

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

1.1 Identification of the substance or mixture

Substance name:	Orthophosphoric acid
Mixture name:	Phosphoric acid, water solution, 39 – 54%
Chemical name and formula:	Orthophosphoric acid, H ₃ PO ₄
Trade name:	Orthophosphoric acid
CAS number:	7664-38-2
EC number:	231-633-2
ID No in Appendix VI/CLP:	015-011-00-6
REACH Registration number:	01-2119485924-24-0013

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

Identified uses:

Manufacture of orthophosphoric acid.

Industrial uses: as intermediate in synthesis of chemical products, in formulation of mixtures including packaging & distribution, in metal surface treatment, as an acid cleaning agent, as processing aids in chemical industry (including laboratory application).

Professional uses: in fertilizers, in metal surface treatment, in construction applications, as a detergent and cleaning agent, as a soldering aid.

Consumers uses: as polishes and waxes, as washing and cleaning products, as soldering aid, in fertilizers.

See complete list in the exposure scenario provided as an annex.

Common technical functions: Fertilizers, Food/feedstuff additives, Intermediates, Laboratory chemicals, pH-regulating agents, Corrosion inhibitors and anti-scaling agents, Processing aid, Degreasing agent.

Uses advised against: none

1.3 Details of the supplier of the substance or mixture

Name:	AGROPOLYCHIM JSC
Address:	9160 DEVNYA, BULGARIA
Phone N°:	+359 / 519 97 419
Fax N°:	+359 / 519 9 33 63
E-mail of person responsible for SDS:	vasileva@agropolychim.bg

1.4 Emergency telephone number

European Emergency N°:	112
National centre for Prevention and Treatment of Intoxications N°:	+359 2 9154 409, 24 h/day
Emergency telephone at the company	+359 519 97 530, 24 h/day

2 HAZARDS IDENTIFICATION

2.1 Classification of the substance

2.1.1 Classification according to Regulation (EC) No 1272/2008/EC

Skin Corr. 1B, H314

2.1.3 Additional information

For full text of EU Hazard-statements: see section 16.

2.2 Label elements

2.2.1 Labeling according to Directive 1272/2008/EC

Hazard pictogram:

GHS05

Corrosion



Signal word(s): Danger

Hazard statements:

H314: Causes severe skin burns and eye damage.

Precautionary statements:

P260 Do not breathe dust/fumes/gas/mist/vapours/sprays.

P301+P330+P331 IF SWALLOWED: rinse mouth. Do not induce vomiting.

P303+P361+P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position 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.

P405 Store locked up.

2.3 Other hazards

The substance does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.

No other hazards identified.

3 COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Composition

Main component:

Name: Orthophosphoric acid

CAS number: 7664-38-2

EC number: 231-633-2

Index number in CLP Annex VI: 015-011-00-6

Preparation Concentration: 39 – 54 % (w/w)

Content of the main constituent on a dry base: $\geq 90,0 - \leq 100\%$ (w/w).

Impurities:

None of the impurities is considered relevant for classification and labelling of the substance.

As a result from technological process, impurities are possible, as follows:

IUPAC name, chemical formula	CAS No:	EINECS No:	Typical content, on a dry base
Orthophosphoric acid, H ₃ PO ₄	7664-38-2	231-235-3	92,93 %
Sulphuric acid, H ₂ SO ₄	7782-41-4	231-639-5	~ 4 %
Fluorine, F	7782-41-4	231-954-8	~ 3 %
Different metals – Fe, Al, Mg, Ca (under oxide form)			under 1 %

4 FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Phosphoric acid has a small oral toxicity, but is corrosive to eyes, skin and mucous membranes. An endoscope, because of the possible existence of several stomach or oesophagus burns, must be considered, even though it might cause perforations or contractions, as well as a stomach wash with an endogastric tube. An observation period might be needed.

Following inhalation

Breathe fresh air. If breathing discomfort occurs and persists after cessation of exposure, see a medical doctor.

Following skin contact

Rinse with water and soap.

Take off immediately all contaminated clothing.

Consult a doctor if irritation persists.

Following eye contact

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Seek medical advice.

Following ingestion

If swallowed, rinse mouth with water (only if the person is conscious).

Do not induce vomiting. Seek medical advice at once.

4.2 Most important symptoms and effects, both acute and delayed

Sensorial irritation and corrosive burns if contact with tissues. The vapour causes slight irritations in eyes, throat and skin.

4.3 Indication of any immediate medical attention and special treatment needed

Follow the advises given in section 4.1.

5 FIRE FIGHTING MEASURES

5.1 Extinguishing media

5.1.1 Suitable extinguishing media

Put out the fire using appropriate agents against the surrounding fire. Cool closed containers exposed to fire with water spray.

5.1.2 Unsuitable extinguishing media

None.

5.2 Special hazards arising from the substance or mixture

Non-flammable.

Hydrogen gas is released in contact with most metals

5.3 Advice for fire-fighters

According to the combustible substance involved.

6 ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

6.1.1 For non-emergency personnel & emergency responders

Wear personal protective equipment.

6.2 Environmental precautions

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite).

Avoid undiluted spillage entering the sewers, basements or pits and watercourses.

6.3 Methods and material for containment and cleaning up

Ventilate area and wash spill site after material pickup is complete.

Throw sand, ashes or powder cement to absorb the liquid.

Neutralize with slaked lime (calcium hydroxide), sodium carbonate, calcium carbonate or sodium bicarbonate.

Place in container for disposal according to local / national regulations.

6.4 Reference to other sections

For more information on exposure controls/personal protection or disposal considerations, please check section 8 and 13 of this safety data sheet.

7 HANDLING AND STORAGE

7.1 Precautions for safe handling

7.1.1 Protective measures

Ensure good ventilation of the work station – Respect the European Occupational Exposure Limit

Only use materials resistant to acids

For preference use pumping techniques for unloading and discharging.

Provide an adapted retention system.

Avoid any direct contact with the product.

Do not breathe vapours.

Never introduce water or any aqueous agent into tanks or containers containing acids

Dilutions or neutralizations are very highly exothermic. Avoid spatters. Carry out slowly

Always add acid to water

Do not mix with incompatible materials (See section 10.5)

7.1.2 Advice on general occupational hygiene

Do not to eat, drink and smoke in work areas;

Wash hands after use; and remove contaminated clothing and protective equipment before entering eating areas.

7.2 Conditions for safe storage, including any incompatibilities

Storage:

Store in cool, dry, clean, well ventilate areas away from alkaline products and metals.

Do not store under direct sun light.

Do not pile up the containers.

Do not store at temperatures close to freezing point.

Compatible materials:

Stainless steel 316-L.

High-density polyethylene.

Glass.

7.3 Specific end use(s)

Please check the identified uses in section 16 and on the annex for exposure scenario of this safety data sheet.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

8-hour TWA (ACGIH -US): 1 mg/m³

15-min STEL (EU ELV): 2 mg/m³

National recommendation – To be completed by member if applicable

Long-term DNEL for workers: 2.92 mg/ m³

Long term DNEL for general population: 0.73 mg/m³

PNEC : pH approach – Safe pH to be between 6 and 9.

8.2 Exposure controls

Use closed systems or covering of open containers (e.g. screens). Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.). Use of pliers, grip arms with long handles with manual use “to avoid direct contact and exposure by splashes (no working over one’s head)”. Local exhaust ventilation is not required but good practice (except for closed processes and outdoor processes).

8.2.1 Appropriate engineering controls

Ensure good ventilation of the work station

Monitor the atmosphere at regular intervals

8.2.2 Individual protection measures, such as personal protective equipment

8.2.2.1 Eye/face protection

Chemical safety goggles to chemical products or a face protection shield.

8.2.2.2 Skin protection

Wear suitable gloves (Neoprene gloves)

Use natural rubber boots.

Use acid resistant protective clothing.

8.2.2.3 Respiratory protection

Not required to usual works.

In foggy/vapours situations, use a spreading over all facemask with a suitable inorganic acid filter.

If product air concentration is not known, use autonomous breathing equipment.

8.2.2.4 Thermal hazards

The substance does not represent a thermal hazard, thus special consideration is not required

8.2.3 Environmental exposure controls

8.2.3.1 Industrial uses

Avoid uncontrolled discharging orthophosphoric acid solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface waters are minimized.

8.2.3.2 Professional uses

Avoid uncontrolled discharging orthophosphoric acid solutions at high flow into municipal wastewater or to surface water

9 PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance:	viscous liquid/solid
Odour:	odourless
pH:	< 1
pKa:	2.148, 7.198, 12.375
Melting point:	41.1°C at 1013 hPa
Boiling point:	296.5°C at 1013 hPa
Flash point:	not applicable (inorganic substance)
Evaporation rate:	No data available
Flammability:	non flammable
Explosive limits:	non explosive
Vapour pressure:	4 Pa at 20°C
Vapour density:	Not data available
Relative density:	1.84 at 20°C
Solubility in water:	1000 g/L at 20°C
Partition coefficient:	not applicable (inorganic substance)
Auto ignition temperature:	not applicable (inorganic substance)
Decomposition temperature:	not applicable
Viscosity:	600 mPa s at 25°C
Oxidising properties:	Non Oxidising
Explosive properties	Non explosive

9.2 Other information

Miscible with water in all proportion

10 STABILITY AND REACTIVITY

10.1 Reactivity

Stable under recommended storage and handling conditions (see section 7)

10.2 Chemical stability

Thermally stable in reaction term at designed storage conditions.

React violently with strong alkalis.

10.3 Possibility of hazardous reactions

May form Phosphorous oxides.

Any contact with reactive metals (as steel to carbon and aluminium) may produce air-hydrogen flammable/explosive mixtures. Reacts violently with strong bases.

10.4 Conditions to avoid

High temperature, light,

10.5 Incompatible materials

- alkalis and caustic products.
- non noble metals

10.6 Hazardous decomposition products

When orthophosphoric acid is heated, phosphorous oxides may be formed.

11 TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Toxicity endpoints	Outcome of the effects assessment
Absorption	The primary health effect orthophosphoric acid is corrosion due to a pH shift. Therefore, absorption is not a relevant parameter for the effects assessment
Acute toxicity	Dermal : No reliable data Oral: LD50 on female rats similar to OECD 423: 1.7 mL/100 g body weight (2600 mg/kg bw) Inhalation: No reliable data available Corrosive substance and not an acute toxicant via inhalation.
Irritation / corrosion	Eye & skin: corrosive Classified as a skin corrosive substance category 1B (concentration $\geq 25\%$) and an eye irritant ($10\% \leq$ concentration $< 25\%$) according to the CLP Regulation Annex VI, table 3.1
Sensitisation	Corrosive substance – Not relevant

Toxicity endpoints	Outcome of the effects assessment
Repeated dose toxicity	oral: A Combined Repeated Dose Toxicity Study With the Reproduction /Developmental Toxicity Screening Test according to OECD 422 (oral gavage in rats) on phosphoric acid, 2008 provide a NOAEL of 250 mg/kg/day inhalation: No reliable data dermal: No data
Mutagenicity	Orthophosphoric acid was found to be negative in in-vitro testing: <ul style="list-style-type: none"> - AMES (OECD 471) in Salmonella typhimurium strains TA1535, TA1537, TA98, TA100 and Escherichia coli strain WP2uvrA - In vitro mammalian chromosome aberration test (OECD 473) in Chinese Hamster Lung (CHL/IU) cell line - Mammalian cell gene mutation assay (mouse lymphoma assay- OECD476) in L5178Y TK+/-3.7.2c mouse lymphoma cell line with and without metabolic activation.
Carcinogenicity	No data
Toxicity for reproduction	Effect on fertility: No adverse effects were seen on reproduction/developmental according to OECD 422 (oral gavage on rats) on orthophosphoric up to a dose – NOAEL of 500 mg/kg bw/day Developmental toxicity: The administration of up to a dose – NOAEL of 410 mg/kg (body weight) of monosodium phosphate to pregnant rats for 10 consecutive days had no clearly discernible effect on nidation or on maternal or foetal survival (for maternal and developmental toxicity).
Likely routes of exposure	The most likely route of exposure to orthophosphoric acid is via inhalation. If inhaled Orthophosphoric acid fumes may cause immediate irritation of the respiratory tract, pain. Via dermal contact, orthophosphoric acid causes skin and eye burns. Via ingestion, orthophosphoric acid causes burns of the digestive tract.

12 ECOLOGICAL INFORMATION

12.1 Toxicity

12.1.1 Acute/Prolonged toxicity to fish

Median lethal pH (96h) 3-3.25 for Lepomis macrochirus (no guideline followed).

12.1.2 Acute/Prolonged toxicity to aquatic invertebrates

EC50 (48 h): > 100 mg/L test mat. (nominal) based on: immobilization (OECD 202 - Daphnia magna)

12.1.3 Acute/Prolonged toxicity to aquatic plants

EC50 (72 h): > 100 mg/L test mat. (nominal) based on: growth rate (OECD 201- Desmodesmus subspicatus (algae))

NOEC (72 h): 100 mg/L test mat. (nominal) based on: growth rate (OECD 201- Desmodesmus subspicatus (algae))

12.1.4 Toxicity to micro-organisms e.g. bacteria

No data on orthophosphoric acid

12.1.5 Chronic toxicity to aquatic organisms

No data on orthophosphoric acid

12.1.6 Toxicity to soil dwelling organisms

No data on orthophosphoric acid

12.1.7 Toxicity to terrestrial plants

No data on orthophosphoric acid

12.1.8 General effect

Affect pH level. Increase of phosphate concentrations have minor effect.

12.2 Persistence and degradability

Not relevant for inorganic substances

12.3 Bioaccumulative potential

Not relevant for inorganic substances

12.4 Mobility in soil

No data on orthophosphoric acid.

12.5 Results of PBT and vPvB assessment

Not relevant for inorganic substances

12.6 Other information

No other information identified

13 DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Neutralize carefully with lime or carbonates

Dispose of in accordance with relevant local regulations

The used packing is only meant for packing this product. After usage, empty the packing completely and dispose of at an approved site

14 TRANSPORT INFORMATION

14.1 Classification

International regulations

UN number: 1805 - ORTHOPHOSPHORIC ACID

Land transport (ADR/RID)

Class: 8

Hazard identification number: /

Classification code: C1

Packaging group: III

Label: 8

Special precaution for user: No special precaution identified

Inland waterway transport (AND(R))

Class: 8

Classification code: C1

Packaging group: III
Label: 8
Marine transport (IMDG)
Class: 8
Subsidiary risk:
Packaging group: III
EmS number: F-A, S-B
Label: 8
Marine pollutant: Not a marine pollutant

Air transport (ICAO/IATA)
Class: 8
Subsidiary risk:
Packaging group: III
Passenger aircraft: FORBIDDEN
Labelling: Corrosive

15 REGULATORY INFORMATION

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

Authorizations: Not required
Restrictions on use: no
Other EU regulations: Orthophosphoric acid is not a SEVESO substance, not an ozone depleting substance and not a persistent organic pollutant
National regulations: Water hazard class 1 (Germany)

15.2 Chemical safety assessment

A chemical safety assessment has been carried out for this substance.

16 OTHER INFORMATION

16.1 Hazard Statement

H314: Causes severe skin burns and eye damage.

16.2 Precautionary Statement

P234: Keep only in original container.
P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P264: Wash... thoroughly after handling.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P301+P330+P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P363: Wash contaminated clothing before reuse.

P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P310: Immediately call a POISON CENTER or doctor/physician.

P390: Absorb spillage to prevent material damage.

P404: Store in a closed container.

P406: Store in corrosive resistant/... container with a resistant inner liner.

P501: Dispose of contents/container to...

16.5 Revision

Chapters 2 and 3.

16.6 Literature references:

Disclaimer: This sheet complements the technical sheets but does not replace them. The information given is based on our knowledge of the product, at the time of publication and is given in good faith. In addition, the attention of the user is drawn to the possible risk incurred by using the product for any other use than that for which it was intended.

In no way does this exempt the user from knowing and applying all the regulations controlling his activity. He alone will take on the responsibility for taking the precautions involved when using the product.

The aim of all the mandatory regulations mentioned is to help the user to fulfill his obligations regarding the use of hazardous products.

This information must not be considered exhaustive. It does not exempt the user from his responsibility to ensure that other obligations than those mentioned could apply relating to the storage and use of the product.

16.7 Acronyms, abbreviations

AC: Article category

ADR: European Agreement concerning international carriage of Dangerous goods by Road

CAS: Chemical Abstracts Service

CO₂: Carbon Dioxide

DNEL: Derivative No effect Level

EC: European Community

EN: European Norm

ERC: Environmental Release Category

EU: European Union

EUH: European Hazard Statement

GHS: Global Harmonized System

H: Hazard Statement

H3PO4: Orthophosphoric acid

ICAO: International Civil Aviation Organization

IMDG: International Maritime Dangerous Goods

IATA: International Air Transport Association

LC50: Median lethal dose

NOAEC/NOAEL: No Observable Adverse Effect Concentration / Level

OECD: Organization for Economic Co-Operation and Development

P: Precautionary statement

PBT: Persistent, bioaccumulative, Toxic

PC: Product Category

PFTE: Polytetrafluoroethylene

PNEC: Predicted No effect Concentration

Ppm: Part per million

PROC: Process Category

PVC: Polyvinyl Chloride

R: Risk phrases

e-SDS: Extended Safety Data Sheet

STEL: Short Term Exposure Limit

SU: Sector of Use

USEPA: United States Environmental Protection Agency

vPvB: Very persistent, very bioaccumulative

w/w: weight by weight

17 ANNEX : EXPOSURE SCENARIO

1. Short title of exposure scenario 1

Manufacture of orthophosphoric acid

2. Description of activities and processes covered in the exposure scenario

Sector of use (SU)	SU3, SU 8, SU9
Product category (PC)	Not applicable
Process category (PROC)	PROC 1: Use in closed process, no likelihood of exposure. PROC 2: Use in closed, continuous process with occasional controlled exposure. PROC 3: Use in closed batch process (synthesis or formulation). PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises. PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). PROC 15: Use as laboratory reagent.
Article category (AC)	Not applicable
Environmental release category (ERC)	ERC 1 (Manufacture of substances)

3. Operational conditions

3.1 Operational conditions related with frequency and quantities of use

Duration of exposure at workplace:	8 hours/day
Frequency of exposure at workplace:	220 days/year for each worker
Annual amount used per site:	The daily and annual amount/emission per site is not considered to be the main determinant for environmental exposure.

3.2 Operational conditions related with substance/ product

Physical state	Solid / Liquid
Concentration of substance in mixture	Aqueous solutions contain more than 25% orthophosphoric acid up to solid form 100% orthophosphoric acid.

3.3 Other relevant operational conditions

Based on the information retrieved, the maximum duration considered for this exposure scenario is a working shift of maximum 8h/day, although workers are not permanently subject to actual or potential exposure during the entirely working shift. Production sites usually manufacture liquid H₃PO₄ with a concentration above 25%, being the typical concentration above 75%. In some cases the solid form of orthophosphoric acid is manufactured as well.

4. Risk Management Measures

4.1 RMMs related to workers

Organisational measures	Workers in the identified risky process/areas should be trained a) to avoid to work without protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of orthophosphoric acid and c) to follow the safer procedures instructed by the employer
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	The employer has also to ascertain that the required PPE is available and used according to instructions.
Technical measures	<ul style="list-style-type: none"> • Use closed/ automated systems or covering of open containers (e.g. screens) to avoid irritating mists, sprayings and potential splashes. (Good practice) • Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.) (Good practice) • Use of pliers, grip arms with long handles with manual use “to avoid direct contact and exposure by splashes (no working over one’s head)” (Good practice) • Store in cool, dry, clean, well ventilate areas away from alkaline products and metals. Do not store under direct sun light. Do not pile up the containers. Do not store at temperatures close to freezing point. (Good practice). • Compatible materials: stainless steel 316-L; high density polyethylene; glass • Local exhaust / general ventilation is not required but good practice
Respiratory protection	Respiratory protection: respiratory protection is not required to usual works. In foggy- vaporous situations, use of a spreading over all facemask with a suitable inorganic acid filler.
Hand protection	Hand protection is required: impervious chemical resistant protective gloves (required). Material: chloroprene gloves or equivalent.
Eye protection	Wearing of eye/face protection is required. Chemical goggles or face protection shield should be consistent with EN 166 or equivalent.
Skin and body protection	Wearing of suitable acid resistant protective clothing and rubber boots is required.
Hygiene measures	Keep away from foodstuffs, drinks and tobacco. Wash hands before breaks and at end of work. Keep work clothes separate.
4.2 RMMs related to the environment	
Organisational measures	Procedural and/or control technologies are required to minimize emissions and the resulting exposure during cleaning and maintenance procedures.
Abatement measures related with wastewater	Orthophosphoric acid wastewater should be reused or discharged to the industrial wastewater and further neutralized if needed
Abatement measures waste air and solid waste	Orthophosphoric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure and high water solubility.
4.3 Waste related measures	
Type of waste	Liquid waste. Packaging material
Disposal technique	The neutralised liquid can be spilled in accordance to regulatory normative (Law regulates emptying wastewater containing phosphorous).The residue of the containers or the used container itself should be disposed in accordance with local requirements.
Fraction released to environment during waste treatment	The pH of wastewater released from manufacturing sites should be between pH 6-9.
5. Prediction of exposure resulting from the conditions described above and the substance properties.	
5.1. Human exposure	
Workers (oral)	No significant oral exposure due to good hygiene practice.
Workers (inhalation) <i>DNEL = 2.92 mg/m³</i> <i>EU –TWA = 1 mg/m³</i>	<p>The European time weighted average (8h) exposure limit for phosphoric acid is lower than the derivative No Effect Level value. Thus if regulatory requirements are observed no risks are related to the use of phosphoric acid.</p> <p>Using ECETOC TRA version 1, the exposure concentration was of 0.375 mg/m³.</p>

Workers (dermal) As reported in the CLP Regulation No 1272/2008 Annex VI Table 3.1, H₃PO₄ is corrosive above the 25% concentration limit. Protective clothing and gloves are mandatory when handling corrosive substances and effective control measures are in place to prevent dermal exposure.

Thus repeated daily dermal exposure to product is considered negligible.

5.2. Environmental exposure (qualitative assessment)

Environmental release	The production of orthophosphoric acid can potentially result in aquatic emissions and locally increase the phosphate concentration while decreasing the pH in the aquatic environment. However, the pH of industrial effluents is normally measured frequently and can be neutralized easily.
Waste water treatment plants (WWTP)	Not relevant. Orthophosphoric acid dissociates in H ⁺ and PO ₄ ³⁻ and will be neutralized before reaching WWTP.
Aquatic pelagic compartment	Due to its high water solubility and low vapour pressure, orthophosphoric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, orthophosphoric acid progressively dissociates affecting the pH of the receiving compartment. The higher the buffer capacity of the water is, the lower the effect on pH will be.
Sediments	Not relevant. There will be no absorption on particulate matter or surfaces.
Soil and groundwater	Not relevant. Infiltration, partial neutralization, dispersion, dilution.
Atmospheric compartment	Not relevant. Orthophosphoric acid release is negligible, due to its low vapour pressure.
Secondary poisoning	Bioaccumulation in organisms is not relevant for orthophosphoric acid.

1. Short title of exposure scenario 2	
<u>Industrial use of orthophosphoric acid</u>	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU 3, SU 8, SU 9, SU 10, SU 15, SU 16, SU 17
Product category (PC)	PC0,PC1, PC7,PC9a, PC9b, PC13, PC14,PC19, PC20,PC21, PC23,PC24, PC25,PC26, PC32,PC34, PC35,PC37, PC39
Process category (PROC)	<p>PROC 1: Use in closed process, no likelihood of exposure.</p> <p>PROC 2: Use in closed, continuous process with occasional controlled exposure.</p> <p>PROC 3: Use in closed batch process (synthesis or formulation).</p> <p>PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises.</p> <p>PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).</p> <p>PROC 7: Industrial spraying.</p> <p>PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.</p> <p>PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.</p> <p>PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).</p> <p>PROC 10: Roller application or brushing.</p> <p>PROC 13: Treatment of articles by dipping and pouring.</p> <p>PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation.</p> <p>PROC 15: Use as laboratory reagent.</p> <p>PROC 19: Hand-mixing with intimate contact and only PPE available.</p> <p>PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature.</p> <p>PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature.</p>
Article category (AC)	Not applicable
Environmental release category (ERC)	<p>ERC 2 (Formulation of preparations)</p> <p>ERC 3: Formulation in materials.</p> <p>ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles.</p> <p>ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates).</p> <p>ERC 6b (Industrial use of reactive processing aid)</p> <p>ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers.</p>
3. Operational conditions	
3.1 Operational conditions related with frequency and quantities of use	
Duration of exposure at workplace:	8 hours/day
Frequency of exposure at workplace:	220 days/year for each worker
Annual amount used per site:	The daily and annual amount/emission per site is not considered to be the main determinant for environmental exposure.
3.2 Operational conditions related with substance/ product	

Physical state	Solid / Liquid
Concentration of substance in mixture	Aqueous solutions contain more than 25% orthophosphoric acid up to solid form 100% orthophosphoric acid.

3.3 Other relevant operational conditions

Based on the information retrieved, the maximum duration considered for this exposure scenario is a working shift of above 4h/day. Concentration of orthophosphoric acid in industrial application range from 10 to 85% and worst case will be taken into account.

4. Risk Management Measures

4.1 RMMs related to workers

Organisational measures	<p>Workers in the identified risky process/areas should be trained a) to avoid to work without protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of orthophosphoric acid and c) to follow the safer procedures instructed by the employer</p> <p>The employer has also to ascertain that the required PPE is available and used according to instructions.</p>
Technical measures	<ul style="list-style-type: none"> • Use closed/ automated systems or covering of open containers (e.g. screens) to avoid irritating mists, sprayings and potential splashes. (Good practice) • Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.) (Good practice) • Use of pliers, grip arms with long handles with manual use "to avoid direct contact and exposure by splashes (no working over one's head)" (Good practice) • Store in cool, dry, clean, well ventilate areas away from alkaline products and metals. Do not store under direct sun light. Do not pile up the containers. Do not store at temperatures close to freezing point. (Good practice). • Compatible materials: stainless steel 316-L; high density polyethylene; glass • Local exhaust / general ventilation is not required but good practice
Respiratory protection	Respiratory protection: respiratory protection is not required to usual works. In foggy- vaporous situations, use of a spreading over all facemask with a suitable inorganic acid filler.
Hand protection	Hand protection is required: impervious chemical resistant protective gloves (required). Material: chloroprene gloves or equivalent.
Eye protection	Wearing of eye/face protection is required. Chemical goggles or face protection shield should be consistent with EN 166 or equivalent.
Skin and body protection	Wearing of suitable acid resistant protective clothing and rubber boots is required.
Hygiene measures	Keep away from foodstuffs, drinks and tobacco. Wash hands before breaks and at end of work. Keep work clothes separate.

4.2 RMMs related to the environment

Organisational measures	Procedural and/or control technologies are required to minimize emissions and the resulting exposure during cleaning and maintenance procedures.
Abatement measures related with wastewater	Orthophosphoric acid wastewater should be reused or discharged to the industrial wastewater and further neutralized if needed

Abatement measures waste air and solid waste	Orthophosphoric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure and high water solubility.
4.3 Waste related measures	
Type of waste	Liquid waste. Packaging material
Disposal technique	The neutralised liquid can be spilled in accordance to regulatory normative (Law regulates emptying wastewater containing phosphorous).The residue of the containers or the used container itself should be disposed in accordance with local requirements.
Fraction released to environment during waste treatment	The pH of wastewater released from manufacturing sites should be between pH 6-9.
5. Prediction of exposure resulting from the conditions described above and the substance properties.	
5.1. Human exposure	
Workers (oral)	No significant oral exposure due to good hygiene practice.
Workers (inhalation) <i>DNEL = 2.92 mg/m³</i> <i>EU –TWA = 1 mg/m³</i>	The European time weighted average (8h) exposure limit for phosphoric acid is lower than the derivative No Effect Level value. Thus if regulatory requirements are observed no risks are related to the use of phosphoric acid. Using ECETOC TRA version 1, the exposure concentration was of 0.375 mg/m ³ .
Workers (dermal)	As reported in the CLP Regulation No 1272/2008 Annex VI Table 3.1, H ₃ PO ₄ is corrosive above the 25% concentration limit. Protective clothing and gloves are mandatory when handling corrosive substances and effective control measures are in place to prevent dermal exposure. Thus repeated daily dermal exposure to product is considered negligible.
5.2. Environmental exposure (qualitative assessment)	
Environmental release	The production of orthophosphoric acid can potentially result in aquatic emissions and locally increase the phosphate concentration while decreasing the pH in the aquatic environment. However, the pH of industrial effluents is normally measured frequently and can be neutralized easily.
Waste water treatment plants (WWTP)	Not relevant. Orthophosphoric acid dissociates in H ⁺ and PO ₄ ³⁻ and will be neutralized before reaching WWTP.
Aquatic pelagic compartment	Due to its high water solubility and low vapour pressure, orthophosphoric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, orthophosphoric acid progressively dissociates affecting the pH of the receiving compartment. The higher the buffer capacity of the water is, the lower the effect on pH will be.
Sediments	Not relevant. There will be no absorption on particulate matter or surfaces.
Soil and groundwater	Not relevant. Infiltration, partial neutralization, dispersion, dilution.
Atmospheric compartment	Not relevant. Orthophosphoric acid release is negligible, due to its low vapour pressure.
Secondary poisoning	Bioaccumulation in organisms is not relevant for orthophosphoric acid.

1. Short title of exposure scenario 3	
<u>Professional use of orthophosphoric acid</u>	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU 1, SU 19, SU 22
Product category (PC)	PC 9a, 9b, 12, 14, 15, 31, 35, 37, 38
Process category (PROC)	<p>PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).</p> <p>PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.</p> <p>PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.</p> <p>PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).</p> <p>PROC 10: Roller application or brushing.</p> <p>PROC 11: Non industrial spraying.</p> <p>PROC 13: Treatment of articles by dipping and pouring.</p> <p>PROC 19: Hand-mixing with intimate contact and only PPE available.</p> <p>PROC 25: Other hot work operations with metals.</p>
Article category (AC)	Not applicable
Environmental release category (ERC)	<p>ERC 8a (Wide dispersive indoor use of processing aids in open systems)</p> <p>ERC 8b (Wide dispersive indoor use of reactive substances in open systems)</p> <p>ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix.</p> <p>ERC 8e (Wide dispersive outdoor use of reactive substances in open systems)</p>
3. Operational conditions	
3.1 Operational conditions related with frequency and quantities of use	
Duration of exposure at workplace:	8 hours/day
Frequency of exposure at workplace:	220 days/year for each worker
Annual amount used per site:	The daily and annual amount/emission per site is not considered to be the main determinant for environmental exposure.
3.2 Operational conditions related with substance/ product	
Physical state	Solid / Liquid
Concentration of substance in mixture	Orthophosphoric acid is used during the production phase of various cleaning products, although often the amount in the end products is limited due to its reactivity. Nevertheless in case of this scenario worst case scenario was considered with products containing more than 25% orthophosphoric acid.
3.3 Other relevant operational conditions	
The amount used per professional workers varies from activity to activity. The maximum duration >4 h/day was considered as worst case assumption.	
4. Risk Management Measures	
4.1 RMMs related to workers	

Organisational measures	Because orthophosphoric acid is corrosive, the risk management measures for human health should focus on the prevention of direct contact with the substance. Since automated, closed systems and local exhaust ventilation may be less feasible to implement for professional settings, product related design measures should be taken (low concentration for example) as well as good practices that prevent direct eye/skin contact with orthophosphoric acid and prevent formation of aerosols and splashes are more important along with the personal protective equipment measures.		
	<i>H3PO4 concentration in product > 25%:</i>	<i>H3PO4 concentration in product between 10% and 25%:</i>	<i>H3PO4 concentration in product < 10%</i>
Respiratory protection	Recommended	Good practice	Not required
Hand protection	Required	Recommended	Good practice
Eye protection	Required	Recommended	Good practice
Skin and body protection	Required	Recommended	Good practice
Hygiene measures	Keep away from foodstuffs, drinks and tobacco. Wash hands before breaks and at end of work. Keep work clothes separate..		

4.2 RMMs related to the environment

Organisational measures	Procedural and/or control technologies are required to minimise emissions and the resulting exposure during cleaning and maintenance procedures.
Abatement measures related to wastewater	Different rules apply to professional users regarding control of their effluents. It is required that the flow of release to municipal wastewater or to surface water do not cause significant in pH changes. It is then dependant whether or not discharging is done to municipal wastewater equipped with sewage treatment plant or not.
Abatement measures related to waste air	Orthophosphoric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure. Therefore, no specific risk management measures for air emissions are provided..
Abatement measures related to soil	For release to soil for fertilizer uses, the pH will be naturally neutralized by the medium before reaching the groundwater.

4.3 Waste related measures

Type of waste	Liquid waste – packaging material
Disposal technique	The neutralised liquid can be spilled in accordance to applicable normative (Law regulates emptying wastewater containing phosphorous).The residue of the containers or the used container itself should be disposed in accordance with local requirements.

5. Prediction of exposure resulting from the conditions described above and the substance properties.

5.1. Human exposure

Professionals (oral)	No significant oral exposure due to good hygiene practice.
Professionals (dermal)	As reported in the CLP Regulation No 1272/2008 Annex VI Table 3.1, H3PO4 is corrosive above the 25% concentration limit. Protective clothing and gloves are mandatory when handling corrosive substances and effective control measures are in place to prevent dermal exposure. Thus repeated daily dermal exposure to product is considered negligible.
Professionnels (inhalation)	The European time weighted average (8h) exposure limit for phosphoric acid is lower than the derivative No Effect Level value. Thus if regulatory requirements are observed

<i>DNEL = 2.92 mg/m³</i> <i>EU –TWA = 1 mg/m³</i>	no risks are related to the use of phosphoric acid. Using ECETOC TRA version 1, the exposure concentration was of 0.375 mg/m ³ .
5.2. Environmental exposure (qualitative assessment)	
Environmental release	The production of orthophosphoric acid can potentially result in aquatic emissions and locally increase the phosphate concentration while decreasing the pH in the aquatic environment. However, the pH of industrial effluents is normally measured frequently and can be neutralized easily.
Waste water treatment plants (WWTP)	Not relevant. Orthophosphoric acid dissociates in H ⁺ and PO ₄ ³⁻ and will be neutralized before reaching WWTP.
Aquatic pelagic compartment	Due to its high water solubility and low vapour pressure, orthophosphoric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, orthophosphoric acid progressively dissociates affecting the pH of the receiving compartment. The higher the buffer capacity of the water is, the lower the effect on pH will be.
Sediments	Not relevant. There will be no absorption on particulate matter or surfaces.
Soil and groundwater	Not relevant. Infiltration, partial neutralization, dispersion, dilution
Atmospheric compartment	Not relevant. Orthophosphoric acid release is negligible, due to its low vapour pressure.
Secondary poisoning	Bioaccumulation in organisms is not relevant for orthophosphoric acid.

1. Short title of exposure scenario 4	
<u>Consumer use of cleaning products and other mixtures containing orthophosphoric acid</u>	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU 21 (Consumer uses: Private households)
Product category (PC)	PC 0, 12, 28, 31, 35, 38, 39
Process category (PROC)	Not applicable
Article category (AC)	Not applicable
Environmental release category (ERC)	ERC 8a (Wide dispersive indoor use of processing aids in open systems) ERC 8b (Wide dispersive indoor use of reactive substances in open systems) ERC 8e (Wide dispersive outdoor use of reactive substances in open systems) ERC 10a Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a Wide dispersive indoor use of long-life articles and materials with low release
3. Operational conditions	
3.1 Operational conditions related with frequency and quantities of use	
Duration of exposure:	Lime scale remover: 20 minutes per event
Frequency of exposure:	Lime scale remover: once a day
Use amount per event:	Lime scale remover: 110 g/event
Emission days:	360 days/year
3.2 Operational conditions related with substance/ product	
Physical state	Liquid
Concentration of substance in mixture	Formulated mixtures may contain up to 25% orthophosphoric acid. In general terms the concentration of orthophosphoric acid in these products are very low and rarely exceed 10%. Furthermore the amounts of orthophosphoric acid used in these mixtures will interact with other ingredients in acid-base reactions and thus only residues of orthophosphoric acid will remain as such in the final product.
3.3 Other relevant operational conditions	
Orthophosphoric acid is employed as the electrolyte in batteries. Consumer use considers the service life and the end-of-life stage of orthophosphoric acid in batteries. Given that batteries are sealed articles and that orthophosphoric acid involved in their maintenance is not intended for direct release exposure to and emission from orthophosphoric acid in these life-cycle stages should be negligible and therefore an exposure assessment is not considered deemed.	
4. Risk Management Measures	
4.1 RMMs related to workers	
General advise	Consumer products should be intrinsically be safe, therefore products containing Orthophosphoric acid should be designed to avoid accidents and in case an accident happens instructions should be available how to minimise the effects. Risk management measures in place relate to the design of the consumer product and to consumers use.
Product design	<ul style="list-style-type: none"> • Required to use resistant labelling-package to avoid its auto-damage and loss of the label integrity, under normal use and storage of the product. • Required that household chemicals, containing Orthophosphoric acid over 10% which may be accessible to children should be provided with a child-resistant fastening and a tactile warning of

	<ul style="list-style-type: none">• Required to provide improved use instructions, and product information to consumers. It should be advisable to use these products in the absence of children or other potential sensitive groups.• Advisable to deliver only in small amounts
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Instructions for product containing more than 10% orthophosphoric acid	<ul style="list-style-type: none"> • Keep out of reach of children. • Keep away from eyes. If product gets into eyes rinse thoroughly with water. • Rinse and dry hands after use • Do not ingest. If the product is ingested then seek medical advice. • Do not change container to store contents • Do not mix with other products • Do not apply product into ventilator openings or slots. • Ventilate the room after use 	
Respiratory protection	Not required	
Hand protection	H ₃ PO ₄ concentration in product between 10% and 25%: Recommended	H ₃ PO ₄ concentration in product < 10%: Good practice
Eye protection	H ₃ PO ₄ concentration in product between 10% and 25%: Recommended	H ₃ PO ₄ concentration in product < 10%: Good practice
Skin and body protection	If splashes are likely to occur, wear long sleeves	
Hygiene measures	Keep away from foodstuffs, drinks and tobacco. Wash hands thoroughly after open handling of the product.	
4.2 RMMs related to the environment		
Organisational measures	Not applicable	
Abatement measures related to wastewater	Wastewater is treated via chemical/biological municipal wastewater treatment plants.	
Abatement measures related to waste air	Not applicable	
Abatement measures related to soil	No measures	
4.3 Waste related measures		
Type of waste	Packaging material.	
Disposal technique	Contaminated packaging material will contain negligible amounts of substance. It will be disposed as domestic/ municipal waste.	
5. Prediction of exposure resulting from the conditions described above and the substance properties.		
5.1. Human exposure – Consumers		
<i>Prediction of human exposure resulting of use of lime scale remover (worst case scenario in term of exposure)</i>		
Consumer (dermal)	Contact with tissue and water of low concentration orthophosphoric acid will yield phosphate and hydrogen ions. These ions are abundantly available in the body. Although accidental exposure to orthophosphoric acid at a concentration higher than 10% is normally excluded from an EU chemical safety assessment and accidental exposure is not considered in the present assessment, several risk management measures for consumers are included in the dossier.	
Consumer (inhalation) <i>DNEL = 0.73 mg/m³</i>	Calculated with ConsExpo: 0,442 mg/m ³	RCR 0.6
5.2. Environmental exposure (qualitative assessment)		
Consumer uses relates to already diluted products, which will further be neutralized quickly in the sewer, well before reaching a WWTP or surface water.		

Orthophosphoric acid used in batteries: there is no environmental release as batteries are sealed articles with a long service life. After use, batteries should be recycled as much as possible. If disposed as municipal waste, orthophosphoric acid is not expected to cause a significant pH effect to the environment when incinerated or land filled.

17.1

Summarised exposure scenarios for orthophosphoric acid

Summary of exposure scenario 1:

1. Short title of exposure scenario 1	
Manufacture of orthophosphoric acid	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU3, SU 8, SU9
Product category (PC)	Not applicable
Process category (PROC)	PROC 1: Use in closed process, no likelihood of exposure. PROC 2: Use in closed, continuous process with occasional controlled exposure. PROC 3: Use in closed batch process (synthesis or formulation). PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises. PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). PROC 15: Use as laboratory reagent.
Article category (AC)	Not applicable
Environmental release category (ERC)	ERC 1 (Manufacture of substances)
3. Operational conditions	
3.1 Operational conditions related with frequency and quantities of use	
Duration of exposure at workplace:	8 hours/day
Frequency of exposure at workplace:	220 days/year for each worker
Annual amount used per site:	The daily and annual amount/emission per site is not considered to be the main determinant for environmental exposure.
3.2 Operational conditions related with substance/ product	
Physical state	Solid / Liquid
Concentration of substance in mixture	Aqueous solutions contain more than 25% orthophosphoric acid up to solid form 100% orthophosphoric acid.
3.3 Other relevant operational conditions	
Based on the information retrieved, the maximum duration considered for this exposure scenario is a working shift of maximum 8h/day, although workers are not permanently subject to actual or potential exposure during the entirely working shift. Production sites usually manufacture liquid H ₃ PO ₄ with a concentration above 25%, being the typical concentration above 75%. In some cases the solid form of orthophosphoric acid is manufactured as well.	
4. Risk Management Measures	
4.1 RMMs related to workers	
Organisational measures	Workers in the identified risky process/areas should be trained a) to avoid to work without protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of orthophosphoric acid and c) to follow the safer procedures instructed by the employer The employer has also to ascertain that the required PPE is available and used according to instructions.
Technical measures	<ul style="list-style-type: none"> Use closed/ automated systems or covering of open containers (e.g. screens) to avoid irritating mists, sprayings and potential splashes. (Good practice) Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.) (Good practice)

	<ul style="list-style-type: none"> Use of pliers, grip arms with long handles with manual use “to avoid direct contact and exposure by splashes (no working over one’s head)” (Good practice) Store in cool, dry, clean, well ventilate areas away from alkaline products and metals. Do not store under direct sun light. Do not pile up the containers. Do not store at temperatures close to freezing point. (Good practice). Compatible materials: stainless steel 316-L; high density polyethylene; glass Local exhaust / general ventilation is not required but good practice 			
Respiratory protection	Respiratory protection: respiratory protection is not required to usual works. In foggy-vaporous situations, use of a spreading over all facemask with a suitable inorganic acid filler.			
Hand protection	Hand protection is required: impervious chemical resistant protective gloves (required). Material: chloroprene gloves or equivalent.			
Eye protection	Wearing of eye/face protection is required. Chemical goggles or face protection shield should be consistent with EN 166 or equivalent.			
Skin and body protection	Wearing of suitable acid resistant protective clothing and rubber boots is required.			
Hygiene measures	Keep away from foodstuffs, drinks and tobacco. Wash hands before breaks and at end of work. Keep work clothes separate.			
4.2 RMMs related to the environment				
Organisational measures	Procedural and/or control technologies are required to minimize emissions and the resulting exposure during cleaning and maintenance procedures.			
Abatement measures related with wastewater	Orthophosphoric acid wastewater should be reused or discharged to the industrial wastewater and further neutralized if needed			
Abatement measures waste air and solid waste	Orthophosphoric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure and high water solubility.			
4.3 Waste related measures				
Type of waste	Liquid waste. Packaging material			
Disposal technique	The neutralised liquid can be spilled in accordance to regulatory normative (Law regulates emptying wastewater containing phosphorous).The residue of the containers or the used container itself should be disposed in accordance with local requirements			
Fraction released to environment during waste treatment	The pH of wastewater released from manufacturing sites should be between pH 6-9.			
5. Prediction of exposure resulting from the conditions described above and the substance properties.				
5.1. Human exposure				
Workers (oral)	No significant oral exposure due to good hygiene practice.			
Workers (inhalation) <i>DNEL (EU-TWA)= 1 mg/m³</i>	Liquid - Calculated with ECETOC TRA	RCR	Solid - Calculated with ECETOC TRA	RCR
PROC 1	3.75E-01 mg/m ³	0.375	1E-02 mg/m ³	0.01
PROC 2	3.75E-01 mg/m ³	0.375	1E-02 mg/m ³	0.01
PROC3	3.75E-01 mg/m ³	0.375	1E-01 mg/m ³	0.1
PROC 4	3.75E-01 mg/m ³	0.375	5E-01 mg/m ³	0.5
PROC 8b	3.75E-01 mg/m ³	0.375	1E-01 mg/m ³	0.1
PROC 9	3.75E-01 mg/m ³	0.375	1E-01 mg/m ³	0.1
PROC15	3.75E-01 mg/m ³	0.375	1E-01 mg/m ³	0.1
Workers (dermal)	As reported in the CLP Regulation No 1272/2008 Annex VI Table 3.1, H3PO4 is corrosive above the 25% concentration limit. Protective clothing and gloves are			

	are in place to prevent dermal exposure. Thus repeated daily dermal exposure to product is considered negligible.
5.2. Environmental exposure (qualitative assessment)	
Environmental release	The production of orthophosphoric acid can potentially result in aquatic emissions and locally increase the phosphate concentration while decreasing the pH in the aquatic environment. However, the pH of industrial effluents is normally measured frequently and can be neutralized easily.
Waste water treatment plants (WWTP)	Not relevant. Orthophosphoric acid dissociates in H ⁺ and PO ₄ ³⁻ and will be neutralized before reaching WWTP.
Aquatic pelagic compartment	Due to its high water solubility and low vapour pressure, orthophosphoric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, orthophosphoric acid progressively dissociates affecting the pH of the receiving compartment. The higher the buffer capacity of the water is, the lower the effect on pH will be.
Sediments	Not relevant. There will be no absorption on particulate matter or surfaces.
Soil and groundwater	Not relevant. Infiltration, partial neutralization, dispersion, dilution.
Atmospheric compartment	Not relevant. Orthophosphoric acid release is negligible, due to its low vapour pressure.
Secondary poisoning	Bioaccumulation in organisms is not relevant for orthophosphoric acid.

Summary of exposure scenario 2:

1. Short title of exposure scenario 2	
<u>Industrial use of orthophosphoric acid</u>	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU 3, SU 8, SU 9, SU 10, SU 15, SU 16, SU 17
Product category (PC)	PC0,PC1, PC7,PC9a, PC9b, PC13, PC14,PC19, PC20,PC21, PC23,PC24, PC25,PC26, PC32,PC34, PC35,PC37, PC39
Process category (PROC)	PROC 1: Use in closed process, no likelihood of exposure. PROC 2: Use in closed, continuous process with occasional controlled exposure. PROC 3: Use in closed batch process (synthesis or formulation). PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises. PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). PROC 7: Industrial spraying. PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). PROC 10: Roller application or brushing. PROC 13: Treatment of articles by dipping and pouring. PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation. PROC 15: Use as laboratory reagent. PROC 19: Hand-mixing with intimate contact and only PPE available. PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature.
Article category (AC)	Not applicable

Environmental release category (ERC)	ERC 2 (Formulation of preparations) ERC 3: Formulation in materials. ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles. ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates). ERC 6b (Industrial use of reactive processing aid) ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers.
3. Operational conditions	
3.1 Operational conditions related with frequency and quantities of use	
Duration of exposure at workplace:	8 hours/day
Frequency of exposure at workplace:	220 days/year for each worker
Annual amount used per site:	The daily and annual amount/emission per site is not considered to be the main determinant for environmental exposure.
3.2 Operational conditions related with substance/ product	
Physical state	Solid / Liquid
Concentration of substance in mixture	Aqueous solutions contain more than 25% orthophosphoric acid up to solid form 100% orthophosphoric acid.
3.3 Other relevant operational conditions	
Based on the information retrieved, the maximum duration considered for this exposure scenario is a working shift of above 4h/day. Concentration of orthophosphoric acid in industrial application range from 10 to 85% and worst case will be taken into account.	
4. Risk Management Measures	
4.1 RMMs related to workers	
Organisational measures	Workers in the identified risky process/areas should be trained a) to avoid to work without protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of orthophosphoric acid and c) to follow the safer procedures instructed by the employer The employer has also to ascertain that the required PPE is available and used according to instructions.
Technical measures	<ul style="list-style-type: none"> • Use closed/ automated systems or covering of open containers (e.g. screens) to avoid irritating mists, sprayings and potential splashes. (Good practice) • Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.) (Good practice) • Use of pliers, grip arms with long handles with manual use “to avoid direct contact and exposure by splashes (no working over one’s head)” (Good practice) • Store in cool, dry, clean, well ventilate areas away from alkaline products and metals. Do not store under direct sun light. Do not pile up the containers. Do not store at temperatures close to freezing point. (Good practice). • Compatible materials: stainless steel 316-L; high density polyethylene; glass • Local exhaust / general ventilation is not required but good practice
Respiratory protection	Respiratory protection: respiratory protection is not required to usual works. In foggy-vaporous situations, use of a spreading over all facemask with a suitable inorganic acid filler.
Hand protection	Hand protection is required: impervious chemical resistant protective gloves (required). Material: chloroprene gloves or equivalent.

Eye protection	Wearing of eye/face protection is required. Chemical goggles or face protection shield should be consistent with EN 166 or equivalent.			
Skin and body protection	Wearing of suitable acid resistant protective clothing and rubber boots is required.			
Hygiene measures	Keep away from foodstuffs, drinks and tobacco. Wash hands before breaks and at end of work. Keep work clothes separate.			
4.2 RMMs related to the environment				
Organisational measures	Procedural and/or control technologies are required to minimize emissions and the resulting exposure during cleaning and maintenance procedures.			
Abatement measures related with wastewater	Orthophosphoric acid wastewater should be reused or discharged to the industrial wastewater and further neutralized if needed			
Abatement measures waste air and solid waste	Orthophosphoric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure and high water solubility.			
4.3 Waste related measures				
Type of waste	Liquid waste. Packaging material			
Disposal technique	The neutralised liquid can be spilled in accordance to regulatory normative (Law regulates emptying wastewater containing phosphorous).The residue of the containers or the used container itself should be disposed in accordance with local requirements			
Fraction released to environment during waste treatment	The pH of wastewater released from manufacturing sites should be between pH 6-9.			
5. Prediction of exposure resulting from the conditions described above and the substance properties.				
5.1. Human exposure				
Workers (oral)	No significant oral exposure due to good hygiene practice.			
Workers (inhalation) <i>DNEL (EU-TWA) = 1 mg/m³</i>	Liquid - Calculated with ECETOC TRA	RCR	Solid - Calculated with ECETOC TRA	RCR
PROC 1	3.75E-01 mg/m ³	0.375	1.00E-02 mg/m ³	0.01
PROC 2	3.75E-01 mg/m ³	0.375	1.00E-02 mg/m ³	0.01
PROC3	3.75E-01 mg/m ³	0.375	1.00E-01 mg/m ³	0.1
PROC 4	3.75E-01 mg/m ³	0.375	5.00E-01 mg/m ³	0.5
PROC 5	3.75E-01 mg/m ³	0.375	5.00E-01 mg/m ³	0.5
PROC 7	3.75E-01 mg/m ³	0.375	N/A	N/A
PROC 8a	3.75E-01 mg/m ³	0.375	5.00E-01 mg/m ³	0.5
PROC 8b	3.75E-01 mg/m ³	0.375	1.00E-01 mg/m ³	0.1
PROC 9	3.75E-01 mg/m ³	0.375	1.00E-01 mg/m ³	0.1
PROC 10	3.75E-01 mg/m ³	0.375	N/A	N/A
PROC 13	3.75E-01 mg/m ³	0.375	N/A	N/A
PROC 14	3.75E-01 mg/m ³	0.375	N/A	N/A
PROC15	3.75E-01 mg/m ³	0.375	1.00E-01 mg/m ³	0.1
PROC 19	3.75E-01 mg/m ³	0.375	N/A	N/A
PROC 22	3.75E-01 mg/m ³	0.375	N/A	N/A
PROC 23	3.75E-01 mg/m ³	0.375	N/A	N/A

Workers (dermal)	As reported in the CLP Regulation No 1272/2008 Annex VI Table 3.1, H ₃ PO ₄ is corrosive above the 25% concentration limit. Protective clothing and gloves are mandatory when handling corrosive substances and effective control measures are in place to prevent dermal exposure. Thus repeated daily dermal exposure to product is considered negligible.
5.2. Environmental exposure (qualitative assessment)	
Environmental release	The production of orthophosphoric acid can potentially result in aquatic emissions and locally increase the phosphate concentration while decreasing the pH in the aquatic environment. However, the pH of industrial effluents is normally measured frequently and can be neutralized easily.
Waste water treatment plants (WWTP)	Not relevant. Orthophosphoric acid dissociates in H ⁺ and PO ₄ ³⁻ and will be neutralized before reaching WWTP.
Aquatic pelagic compartment	Due to its high water solubility and low vapour pressure, orthophosphoric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, orthophosphoric acid progressively dissociates affecting the pH of the receiving compartment. The higher the buffer capacity of the water is, the
Sediments	Not relevant. There will be no absorption on particulate matter or surfaces.
Soil and groundwater	Not relevant. Infiltration, partial neutralization, dispersion, dilution.
Atmospheric compartment	Not relevant. Orthophosphoric acid release is negligible, due to its low vapour pressure.
Secondary poisoning	Bioaccumulation in organisms is not relevant for orthophosphoric acid.

Summary of exposure scenario 3:

1. Short title of exposure scenario 3	
<u>Professional use of orthophosphoric acid</u>	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU 1, SU 19, SU 22
Product category (PC)	PC 9a, 9b, 12, 14, 15, 31, 35, 37, 38
Process category (PROC)	PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). PROC 10: Roller application or brushing. PROC 11: Non industrial spraying. PROC 13: Treatment of articles by dipping and pouring. PROC 19: Hand-mixing with intimate contact and only PPE available. PROC 25: Other hot work operations with metals.
Article category (AC)	Not applicable
Environmental release category (ERC)	ERC 8a (Wide dispersive indoor use of processing aids in open systems) ERC 8b (Wide dispersive indoor use of reactive substances in open systems) ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix. ERC 8e (Wide dispersive outdoor use of reactive substances in open systems)
3. Operational conditions	
3.1 Operational conditions related with frequency and quantities of use	

Duration of exposure at workplace:	8 hours/day		
Frequency of exposure at workplace:	220 days/year for each worker		
Annual amount used per site:	The daily and annual amount/emission per site is not considered to be the main determinant for environmental exposure.		
3.2 Operational conditions related with substance/ product			
Physical state	Solid / Liquid		
Concentration of substance in mixture	Orthophosphoric acid is used during the production phase of various cleaning products, although often the amount in the end products is limited due to its reactivity. Nevertheless in case of this scenario worst case scenario was considered with products containing more than 25% orthophosphoric acid.		
3.3 Other relevant operational conditions			
The amount used per professional workers varies from activity to activity. The maximum duration >4 h/day was considered as worst case assumption.			
4. Risk Management Measures			
4.1 RMMs related to workers			
Organisational measures	Because orthophosphoric acid is corrosive, the risk management measures for human health should focus on the prevention of direct contact with the substance. Since automated, closed systems and local exhaust ventilation may be less feasible to implement for professional settings, product related design measures should be taken (low concentration for example) as well as good practices that prevent direct eye/skin contact with orthophosphoric acid and prevent formation of aerosols and splashes are more important along with the personal		
	<i>H3PO4 concentration in product > 25%:</i>	<i>H3PO4 concentration in product between 10% and 25%:</i>	<i>H3PO4 concentration in product < 10%</i>
Respiratory protection	Recommended	Good practice	Not required
Hand protection	Required	Recommended	Good practice
Eye protection	Required	Recommended	Good practice
Skin and body protection	Required	Recommended	Good practice
Hygiene measures	Keep away from foodstuffs, drinks and tobacco. Wash hands before breaks and at end of work. Keep work clothes separate..		
4.2 RMMs related to the environment			
Organisational measures	Procedural and/or control technologies are required to minimise emissions and the resulting exposure during cleaning and maintenance procedures.		
Abatement measures related to wastewater	Different rules apply to professional users regarding control of their effluents. It is required that the flow of release to municipal wastewater or to surface water do not cause significant in pH changes. It is then dependant whether or not discharging is done to municipal wastewater equipped with sewage treatment plant or not.		
Abatement measures related to waste air	Orthophosphoric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure. Therefore, no specific risk management measures for air emissions are provided.		
Abatement measures related to soil	For release to soil for fertilizer uses, the pH will be naturally neutralized by the medium before reaching the groundwater.		
4.3 Waste related measures			
Type of waste	Liquid waste – packaging material		

Disposal technique	The neutralised liquid can be spilled in accordance to applicable normative (Law regulates emptying wastewater containing phosphorous).The residue of the containers or the used container itself should be disposed in accordance with local requirements.	
5. Prediction of exposure resulting from the conditions described above and the substance properties.		
5.1. Human exposure		
Professionals (oral)	No significant oral exposure due to good hygiene practice.	
Professionals (dermal)	As reported in the CLP Regulation No 1272/2008 Annex VI Table 3.1, H3PO4 is corrosive above the 25% concentration limit. Protective clothing and gloves are mandatory when handling corrosive substances and effective control measures are in place to prevent dermal exposure. Thus repeated daily dermal exposure to product is considered negligible.	
Professionals (inhalation) <i>DNEL (EU-TWA) = 1 mg/m³</i> PROC 5, 8a, 8b, 9, 10, 11, 13, 19, 25	Calculated with ECETOC TRA 3.75E-01 mg/m ³	RCR 0.375
5.2. Environmental exposure (qualitative assessment)		
Environmental release	The production of orthophosphoric acid can potentially result in aquatic emissions and locally increase the phosphate concentration while decreasing the pH in the aquatic environment. However, the pH of industrial effluents is normally measured frequently and can be neutralized easily.	
Waste water treatment plants (WWTP)	Not relevant. Orthophosphoric acid dissociates in H ⁺ and PO ₄ ³⁻ and will be neutralized before reaching WWTP.	
Aquatic pelagic compartment	Due to its high water solubility and low vapour pressure, orthophosphoric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, orthophosphoric acid progressively dissociates affecting the pH of the receiving compartment. The higher the buffer capacity of the water is, the	
Sediments	Not relevant. There will be no absorption on particulate matter or surfaces.	
Soil and groundwater	Not relevant. Infiltration, partial neutralization, dispersion, dilution.	
Atmospheric compartment	Not relevant. Orthophosphoric acid release is negligible, due to its low vapour pressure.	
Secondary poisoning	Bioaccumulation in organisms is not relevant for orthophosphoric acid.	

Summary of exposure scenario 4:

1. Short title of exposure scenario 4	
Consumer use of cleaning products and other mixtures containing orthophosphoric acid	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU 21 (Consumer uses: Private households)
Product category (PC)	PC 0, 12, 28, 31, 35, 38, 39
Process category (PROC)	Not applicable
Article category (AC)	Not applicable

Environmental release category (ERC)	ERC 8a (Wide dispersive indoor use of processing aids in open systems) ERC 8b (Wide dispersive indoor use of reactive substances in open systems) ERC 8e (Wide dispersive outdoor use of reactive substances in open systems) ERC 10a Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a Wide dispersive indoor use of long-life articles and materials with low release	
3. Operational conditions		
3.1 Operational conditions related with frequency and quantities of use		
Duration of exposure:	Lime scale remover: 20 minutes per event	
Frequency of exposure:	Lime scale remover: once a day	
Use amount per event:	Lime scale remover: 110 g/event	
Emission days:	360 days/year	
3.2 Operational conditions related with substance/ product		
Physical state	Liquid	
Concentration of substance in mixture	Formulated mixtures may contain up to 25% orthophosphoric acid. In general terms the concentration of orthophosphoric acid in these products are very low and rarely exceed 10%. Furthermore the amounts of orthophosphoric acid used in these mixtures will interact with other ingredients in acid-base reactions and thus only residues of orthophosphoric acid will remain as such in the final product.	
3.3 Other relevant operational conditions		
Orthophosphoric acid is employed as the electrolyte in batteries. Consumer use considers the service life and the end-of-life stage of orthophosphoric acid in batteries. Given that batteries are sealed articles and that orthophosphoric acid involved in their maintenance is not intended for direct release exposure to and emission from orthophosphoric acid in these life-cycle stages should be negligible and therefore an exposure assessment is not considered deemed.		
4. Risk Management Measures		
4.1 RMMs related to workers		
General advise	Consumer products should be intrinsically be safe, therefore products containing Orthophosphoric acid should be designed to avoid accidents and in case an accident happens instructions should be available how to minimise the effects. Risk management measures in place relate to the design of the consumer product and to consumers use.	
Product design	<ul style="list-style-type: none"> • Required to use resistant labelling-package to avoid its auto-damage and loss of the label integrity, under normal use and storage of the product. • Required that household chemicals, containing Orthophosphoric acid over 10% which may be accessible to children should be provided with a child-resistant fastening and a tactile warning of • Required to provide improved use instructions, and product information to consumers. It should be advisable to use these products in the absence of children or other potential sensitive groups. • Advisable to deliver only in small amounts 	
Instructions for product containing more than 10% orthophosphoric acid	<ul style="list-style-type: none"> • Keep out of reach of children. • Keep away from eyes. If product gets into eyes rinse thoroughly with water. • Rinse and dry hands after use • Do not ingest. If the product is ingested then seek medical advice. • Do not change container to store contents • Do not mix with other products • Do not apply product into ventilator openings or slots. • Ventilate the room after use 	
Respiratory protection	Not required	
Hand protection	H ₃ PO ₄ concentration in product between 10% and 25%: Recommended	H ₃ PO ₄ concentration in product < 10%: Good practice
Eye protection	H ₃ PO ₄ concentration in product between 10% and 25%:	H ₃ PO ₄ concentration in product < 10%: Good practice

Orthophosphoric acid_ShortES

	Recommended	
Skin and body protection	If splashes are likely to occur, wear long sleeves	
Hygiene measures	Keep away from foodstuffs, drinks and tobacco. Wash hands thoroughly after open handling of the product.	
4.2 RMMs related to the environment		
Organisational measures	Not applicable	
Abatement measures related to wastewater	Wastewater is treated via chemical/biological municipal wastewater treatment plants.	
Abatement measures related to waste air	Not applicable	
Abatement measures related to soil	No measures	
4.3 Waste related measures		
Type of waste	Packaging material.	
Disposal technique	Contaminated packaging material will contain negligible amounts of substance. It will be disposed as domestic/ municipal waste.	
5. Prediction of exposure resulting from the conditions described above and the substance properties.		
5.1. Human exposure – Consumers		
<i>Prediction of human exposure resulting of use of lime scale remover (worst case scenario in term of exposure)</i>		
Consumer (dermal)	Contact with tissue and water of low concentration orthophosphoric acid will yield phosphate and hydrogen ions. These ions are abundantly available in the body. Although accidental exposure to orthophosphoric acid at a concentration higher than 10% is normally excluded from an EU chemical safety assessment and accidental exposure is not considered in the present assessment, several risk management measures for consumers are included in the dossier.	
Consumer (inhalation) DNEL = 0.73 mg/m3	Calculated with ConsExpo: 0,442 mg/m3	RCR 0.6
5.2. Environmental exposure (qualitative assessment)		
Consumer uses relates to already diluted products, which will further be neutralized quickly in the sewer, well before reaching a WWTP or surface water.		
Orthophosphoric acid used in batteries: there is no environmental release as batteries are sealed articles with a long service life. After use, batteries should be recycled as much as possible. If disposed as municipal waste, orthophosphoric acid is not expected to cause a significant pH effect to the environment when incinerated or land filled.		