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

1.1 Product identifier

Trade name : Ammonium Nitrate Solution 85%, Ammonium Nitrate Solution 92%, Ammonium Nitrate Solution 90% for laughing gas production

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

Use of the Substance/Mixture : Raw material for industry, Production of laughing gas, Intermediate

1.3 Details of the supplier of the safety data sheet

Supplier : Borealis L.A.T GmbH
St.-Peter-Strasse 25, 4021 Linz, Austria
Telephone: +43 732 6915-0

E-mail address : sds@borealisgroup.com

1.4 Emergency telephone number

+44 (0) 1235 239 670 (24h)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Oxidizing liquids, Category 3	H272: May intensify fire; oxidizer.
Eye irritation, Category 2	H319: Causes serious eye irritation.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal word : Warning

Hazard statements :	H272	May intensify fire; oxidizer.
	H319	Causes serious eye irritation.

Precautionary statements : **Prevention:**

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P220	Keep/Store away from clothing/ combustible materials.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use water to extinguish.

Hazardous components which must be listed on the label:
Ammonium nitrate

2.3 Other hazards

These solutions are dangerous because of their high temperature and possible chemical attack on the skin.
Contact with hot product will cause thermal burns.

Risk of explosion if heated under confinement.
Heating or fire can release toxic gas.

Heavy spillage may cause adverse environmental impact such as eutrophication in confined surface waters.

Results of PBT and vPvB assessment : PBT and vPvB assessment: Not applicable (inorganic)

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Hazardous components

Chemical name	CAS-No. EC-No. Registration number	Classification (REGULATION (EC) No 1272/2008)	Concentration (% w/w)
Ammonium nitrate	6484-52-2 229-347-8	Ox. Sol. 3; H272 Eye Irrit. 2; H319	>= 80 - <= 95

	01-2119490981-27		

Remarks : REACH Registration Numbers:
www.borealisgroup.com , Company - REACH - Registered substances

For explanation of abbreviations see section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : Move the victim to fresh air.

If inhaled : Remove to fresh air.
If not breathing, give artificial respiration.
No mouth-to-mouth respiration.
If breathing is difficult, give oxygen.
Seek medical advice.

In case of skin contact : Do not remove contaminated clothing (clothing might stick to the skin).
Wash off with soap and plenty of water.
If skin irritation persists, call a physician.

In case of eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 5 minutes.
If easy to do, remove contact lens, if worn.
Get medical attention if irritation develops and persists.

If swallowed : Obtain medical attention.
Clean mouth with water and drink afterwards plenty of water.
Never give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : Eye contact:
Redness
Pain

Ingestion:
Abdominal pain
Convulsions
Diarrhoea
Dizziness
Vomiting

Weakness

Skin contact:
Redness

Inhalation:
Cough
Headache
Sore throat

The absorption of this product into the body may lead to the formation of methaemoglobine that, in sufficient concentration, causes cyanosis.

Risks : Causes serious eye irritation.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : Immediately give oxygen if victim turns blue (lips, ears, fingernails).
Symptoms of poisoning may not appear for several hours.
Keep under medical supervision for at least 48 hours.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : High volume water jet

Unsuitable extinguishing media : Foam
Sand
Dry powder
Halons
Carbon dioxide (CO2)

5.2 Special hazards arising from the substance or mixture

Specific hazards during firefighting : Hazardous decomposition products formed under fire conditions.
Toxic vapours are evolved.
Nitrogen oxides (NOx)
Ammonia
Potential explosion hazard when heated under strong confinement (e.g. tubes and drains) especially if contaminated with incompatible material.
See chapter 10.

5.3 Advice for firefighters

Special protective equipment : In the event of fire, wear self-contained breathing apparatus.

for firefighters		Complete suit protecting against chemicals
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system. Contact the proper local authorities.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment.
Avoid breathing vapours, mist or gas.
Avoid contact with skin, eyes and clothing.
Eliminate all ignition sources if safe to do so.

6.2 Environmental precautions

Do not allow contact with soil, surface or ground water.
Do not flush into surface water or sanitary sewer system.
If the product contaminates rivers and lakes or drains inform respective authorities.

6.3 Methods and material for containment and cleaning up

Soak up with inert absorbent material.
Allow to solidify, use mechanical handling equipment.
Scrape up.
Shovel into suitable container for disposal.
After cleaning, flush away traces with water.

6.4 Reference to other sections

For personal protection see section 8., For disposal considerations see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling	:	Indoor use Ensure adequate ventilation. Use with local exhaust ventilation. Avoid inhalation of vapour or mist. The pump should be rinsed with water before each start-up due to safety reasons. Rinse the pump with water also after shutdown to avoid formation of solid residues. The running of pumps with closed valves are not permitted (see item 8 and TRGS 511, 6.3.3) Drain down and flush system prior to equipment opening or maintenance.

Wash hands before breaks and immediately after handling the product.
Keep away from food, drink and animal feedingstuffs.
When using do not eat, drink or smoke.
Take off contaminated clothing and wash before reuse.

Advice on protection against fire and explosion : Keep away from open flames, hot surfaces and sources of ignition. Keep away from combustible material. Keep away from heat. Risk of explosion if heated under confinement.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice for diagnostics. Regular cleaning of equipment, work area and clothing.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Suitable materials for containers: Stainless steel Keep away from sources of ignition - No smoking. Keep locked up or in an area accessible only to qualified or authorised persons.

Further information on storage conditions : Avoid unprotected outdoor storage. Keep solutions above crystallisation temperature (~ 96 °C) to prevent precipitation. Keep at temperature not exceeding 140 °C.

Advice on common storage : Keep away from combustible material.
Keep away from incompatible materials.
See chapter 10.

7.3 Specific end use(s)

Specific use(s) : Consult the technical guidelines for the use of this substance/mixture.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Contains no substances with occupational exposure limit values.

DNEL:

Ammonium nitrate : **End Use: Workers**
Exposure routes: Skin contact
Potential health effects: Long-term, Systemic
Value: 5,12 mg/kg
End Use: Workers
Exposure routes: Inhalation
Potential health effects: Long-term, Systemic

Value: 36 mg/m3
End Use: Consumers
Exposure routes: Skin contact
Potential health effects: Long-term, Systemic
Value: 2,56 mg/kg
End Use: Consumers
Exposure routes: Inhalation
Potential health effects: Long-term, Systemic
Value: 8,9 mg/m3
End Use: Consumers
Exposure routes: Ingestion
Potential health effects: Long-term, Systemic
Value: 2,56 mg/kg

PNEC:

Ammonium nitrate	:	Sewage treatment plant Value: 18 mg/l

8.2 Exposure controls

Engineering measures

Avoid inhalation of vapour or mist.
Provide adequate ventilation.
Ensure that eye flushing systems and safety showers are located close to the working place.
Before working with fire and hot materials on containers and apparatus remains of products must be deleted through efficient cleaning with water.
Work with fire and hot materials are completed only with allowance of employer only through a technical expert or by permanently control through a technical expert (see TRGS 511, 6.1.4.3).
Minimise number of staff exposed.
Effective contaminant extraction.
Minimisation of manual phases.
Avoidance of contact with contaminated tools and objects.

Personal protective equipment

Eye protection	:	Safety glasses with side-shields conforming to EN166
Hand protection		
Material	:	Heat resistant gloves
Material	:	Nitrile rubber
Break through time	:	> 480 min
Material	:	Viton (R)
Break through time	:	> 480 min
Material	:	butyl-rubber
Break through time	:	> 480 min
Remarks	:	The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it. Please observe the instructions regarding permeability and breakthrough time which are

provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time.

Skin and body protection : Wear suitable protective clothing.
Chemical resistant protective suit
Apron
Boots

Respiratory protection : Suitable respiratory equipment:
(K or ABEK-filter)
Respiratory protection complying with EN 143 / EN 149.
In case of insufficient ventilation: Self-contained breathing apparatus.

Environmental exposure controls

General advice : Do not allow contact with soil, surface or ground water. Do not flush into surface water or sanitary sewer system. If the product contaminates rivers and lakes or drains inform respective authorities.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	:	liquid, (hot)
Colour	:	colourless, pale yellowish
Odour	:	ammoniacal
Odour Threshold	:	Not applicable
pH	:	5 - 7, 85 - 92 %
Melting point	:	74 °C concentration 85 % 95 °C concentration 90 % ca. 100 °C concentration 92 %
Boiling point	:	ca. 146 °C

Flash point	:	Not applicable
Evaporation rate	:	No data available
Flammability (solid, gas)	:	The product is not flammable.
Upper explosion limit	:	Not applicable
Lower explosion limit	:	Not applicable
Vapour pressure	:	No data available
Relative vapour density	:	Not applicable
Relative density	:	No data available
Density	:	1,355 g/cm³ (20 °C) concentration 85 % 1,380 g/cm³ (20 °C) concentration 90 % 1,400 g/cm³ (20 °C) concentration 92 %
Solubility(ies)		
Water solubility	:	1.920 g/l (Ammonium nitrate) (20 °C)
Partition coefficient: n-octanol/water	:	Not applicable
Auto-ignition temperature	:	not auto-flammable
Decomposition temperature	:	ca. 170 °C Decomposes on heating.
Viscosity		
Viscosity, dynamic	:	No data available
Explosive properties	:	Explosive when mixed with combustible material.
Oxidizing properties	:	May intensify fire; oxidizer.

9.2 Other information

Surface tension	:	No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

Stable under recommended storage conditions.
No decomposition if stored and applied as directed.

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions : Contact with strong bases liberates ammonia.
Contact with strong acids liberates nitrous gases.
May react violently with:
Combustible material

10.4 Conditions to avoid

Conditions to avoid : Decomposes on heating.
Risk of explosion if heated under confinement.

10.5 Incompatible materials

Materials to avoid : Reducing agents
Strong acids and strong bases
Powdered metals
Combustible material
Organic materials
Copper
Copper alloys
Chlorates
Chromates
Nitrites
sulphur
permanganates

10.6 Hazardous decomposition products

Under fire conditions:, Nitrogen oxides (NOx), Ammonia

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Not classified based on available information.

Components:

Ammonium nitrate:

Acute oral toxicity	:	LD50 (Rat): 2.950 mg/kg Method: OECD Test Guideline 401
Acute inhalation toxicity	:	LC50: > 88,8 mg/l Method: No information available.
Acute dermal toxicity	:	LD50: > 5.000 mg/kg Method: OECD Test Guideline 402

Skin corrosion/irritation

Not classified based on available information.

Components:

Ammonium nitrate:
Species: Rabbit
Method: OECD Test Guideline 404
Result: No skin irritation

Serious eye damage/eye irritation

Causes serious eye irritation.

Components:

Ammonium nitrate:
Species: Rabbit
Method: OECD Test Guideline 405
Result: Irritating to eyes.

Respiratory or skin sensitisation

Skin sensitisation: Not classified based on available information.
Respiratory sensitisation: Not classified based on available information.

Components:

Ammonium nitrate:
Species: Mouse
Method: OECD Test Guideline 429
Result: Does not cause skin sensitisation.
Test substance: Calcium ammonium nitrate
Read-across (Analogy)

Germ cell mutagenicity

Not classified based on available information.

Components:

Ammonium nitrate:

Genotoxicity in vitro	:	Test Type: Ames test Method: OECD Test Guideline 471

Result: negative
Test substance: Ammonium calcium nitrate

: Test Type: Chromosome aberration test in vitro
Method: OECD Test Guideline 473
Result: negative
Test substance: Ammonium calcium nitrate

: Test Type: In vitro gene mutation study in mammalian cells
Method: OECD Test Guideline 476
Result: negative
Test substance: Potassium nitrate

Carcinogenicity

Not classified based on available information.

Components:

Ammonium nitrate:
Remarks: No significant adverse effects were reported

Reproductive toxicity

Not classified based on available information.

Components:

Ammonium nitrate:
Effects on fertility : Species: Rat
NOAEL: > 1.500 mg/kg,
Method: OECD Test Guideline 422
Test substance: Potassium nitrate

STOT - single exposure

Not classified based on available information.

Components:

Ammonium nitrate:
Assessment: Based on available data, the classification criteria are not met.

STOT - repeated exposure

Not classified based on available information.

Components:

Ammonium nitrate:
Species: Rat
NOAEL: 256 mg/kg
Application Route: Oral
Exposure time: 364 d
Method: OECD Test Guideline 453

Test substance: Ammonium sulphate

Species: Rat
NOAEL: 0,185 mg/l
Application Route: Inhalation
Exposure time: 14 d
Method: OECD Test Guideline 412
Test substance: Ammonium nitrate

Aspiration toxicity

Not classified based on available information.

Components:

Ammonium nitrate:
No data available

SECTION 12: Ecological information

12.1 Toxicity

Components:

Ammonium nitrate:

Toxicity to fish	:	LC50 (Cyprinus carpio (Carp)): 447 mg/l Exposure time: 48 h Test Type: Short term
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 490 mg/l Exposure time: 48 h Test Type: Short term Test substance: Potassium nitrate Remarks: Fresh water
Toxicity to algae	:	EC50 : > 1.700 mg/l Exposure time: 10 d Test substance: Potassium nitrate Remarks: Marine water
Toxicity to bacteria	:	EC50 : > 1.000 mg/l Exposure time: 180 min Test Type: Respiration inhibition of activated sludge Test substance: Sodium nitrate Method: OECD Test Guideline 209
Toxicity to fish (Chronic toxicity)	:	Remarks: study scientifically unjustified

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	EC50: 555 mg/l Exposure time: 7 d Species: Bullia digitalis (prosobranch gastropod)

12.2 Persistence and degradability

Components:

Ammonium nitrate:

Biodegradability	:	Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Components:

Ammonium nitrate:

Bioaccumulation	:	Remarks: Bioaccumulation is unlikely.

12.4 Mobility in soil

Components:

Ammonium nitrate:

Mobility	:	Medium: Water Remarks: completely soluble
	:	Medium: Soil Remarks: (NO3-), Not expected to adsorb on soil.
	:	Medium: Soil Remarks: (NH4+), After release, adsorbs onto soil.

12.5 Results of PBT and vPvB assessment

Product:

Assessment	:	PBT and vPvB assessment:. Not applicable. (inorganic).

Components:

Ammonium nitrate:

Assessment	:	Not applicable. (inorganic).

12.6 Other adverse effects

Product:

Additional ecological information	:	Remarks: Do not allow product to reach ground water, water bodies or sewage system. Heavy spillage may cause adverse environmental impact such as eutrophication in confined surface waters.

Components:
Ammonium nitrate:

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product	:	Can be landfilled or incinerated, when in compliance with local regulations. Depending on the degree of contamination, dispose of by use as fertilizer on farm or as raw material for an authorised waste facility. Do not allow product to reach ground water, water bodies or sewage system. Do not dispose of together with household waste. European waste code: 06 10: wastes from the MFSU of nitrogen chemicals, nitrogen chemical processes and fertiliser manufacture
Contaminated packaging	:	In accordance with local and national regulations.

SECTION 14: Transport information

14.1 UN number

ADR	:	UN 2426
RID	:	UN 2426
IMDG	:	UN 2426

14.2 UN proper shipping name

ADR	:	AMMONIUM NITRATE, LIQUID
RID	:	AMMONIUM NITRATE, LIQUID
IMDG	:	AMMONIUM NITRATE, LIQUID

14.3 Transport hazard class(es)

ADR	:	5.1
RID	:	5.1
IMDG	:	5.1
Subsidiary hazard class	:	

14.4 Packing group

ADR

Packing group	:	Not assigned by regulation
Hazard Identification Number	:	59
Labels	:	5.1
Tunnel restriction code	:	(E)

RID

Packing group	:	Not assigned by regulation
Classification Code	:	O1
Hazard Identification Number	:	59
Labels	:	5.1

IMDG

Packing group	:	Not assigned by regulation
Labels	:	5.1
EmS Code	:	F-H, S-Q

14.5 Environmental hazards

ADR

Environmentally hazardous	:	no

RID

Environmentally hazardous	:	no

IMDG

Marine pollutant	:	no

14.6 Special precautions for user

Remarks	:	No specific instructions needed.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Ship type	:	2
Pollution category	:	Z

SECTION 15: Regulatory information

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

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII)	:	Ammonium nitrate Restricted to professional users. See Annex XVII to Regulation (EC) no 1907/2006 for Conditions of restriction

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

Category		Quantity 1	Quantity 2
3	Ammonium nitrate: technical grade	350 t	2.500 t

Other regulations : Regulation (EU) No 98/2013 of the European Parliament and of the Council of 15 January 2013 on the marketing and use of explosives precursors:
Annex II

15.2 Chemical safety assessment

A Chemical Safety Assessment has been carried out for this substance.
(Ammonium nitrate)

SECTION 16: Other information

Full text of H-Statements

H272 : May intensify fire; oxidizer.
H319 : Causes serious eye irritation.

Full text of other abbreviations

Eye Irrit. : Eye irritation
Ox. Sol. : Oxidizing solids

Further information

Training advice : Provide adequate information, instruction and training for operators., Regular trainings of all employees which are involved in the transport of dangerous goods (according to chapter 1.3 ADR).

Other information : Issued according to Regulation (EC) No 1907/2006, Annex II, and its amendments.
Changes since the last version are highlighted in the margin.
This version replaces all previous versions.

Issuer : Borealis, Group Product Stewardship / Mikaela Eriksson.

Sources of key data used to compile the Safety Data Sheet : Chemical Safety Report, Ammonium Nitrate. FARM REACH Consortium, 2015

Disclaimer

To the best of our knowledge, the information contained herein is accurate and reliable as of the date of publication; however we do not assume any liability whatsoever for the accuracy and completeness of such information.

Borealis makes no warranties which extend beyond the description contained herein. Nothing herein shall constitute any warranty of merchantability or fitness for a particular purpose.

It is the customer's responsibility to inspect and test our products in order to satisfy itself as to the suitability of the products for the customer's particular purpose. The customer is responsible for the appropriate, safe and legal use, processing and handling of our products.

No liability can be accepted in respect of the use of Borealis' products in conjunction with other materials. The information contained herein relates exclusively to our products when not used in conjunction with any third party materials.

Identified uses:

Use: Industrial use, Use as an intermediate

Main User Groups	:	**SU 3:** Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	:	**SU8, SU9:** Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals
Chemical product category	:	**PC19:** Intermediate
Process categories	:	**PROC1:** Use in closed process, no likelihood of exposure **PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC5:** Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) **PROC8a:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC9:** Transfer of substance or preparation into small containers (dedicated filling line, including weighing) **PROC13:** Treatment of articles by dipping and pouring **PROC14:** Production of preparations or articles by tabletting, compression, extrusion, pelletisation **PROC15:** Use as laboratory reagent
Environmental Release Categories	:	**ERC6a:** Industrial use resulting in manufacture of another substance (use of intermediates)

Use: Formulation

Main User Groups	:	**SU 3:** Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	:	**SU 10:** Formulation
Chemical product category	:	**PC12:** Fertilizers
Process categories	:	**PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or

		formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC5:** Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) **PROC8a:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC9:** Transfer of substance or preparation into small containers (dedicated filling line, including weighing) **PROC13:** Treatment of articles by dipping and pouring **PROC14:** Production of preparations or articles by tabletting, compression, extrusion, pelletisation **PROC15:** Use as laboratory reagent
Environmental Release Categories	:	**ERC2:** Formulation of preparations

1. Short title of Exposure Scenario: Industrial use, Use as an intermediate

Main User Groups	:	**SU 3:** Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	:	**SU8, SU9:** Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals
Chemical product category	:	**PC19:** Intermediate
Process categories	:	**PROC1:** Use in closed process, no likelihood of exposure **PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC5:** Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) **PROC8a:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC9:** Transfer of substance or preparation into small containers (dedicated filling line, including weighing) **PROC13:** Treatment of articles by dipping and pouring **PROC14:** Production of preparations or articles by tabletting, compression, extrusion, pelletisation **PROC15:** Use as laboratory reagent
Environmental Release Categories	:	**ERC6a:** Industrial use resulting in manufacture of another substance (use of intermediates)

2.1 Contributing scenario controlling environmental exposure for: ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)

Remarks	:	Exposure assessment and risk characterization are not required for environment.

2.2 Contributing scenario controlling worker exposure for: Use as an intermediate, General measures

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC15: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation), Use in batch and other process (synthesis) where opportunity for exposure arises, Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact), Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Transfer of substance or preparation into small containers (dedicated filling line, including weighing), Treatment of articles by dipping and pouring, Production of preparations or articles by tabletting, compression, extrusion, pelletisation, Use as laboratory reagent, PC19: Intermediate

Product characteristics

Concentration of the Substance in Mixture/Article	:	Covers concentrations up to 100%.
Physical Form (at time of use)	:	Solid, Liquid, Dustiness: Low

Frequency and duration of use

Duration of the acitivity	:	< 8 h

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor
Ventilation rate per hour	:	1 - 3
Remarks	:	Assumes a good basic standard of occupational hygiene is implemented.

Technical conditions and measures

Handle substance within a closed system. Provide a good standard of general ventilation (not less than 1 to 3 air changes per hour). Wash off skin contamination immediately.

Organisational measures to prevent /limit releases, dispersion and exposure

Integrated safety management systems

Conditions and measures related to personal protection, hygiene and health evaluation

Skin protection, Long sleeved clothing, Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. (Effectiveness (of a measure): 90 %)
Goggles
Respiratory protection, No (Effectiveness (of a measure): 0 %)

Additional good practice advice beyond the REACH Chemical Safety Assessment

Additional good practice advice	:	Minimise number of staff exposed., Effective contaminant

extraction., Minimisation of manual phases., Avoidance of contact with contaminated tools and objects., Regular cleaning of equipment, work area and clothing., Handle in accordance with good industrial hygiene and safety practice.

2.3 Contributing scenario controlling worker exposure for: Use as an intermediate PROC1: Use in closed process, no likelihood of exposure

Human factors not influenced by risk management

Dermal exposure : One hand face only (240 cm2)

Technical conditions and measures

Containment measures Closed system (minimal contact during routine operations)

2.4 Contributing scenario controlling worker exposure for: Use as an intermediate PROC2: Use in closed, continuous process with occasional controlled exposure

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures Use in closed, continuous process with occasional controlled exposure

2.5 Contributing scenario controlling worker exposure for: Use as an intermediate PROC3: Use in closed batch process (synthesis or formulation)

Human factors not influenced by risk management

Dermal exposure : One hand face only (240 cm2)

Technical conditions and measures

Containment measures Closed batch process with occational controlled exposure

2.6 Contributing scenario controlling worker exposure for: Use as an intermediate PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures Semi-closed process with occational controlled exposure

2.7 Contributing scenario controlling worker exposure for: Use as an intermediate PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact)

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures No

2.8 Contributing scenario controlling worker exposure for: Use as an intermediate PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

Human factors not influenced by risk management

Dermal exposure : Two hands (960 cm2)

Technical conditions and measures

Containment measures No

2.9 Contributing scenario controlling worker exposure for: Use as an intermediate PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Human factors not influenced by risk management

Dermal exposure : Two hands (960 cm2)

Technical conditions and measures

Containment measures Semi-closed process with occational controlled exposure

2.10 Contributing scenario controlling worker exposure for: Use as an intermediate PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures Semi-closed process with occational controlled exposure

2.11 Contributing scenario controlling worker exposure for: Use as an intermediate PROC13: Treatment of articles by dipping and pouring

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures No

2.12 Contributing scenario controlling worker exposure for: Use as an intermediate PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures No

2.13 Contributing scenario controlling worker exposure for: Use as an intermediate PROC15: Use as laboratory reagent

Human factors not influenced by risk management

Dermal exposure : One hand face only (240 cm2)

Technical conditions and measures

Containment measures No

3. Exposure estimation and reference to its source

Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value type	Level of Exposure	RCR

ERC6a			Other			
Remarks:		Exposure assessment and risk characterization are not required for environment.				

Workers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value type	Level of Exposure	RCR
PROC1	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,01 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	0,003 mg/kg bw/day	< 0,01
		Systemic, Long term	all routes		< 0,01
PROC2	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,01 mg/m³	< 0,01
		Systemic, Long term	Dermal	0,137 mg/kg bw/day	0,027
		Systemic, Long term	all routes		0,027
PROC3	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	0,069 mg/kg bw/day	0,013
		Systemic, Long term	all routes		0,016
PROC4	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,5 mg/m³	0,014
		Indoor, Systemic, Long term	Dermal	0,686 mg/kg bw/day	0,134
		Systemic, Long term	all routes		0,148
PROC5	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,5 mg/m³	0,014
		Indoor, Systemic, Long term	Dermal	1,371 mg/kg bw/day	0,268
		Systemic, Long term	all routes		0,282
PROC8a	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,5 mg/m³	0,014
		Indoor, Systemic, Long term	Dermal	1,371 mg/kg bw/day	0,268
		Systemic, Long term	all routes		0,282
PROC8b	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	1,371 mg/kg bw/day	0,268
		Systemic, Long term	all routes		0,271
PROC9	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	0,686 mg/kg bw/day	0,134
		Systemic, Long term	all routes		0,137

PROC13	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	1,371 mg/kg bw/day	0,268
		Systemic, Long term	all routes		0,271
PROC14	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	0,343 mg/kg bw/day	0,067
		Systemic, Long term	all routes		0,07
PROC15	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	0,034 mg/kg bw/day	< 0,01
		Systemic, Long term	all routes		< 0,01
Remarks:		LEV = Local Exhaust Ventilation.			
		Dermal, local, long term: there is no DNEL available nor a suitable benchmark value so quantitative dermal exposure estimation is not meaningful.			
		Qualitative assessment: As personal protective equipment is worn, the risk of local effects via long-term dermal exposure is considered to be controlled.			

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

The safety data sheet at hand provides the user with risk management measures and operational conditions which enables him to work safely with the substance / mixture. If other risk management measures / operational conditions are adopted, the user has to ensure, that the risks are managed to at least equivalent levels.

1. Short title of Exposure Scenario: Formulation

Main User Groups	:	**SU 3:** Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	:	**SU 10:** Formulation
Chemical product category	:	**PC12:** Fertilizers
Process categories	:	**PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC5:** Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) **PROC8a:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC9:** Transfer of substance or preparation into small containers (dedicated filling line, including weighing) **PROC13:** Treatment of articles by dipping and pouring **PROC14:** Production of preparations or articles by tabletting, compression, extrusion, pelletisation **PROC15:** Use as laboratory reagent
Environmental Release Categories	:	**ERC2:** Formulation of preparations

2.1 Contributing scenario controlling environmental exposure for: ERC2: Formulation of preparations

Remarks	:	Exposure assessment and risk characterization are not required for environment.

2.2 Contributing scenario controlling worker exposure for: Formulation, General measures
PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC15: Use in closed, continuous process with occasional controlled exposure, Use in closed

batch process (synthesis or formulation), Use in batch and other process (synthesis) where opportunity for exposure arises, Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact), Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Transfer of substance or preparation into small containers (dedicated filling line, including weighing), Treatment of articles by dipping and pouring, Production of preparations or articles by tabletting, compression, extrusion, pelletisation, Use as laboratory reagent, PC12: Fertilizers

Product characteristics

Concentration of the Substance in Mixture/Article	:	Covers concentrations up to 100%.
Physical Form (at time of use)	:	Solid, Liquid, Dustiness: Low

Frequency and duration of use

Duration of the acitivity	:	< 8 h

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor
Ventilation rate per hour	:	1 - 3
Remarks	:	Assumes a good basic standard of occupational hygiene is implemented.

Technical conditions and measures

Handle substance within a closed system. Provide a good standard of general ventilation (not less than 1 to 3 air changes per hour). Wash off skin contamination immediately.

Organisational measures to prevent /limit releases, dispersion and exposure

Integrated safety management systems

Conditions and measures related to personal protection, hygiene and health evaluation

Skin protection, Long sleeved clothing, Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. (Effectiveness (of a measure): 90 %)
Eye protection, Safety goggles or face-shield.
Respiratory protection, No (Effectiveness (of a measure): 0 %)

Additional good practice advice beyond the REACH Chemical Safety Assessment

Additional good practice advice	:	Minimise number of staff exposed., Effective contaminant extraction., Minimisation of manual phases., Avoidance of contact with contaminated tools and objects., Regular cleaning of equipment, work area and clothing., Handle in accordance with good industrial hygiene and safety practice.

2.3 Contributing scenario controlling worker exposure for: Formulation PROC2: Use in closed, continuous process with occasional controlled exposure

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures Use in closed, continuous process with occasional controlled exposure

2.4 Contributing scenario controlling worker exposure for: Formulation PROC3: Use in closed batch process (synthesis or formulation)

Human factors not influenced by risk management

Dermal exposure : One hand face only (240 cm2)

Technical conditions and measures

Containment measures Closed batch process with occational controlled exposure

2.5 Contributing scenario controlling worker exposure for: Formulation PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures Semi-closed process with occational controlled exposure

2.6 Contributing scenario controlling worker exposure for: Formulation PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact)

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures No

2.7 Contributing scenario controlling worker exposure for: Formulation PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

Human factors not influenced by risk management

Dermal exposure : Two hands (960 cm2)

Technical conditions and measures

Containment measures No

2.8 Contributing scenario controlling worker exposure for: Formulation PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Human factors not influenced by risk management

Dermal exposure : Two hands (960 cm2)

Technical conditions and measures

Containment measures Semi-closed process with occational controlled exposure

2.9 Contributing scenario controlling worker exposure for: Formulation PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures Semi-closed process with occational controlled exposure

2.10 Contributing scenario controlling worker exposure for: Formulation PROC13: Treatment of articles by dipping and pouring

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures No

2.11 Contributing scenario controlling worker exposure for: Formulation PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation

Human factors not influenced by risk management

Dermal exposure : Palms of both hands (480 cm2)

Technical conditions and measures

Containment measures No

2.12 Contributing scenario controlling worker exposure for: Formulation PROC15: Use as laboratory reagent

Human factors not influenced by risk management

Dermal exposure : One hand face only (240 cm2)

Technical conditions and measures

Containment measures No

3. Exposure estimation and reference to its source

Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value type	Level of Exposure	RCR
ERC2			Other			
Remarks:		Exposure assessment and risk characterization are not required for environment.				

Workers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value type	Level of Exposure	RCR
PROC2	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,01 mg/m³	< 0,01
		Systemic, Long term	Dermal	0,137 mg/kg bw/day	0,027
		Systemic, Long term	all routes		0,027
PROC3	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long	Dermal	0,069 mg/kg	0,013

		term		bw/day	
		Systemic, Long term	all routes		0,016
PROC4	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,5 mg/m³	0,014
		Indoor, Systemic, Long term	Dermal	0,686 mg/kg bw/day	0,134
		Systemic, Long term	all routes		0,148
PROC5	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,5 mg/m³	0,014
		Indoor, Systemic, Long term	Dermal	1,371 mg/kg bw/day	0,268
		Systemic, Long term	all routes		0,282
PROC8a	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,5 mg/m³	0,014
		Indoor, Systemic, Long term	Dermal	1,371 mg/kg bw/day	0,268
		Systemic, Long term	all routes		0,282
PROC8b	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	1,371 mg/kg bw/day	0,268
		Systemic, Long term	all routes		0,271
PROC9	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	0,686 mg/kg bw/day	0,134
		Systemic, Long term	all routes		0,137
PROC13	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	1,371 mg/kg bw/day	0,268
		Systemic, Long term	all routes		0,271
PROC14	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	0,343 mg/kg bw/day	0,067
		Systemic, Long term	all routes		0,07
PROC15	ECETOC TRA	Indoor without LEV, Systemic, Long term	Inhalation	0,1 mg/m³	< 0,01
		Indoor, Systemic, Long term	Dermal	0,034 mg/kg bw/day	< 0,01
		Systemic, Long term	all routes		< 0,01
Remarks:		LEV = Local Exhaust Ventilation.			
		Dermal, local, long term: there is no DNEL available nor a suitable benchmark value so quantitative dermal exposure estimation is not meaningful.			
		Qualitative assessment: As personal protective equipment is worn, the risk of local effects via long-term dermal exposure is considered to be			

	controlled.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

The safety data sheet at hand provides the user with risk management measures and operational conditions which enables him to work safely with the substance / mixture. If other risk management measures / operational conditions are adopted, the user has to ensure, that the risks are managed to at least equivalent levels.