoor use, Indoor use, Without LEV	< 0.01
Long term - Local - Inhalation	0 mg/m³	Outdoor use, Indoor use, Without LEV	< 0.01

1.3.8. Worker exposure:

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	1.37 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.201
	0.14 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.021
Inhalation - Long-term - systemic effects	1.24 mg/m³	Outdoor use, With RPE95%	0.026

	3.54 mg/m³	Indoor use, With LEV, No RPE	0.074
Dermal - Acute - systemic effects	1.37 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.201
	0.14 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.021
Inhalation - Acute - systemic effects	1.24 mg/m³	Outdoor use, With RPE95%	0.026
	3.54 mg/m³	Indoor use, With LEV, No RPE	0.074
Acute - Local - Inhalation	1.24 mg/m³	Outdoor use, With RPE95%	0.034
	3.54 mg/m³	Indoor use, With LEV, No RPE	0.098
Long term - Local - Inhalation	1.24 mg/m³	Outdoor use, With RPE95%	0.089
	3.54 mg/m³	Indoor use, With LEV, No RPE	0.253

1.3.9. Worker exposure:

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.34 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.05
	0.03 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.004
Inhalation - Long-term - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Dermal - Acute - systemic effects	0.34 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.05
	0.03 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.004
Inhalation - Acute - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.069
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.197
Long term - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.177
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.506

1.3.10. Worker exposure:

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Long-term - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Dermal - Acute - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Acute - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.069
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.197
Long term - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.177
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.506

1.3.11. Worker exposure:

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Long-term - systemic effects	3.72 mg/m³	Outdoor use, With RPE95%	0.078
	3.19 mg/m³	Indoor use, With LEV, No RPE	0.067
Dermal - Acute - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Acute - systemic effects	3.72 mg/m³	Outdoor use, With RPE95%	0.078
	3.19 mg/m³	Indoor use, With LEV, No RPE	0.067
Acute - Local - Inhalation	3.72 mg/m³	Outdoor use, With RPE95%	0.103
	3.19 mg/m³	Indoor use, With LEV, No RPE	0.089
Long term - Local - Inhalation	3.72 mg/m³	Outdoor use, With RPE95%	0.266

	3.19 mg/m³	Indoor use, With LEV, No RPE	0.228

1.3.12. Worker exposure:

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Long-term - systemic effects	4.96 mg/m³	Outdoor use, With RPE95%	0.104
	0.71 mg/m³	Indoor use, With LEV, With RPE	0.015
Dermal - Acute - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No RPE	0.101
Inhalation - Acute - systemic effects	4.96 mg/m³	Outdoor use, With RPE95%	0.104
	0.71 mg/m³	Indoor use, With LEV, With RPE	0.015
Acute - Local - Inhalation	4.96 mg/m³	Outdoor use, With RPE95%	0.138
	0.71 mg/m³	Indoor use, With LEV, With RPE	0.02
Long term - Local - Inhalation	4.96 mg/m³	Outdoor use, With RPE95%	0.354
	0.71 mg/m³	Indoor use, With LEV, With RPE	0.051

1.4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

1.4.1. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see : https://ec.europa.eu/jrc/en/scientific-tool/european-union-system-evaluation-substances

1.4.2. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see : http://www.ecetoc.org/tra

2. EIGA002-2: Professional uses

2.1. Title section

Professional uses	
ES Ref.: EIGA002-2 Revision date: 4/25/2017	

Processes, tasks, activities covered	Professional uses, including transfer of product in non-industrial settings

Environment	Use descriptors
CS1	

Worker	Use descriptors
CS2	
CS3	

Assessment method	ECETOC TRA 2.0

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
No additional information	

Technical and organisational conditions and measures	
Ensure operatives are trained to minimise exposure	

Conditions and measures related to sewage treatment plant	
No additional information	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	

2.2.2. Control of worker exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.

Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

2.2.3. Control of worker exposure:

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure:

Qualitative approach used to conclude safe use,The exposure of aquatic, terrestrial, sediment and sewage treatment microorganisms is considered to be negligible because the substance partitions primarily to air when released to the environment,The resulting environmental exposure is not expected to add significantly to already present background levels of the gas in the environment,An additional assessment for environmental exposure for wide dispersive uses has therefore not been presented in section 3.

2.3.2. Worker exposure:

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
Inhalation - Long-term - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Dermal - Acute - systemic effects	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
Inhalation - Acute - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.069
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.197

Long term - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.177
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.506

2.3.3. Worker exposure:

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.14 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.021
	1.37 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.201
Inhalation - Long-term - systemic effects	6.2 mg/m³	Outdoor use, With RPE95%	0.13
	0.89 mg/m³	Indoor use, With LEV, No RPE	0.019
Dermal - Acute - systemic effects	0.14 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.021
	1.37 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.201
Inhalation - Acute - systemic effects	6.2 mg/m³	Outdoor use, With RPE95%	0.13
	0.89 mg/m³	Indoor use, With LEV, No RPE	0.019
Acute - Local - Inhalation	6.2 mg/m³	Outdoor use, With RPE95%	0.172
	0.89 mg/m³	Indoor use, With LEV, No RPE	0.025
Long term - Local - Inhalation	6.2 mg/m³	Outdoor use, With RPE95%	0.443
	0.89 mg/m³	Indoor use, With LEV, No RPE	0.064

2.4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

2.4.1. Environment

Guidance - Environment	Check that RMMs and OCs are as described above or of equivalent efficiency

2.4.2. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see : http://www.ecetoc.org/tra

End of document