



### Danger



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

### 1.1. Product identifier

Trade name	: Ammonia 2.8; Ammonia 3.8
SDS no	: RS-NH3-02
Other means of identification	: Ammonia, anhydrous
CAS no.	: 7664-41-7
EC no.	: 231-635-3
Index no.	: 007-001-00-5
REACH no.	: 01-2119488876-14
Chemical formula	: NH <sub>3</sub>

### 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. Industrial and professional uses. 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.

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

Messer Tehnogas AD Beograd  
Banjicki put , 62  
RS- 11090 Belgrade, Serbia  
T +381 11 35 37 200 - F +381 11 35 37 291  
[postoffice@messer.rs](mailto:postoffice@messer.rs) - [www.messer.rs](http://www.messer.rs)

### 1.4. Emergency telephone number

Emergency telephone number	: Poison Control Center, VMA Crnotravska 17, Belgrade Serbia Tel. : +381(0) 11 360 8440 (24h)
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## SECTION 2: Hazards identification

### 2.1. Classification of the substance or mixture

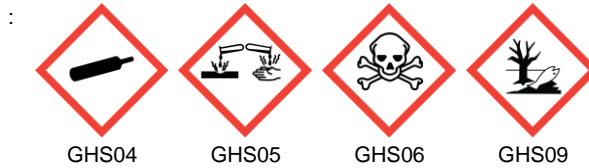
#### Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Flammable gases, Category 2	H221
	Gases under pressure : Liquefied gas	H280
Health hazards	Acute toxicity (inhalation:gas) Category 3	H331
	Skin corrosion/irritation, Category 1, Sub-Category 1B	H314
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)



Signal word (CLP)

: Danger

Hazard statements (CLP)

: H221 - Flammable gas.  
H280 - Contains gas under pressure; may explode if heated.  
H314 - Causes severe skin burns and eye damage.  
H331 - Toxic if inhaled.  
H410 - Very toxic to aquatic life with long lasting effects.  
H411 - 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.  
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.  
P260 - Do not breathe gas, vapours.  
P264 - Wash exposed body parts thoroughly after handling.  
P271 - Use only outdoors or in a well-ventilated area.  
P273 - Avoid release to the environment.  
P280 - Wear protective gloves, protective clothing, eye protection, face protection, hand protection.

- Response

: P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.  
P303+P361+P353 - IF ON SKIN (or hair): Take off Immediately all contaminated clothing. Rinse skin with water / shower.  
P304+P340 - IF INHALED : Remove person to fresh air and keep comfortable for breathing.  
P305+P351+P338 - IF IN EYES : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P310 - Immediately call a POISON CENTER or doctor.  
P321 - Specific treatment.  
P363 - Wash contaminated clothing before reuse.  
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
P381 - In case of leakage, eliminate all ignition sources.  
P391 - Collect spillage.

- Storage

: P403+P410+P233 - Protect from sunlight. Store in a well-ventilated place. Keep container tightly closed.  
P405 - Store locked up.

- Disposal

: [P501 - Dispose of container in accordance with local, regional, national and/or international regulation.](#)

### 2.3. Other hazards

Not classified as PBT or vPvB.

The substance/mixture has no endocrine disrupting properties.

### 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 Index no.: 007-001-00-5 REACH no.: 01-2119488876-14	≤ 100	Flam. Gas 2, H221 Press. Gas (Liq.), H280 Acute Tox. 3 (Inhalation:gas), H331 Skin Corr. 1B, H314 Aquatic Acute 1, H400 Aquatic Chronic 2, H411

Name	Product identifier	Specific concentration limits (%)
ammonia, anhydrous	CAS no.: 7664-41-7 EC no.: 231-635-3 Index no.: 007-001-00-5 REACH no.: 01-2119488876-14	(1 ≤ C ≤ 100) STOT SE 3; H335

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 : Get immediate medical help. Provide oxygen. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Perform cardiopulmonary resuscitation in case of respiratory arrest. Avoid mouth-to-mouth artificial respiration due to the danger to the rescuer.
- Skin contact : Immediately call a POISON CENTER or doctor. Carefully remove contaminated clothing. Rinse clothing with water before removing or use gloves. In case of frostbite spray with water for at least 15 minutes. Mandatory wash contaminated clothing and footwear before reuse. Chemical injuries must be treated by a doctor.
- Eye contact : Get immediate medical attention or call a poison control center. Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses. Continue rinsing. Chemical injuries must be treated by a doctor.
- Ingestion : Ingestion is not considered a potential route of exposure.

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

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

: Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment. Ensure equipment is adequately earthed. Take precautionary measures against static discharge. Keep away from ignition sources (including static discharges). Consider the use of only non-sparking tools. Before use, ensure that the equipment is properly grounded.

Avoid exposure, obtain special instructions before use.

The product must be handled in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke while working with the product. Wash hands after use. Purge air from system before introducing gas. 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. Only experienced and properly instructed persons should handle gases under pressure. Wear personal protective equipment (See section 8). Consider pressure relief device(s) in gas installations. Ensure the complete gas system was (or is regularly) checked for leaks before use. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only lubricants and sealings approved for the specific gas service.

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.

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 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 the protection cap is too tight, remove it with adjustable wrench. Never insert sharp objects into the cavities of the cap, this can lead to damage to the valve and leakage. Open valve slowly to avoid pressure shock. 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 allow backfeed into the container. Suck back of water into the container must be prevented.

Do not remove or deface labels provided by the supplier for the identification of the content of the container.

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

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 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. [Store locked up.](#)

#### 7.3. Specific end use(s)

None.

### SECTION 8: Exposure controls/personal protection

#### 8.1. Control parameters

Ammonia, anhydrous (7664-41-7)	
<b>EU - Indicative Occupational Exposure Limit (IOEL)</b>	
Local name	Ammonia, anhydrous
IOEL TWA	14 mg/m <sup>3</sup>
	20 ppm
IOEL STEL	36 mg/m <sup>3</sup>
	50 ppm
Regulatory reference	COMMISSION DIRECTIVE 2000/39/EC
<b>Serbia - Occupational Exposure Limits</b>	
Local name	амонијак, анхидровани
OEL TWA	14 mg/m <sup>3</sup>
	20 ppm
OEL STEL	36 mg/m <sup>3</sup>
	50 ppm
Remark	ЕУ* – напомена да се ради о хемијским материјама за које су утврђене индикативне граничне вредности изложености према Директиви 2000/39/ЕЗ (прва листа); К – напомена да хемијска материја може штетно деловати на кожу
Regulatory reference	ПРАВИЛНИК о превентивним мерама за безбедан и здрав рад при излагању хемијским материјама („Службени гласник РС”, бр. 106/09, 117/17 и 107/21)

Ammonia, anhydrous (7664-41-7)	
DNEL: Derived no effect level (Workers)	
Acute - local effects, inhalation	36 mg/m <sup>3</sup>
Acute - systemic effects, inhalation	47.6 mg/m <sup>3</sup>
Long-term - local effects, inhalation	14 mg/m <sup>3</sup>
Long-term - systemic effects, inhalation	47.6 mg/m <sup>3</sup>
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:

• Eye/face protection

PPE compliant to the recommended EN/ISO standards should be selected.  
: 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.

• Skin protection

- Hand protection

: Wear working gloves when handling gas containers.  
Wear chemically resistant protective gloves.  
Standard EN 374 - Protective gloves against chemicals.  
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.](#)  
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.

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.

- 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). 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.  
Gas filters do not protect against oxygen deficiency.  
Standard EN 14387 - Gas filter(s), combined filter(s) and standard EN136, full face masks .  
Keep self contained breathing apparatus readily available for emergency use.  
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

[Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers.](#)

• 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
Boiling point	: -33 °C
Flammability	: Flammable gas.
Lower explosion limit	: 15.4 vol %
Upper explosion limit	: 33.6 vol %
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 K <sub>ow</sub> )	: Not applicable for inorganic products.
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

Explosion limits	: Not known.
Oxidising properties	: No oxidising properties.
T <sub>ci</sub>	: 40.1 %
Critical temperature [°C]	: 132 °C

##### 9.2.2. Other safety characteristics

Molar mass	: 17 g/mol
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### 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. Reacts violently with oxidants.  
Ammonia can react dangerously with acids, fluorine, acetaldehyde, boron halides, chlorine mixtures, carbon dioxide, platinum catalysts, phosphorus oxides, sulfur dioxide, hydrogen sulfide.

#### 10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.  
Avoid moisture in installation systems. (See Section 7.)

#### 10.5. Incompatible materials

Air, Oxidisers.  
Reacts with water to form corrosive alkalis.  
May react violently with acids.  
See sub-sections 10.3.  
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]	4000 ppm/1h (ADR) 2000 ppm/4h (CLP)
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**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.

Effect on the ozone layer : No effect on the ozone layer.  
Global warming potential [CO<sub>2</sub>=1] according to Annex I of EU 2024/573 : 0  
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.30/21 "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

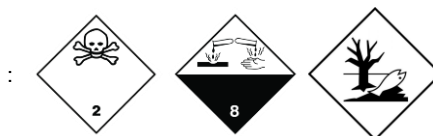
In accordance with ADR / RID / IMDG / IATA / ADN  
UN-No. : 1005

### 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****RS Regulations**

Pravilnik o ograničenjima i zabranama proizvodnje, stavljanja u promet i korišćenja hemikalija ("Sl. glasnik RS", br. 105/2013, 52/2017, 21/2019 i 29/2024) : None.  
Pravilnik o izvozu i uvozu određenih opasnih hemikalija („Sl. glasnik RS“ br. 93/23) : None.  
Pravilnik o Listi opasnih materija i njihovim količinama i kriterijumima za određivanje vrste dokumenta koje izrađuje operater seveso postrojenja, odnosno kompleksa ("Sl. glasnik RS", br. 41/2010, 51/2015 i 50/2018) : Listed.

**EU Regulations**

Restrictions on use : None.  
Other information, restriction and prohibition regulations : 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.

**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.  
In Section 2, the Safety Data Sheet is supplemented with information about label elements and other hazards.  
In Section 7, the Safety Data Sheet is supplemented with information conditions for safe storage, including any incompatibilities.  
In Section 8, the Safety Data Sheet is supplemented with information about exposure control and personal protection.  
In Section 9, the Safety Data Sheet is supplemented with information about physical and chemical properties.  
In Section 11, the Safety Data Sheet is supplemented with information about toxicological information.  
In Section 12, the Safety Data Sheet is supplemented with information about other adverse effects.  
In Section 13, the Safety Data Sheet is supplemented with information about waste treatment methods.  
In Section 15, the Safety Data Sheet is supplemented with regulatory information.
- Abbreviations and acronyms : ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road  
ATE - Acute Toxicity Estimate  
CAS - Chemical Abstract Service number  
CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008  
CSA - Chemical Safety Assessment  
DNEL - Derived No Effect Levels  
EINECS - European Inventory of Existing Commercial Chemical Substances  
EC- European Community number  
EIGA - European Industrial Gases Association  
EN - European Standard  
IATA - International Air Transport Association  
ICAO - International Civil Aviation Organization  
IMDG code - International Maritime Dangerous Goods  
IMO - International Maritime Organization  
LC50 - Lethal Concentration to 50 % of a test population  
LD50 - Lethal Dose 50%  
LEL - Lower Explosive Limit  
OEL - Occupational exposure limits  
PBT - Persistent, Bioaccumulative and Toxic  
PNEC - Predicted No Effect Concentration  
PPE - Personal Protection Equipment  
REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006  
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail  
RMM - Risk Management Measures  
STOT - RE - Specific Target Organ Toxicity - Repeated Exposure  
STOT- SE - Specific Target Organ Toxicity - Single Exposure  
STEL - Short Term Exposure Limit  
TWA –8-hour total weight average  
UEL - Upper explosive limit  
UFI - Unique Formula Identifier  
UN - United Nations  
vPvB - Very Persistent and Very Bioaccumulative  
WGK - Water Hazard Class
- Training advice : Receptacle under pressure.  
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
EUH071	Corrosive to the respiratory tract.
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Flam. Gas 2	Flammable gases, Category 2
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.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.
Press. Gas (Liq.)	Gases under pressure : Liquefied gas
Skin Corr. 1B	Skin corrosion/irritation, Category 1, Sub-Category 1B
STOT SE 3	Specific target organ toxicity – Single exposure, Category 3, Respiratory tract irritation

#### 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.

**End of Safety Data Sheet**

### Annex to the safety data sheet

This Annex documents the Exposure Scenarios (ESs) related to the identified uses of the registered substance. The ESs detail protective measures for workers and the environment in addition to those described in sections 7, 8, 11, 12 and 13 of the SDS that are required to ensure that the potential exposure to workers and the environment remains within acceptable levels for each of the identified uses.

#### Table of contents of the Annex

Identified Uses	Es N°	Short title	Page
Water treatment	EIGA002-1	Industrial uses, closed contained conditions	15
Formulation of mixtures in pressure receptacles	EIGA002-1	Industrial uses, closed contained conditions	15
Transfiling in pressure receptacles	EIGA002-1	Industrial uses, closed contained conditions	15
Metal treatment	EIGA002-1	Industrial uses, closed contained conditions	15
Electronic component manufacture	EIGA002-1	Industrial uses, closed contained conditions	15
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**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	ERC1
CS2	ERC2
CS3	ERC4
CS4	ERC6a
CS5	ERC6b
CS6	ERC7

Worker	Use descriptors
CS7	PROC1
CS8	PROC2
CS9	PROC3
CS10	PROC4
CS11	PROC8b
CS12	PROC9

Assessment method ECETOC TRA 2.0  
EUSES

**1.2. Conditions of use affecting exposure**

**1.2.1. Control of environmental exposure: ERC1**

ERC1 Manufacture of the substance

**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

# Exposure scenario

## Ammonia

Annex to the safety data sheet  
Reference number: EIGA002  
CAS-No.: 7664-41-7 Product form: Substance Physical state: Gas

Regional use tonnage:	6500000 t/yr
Emission Days (days/year)	330

<b>Technical and organisational conditions and measures</b>
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

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

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

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

### 1.2.2. Control of environmental exposure: ERC2

ERC2	Formulation into mixture
------	--------------------------

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

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

<b>Technical and organisational conditions and measures</b>
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

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



# Exposure scenario

## Ammonia

Annex to the safety data sheet  
Reference number: EIGA002  
CAS-No.: 7664-41-7 Product form: Substance Physical state: Gas

### 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 <sup>3</sup> /d
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Dilution of STP emissions at least:	10
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### 1.2.3. Control of environmental exposure: ERC4

ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
------	---

### Product (article) characteristics

Physical form of product	See section 9 of the SDS, No additional information
--------------------------	---

Concentration of substance in product	≤ 100 %
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### Amount used, frequency and duration of use (or from service life)

Annual site tonnage:	25000 t/yr
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Regional use tonnage:	354000 t/yr
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Emission Days (days/year)	330
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### 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 <sup>3</sup> /d
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Dilution of STP emissions at least:	10
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### 1.2.4. Control of environmental exposure: ERC6a

ERC6a	Use of intermediate
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# Exposure scenario

## Ammonia

Annex to the safety data sheet  
Reference number: EIGA002  
CAS-No.: 7664-41-7 Product form: Substance Physical state: Gas

### 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 <sup>3</sup> /d
Dilution of STP emissions at least:	10

### 1.2.5. Control of environmental exposure: ERC6b

ERC6b	Use of reactive processing aid at industrial site (no inclusion into or onto article)
-------	---

### 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 <sup>3</sup> /d
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Dilution of STP emissions at least:	10
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**1.2.6. Control of environmental exposure: ERC7**

ERC7	Use of functional fluid at industrial site
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**Product (article) characteristics**

Physical form of product	See section 9 of the SDS, No additional information
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Concentration of substance in product	≤ 100 %
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**Amount used, frequency and duration of use (or from service life)**

Annual site tonnage:	25000 t/yr
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Regional use tonnage:	354000 t/yr
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Emission Days (days/year)	330
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**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

# Exposure scenario

## Ammonia

Annex to the safety data sheet  
Reference number: EIGA002  
CAS-No.: 7664-41-7 Product form: Substance Physical state: Gas

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

### 1.2.7. Control of worker exposure: PROC1

PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
-------	--

#### 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: PROC2

PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
-------	--

#### 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 scenario

## Ammonia

Annex to the safety data sheet  
Reference number: EIGA002  
CAS-No.: 7664-41-7 Product form: Substance Physical state: Gas

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 where 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: PROC3

PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
-------	--

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 where 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: PROC4

PROC4	Chemical production where opportunity for exposure arises
-------	---

### 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 where 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: PROC8b

PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
--------	---

### 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 where 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: PROC9

PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
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### 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 where 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: ERC1

Assessment method	EUSES
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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: ERC2

Assessment method	EUSES
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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: ERC4

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: ERC6a

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: ERC6b

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: ERC7

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: PROC1

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/m <sup>3</sup>	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/m <sup>3</sup>	Outdoor use, Indoor use, Without LEV	< 0.01
Acute - Local - Inhalation	0 mg/m <sup>3</sup>	Outdoor use, Indoor use, Without LEV	< 0.01
Long term - Local - Inhalation	0 mg/m <sup>3</sup>	Outdoor use, Indoor use, Without LEV	< 0.01

### 1.3.8. Worker exposure: PROC2

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/m <sup>3</sup>	Outdoor use, With RPE95%	0.026
	3.54 mg/m <sup>3</sup>	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/m <sup>3</sup>	Outdoor use, With RPE95%	0.026
	3.54 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.074
Acute - Local - Inhalation	1.24 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.034
	3.54 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.098
Long term - Local - Inhalation	1.24 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.089
	3.54 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.253

### 1.3.9. Worker exposure: PROC3

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/m <sup>3</sup>	Outdoor use, With RPE95%	0.052
	7.08 mg/m <sup>3</sup>	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/m <sup>3</sup>	Outdoor use, With RPE95%	0.052
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.069
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.197
Long term - Local - Inhalation	2.48 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.177
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.506

### 1.3.10. Worker exposure: PROC4

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/m <sup>3</sup>	Outdoor use, With RPE95%	0.052
	7.08 mg/m <sup>3</sup>	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/m <sup>3</sup>	Outdoor use, With RPE95%	0.052
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.069
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.197
Long term - Local - Inhalation	2.48 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.177
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.506

### 1.3.11. Worker exposure: PROC8b

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/m <sup>3</sup>	Outdoor use, With RPE95%	0.078
	3.19 mg/m <sup>3</sup>	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/m <sup>3</sup>	Outdoor use, With RPE95%	0.078
	3.19 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.067
Acute - Local - Inhalation	3.72 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.103
	3.19 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.089
Long term - Local - Inhalation	3.72 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.266
	3.19 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.228

### 1.3.12. Worker exposure: PROC9

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/m <sup>3</sup>	Outdoor use, With RPE95%	0.104
	0.71 mg/m <sup>3</sup>	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/m <sup>3</sup>	Outdoor use, With RPE95%	0.104
	0.71 mg/m <sup>3</sup>	Indoor use, With LEV, With RPE	0.015
Acute - Local - Inhalation	4.96 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.138
	0.71 mg/m <sup>3</sup>	Indoor use, With LEV, With RPE	0.02
Long term - Local - Inhalation	4.96 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.354
	0.71 mg/m <sup>3</sup>	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 : <a href="https://ec.europa.eu/jrc/en/scientific-tool/european-union-system-evaluation-substances">https://ec.europa.eu/jrc/en/scientific-tool/european-union-system-evaluation-substances</a>
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### 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 : <a href="http://www.ecetoc.org/tra">http://www.ecetoc.org/tra</a>
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**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

ERC9a, ERC9b

**Worker**

**Use descriptors**

CS2

PROC4

CS3

PROC8a

Assessment method

ECETOC TRA 2.0

**2.2. Conditions of use affecting exposure**

**2.2.1. Control of environmental exposure: ERC9a, ERC9b**

ERC9a

Widespread use of functional fluid (indoor)

ERC9b

Widespread use of functional fluid (outdoor)

**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: PROC4

PROC4	Chemical production where opportunity for exposure arises
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### 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 where 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: PROC8a

PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
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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 where 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: ERC9a, ERC9b

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: PROC4

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/m <sup>3</sup>	Outdoor use, With RPE95%	0.052
	7.08 mg/m <sup>3</sup>	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/m <sup>3</sup>	Outdoor use, With RPE95%	0.052
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.069
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.197
Long term - Local - Inhalation	2.48 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.177
	7.08 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.506

### 2.3.3. Worker exposure: PROC8a

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/m <sup>3</sup>	Outdoor use, With RPE95%	0.13
	0.89 mg/m <sup>3</sup>	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/m <sup>3</sup>	Outdoor use, With RPE95%	0.13
	0.89 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.019
Acute - Local - Inhalation	6.2 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.172
	0.89 mg/m <sup>3</sup>	Indoor use, With LEV, No RPE	0.025
Long term - Local - Inhalation	6.2 mg/m <sup>3</sup>	Outdoor use, With RPE95%	0.443
	0.89 mg/m <sup>3</sup>	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
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### 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 : <a href="http://www.ecetoc.org/tra">http://www.ecetoc.org/tra</a>
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