

Nitric acid, highly concentratedIdentcode: 0041
Version: 4.0 (MSDS_EU/EN)Revision Date: 25.05.2023
Print Date: 25.05.2023**1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING****1.1 Product identifiers**

Commercial Product Name: **Nitric acid, highly concentrated**
 Substance name: **Nitric acid 98,5 %**
 Chemical Formula: **HNO₃**
 CAS-No.: 7697-37-2
 Index-No.: 007-004-00-1
 EC-No.: 231-714-2
 REACH Registration Number: 01-2119487297-23-0021

1.2 Identified uses

Production of nitric acids.

Industrial use: as intermediate, in formulation of mixtures, distribution, Cleaning agent, in metal/plastic surface treatment, Processing aid, Surface treatment, regeneration of ion exchange resins, Use as laboratory reagent**Professional use:** distribution, dilution or suspension of fertilizers, Cleaning agent, metal surface treatment, pH-regulating agents, Laboratory chemicals, as surface etchant for concrete**Common technical functions:** Intermediate, pH-regulating agents, Cleaning agentAdditional information to identified uses see: www.skwp.de**1.3 Details of the supplier of the safety data sheet**

SKW Stickstoffwerke Piesteritz GmbH
 Möllendorfer Str. 13
 06886 Lutherstadt Wittenberg, Deutschland
 E-mail address:

Telephone: +49 3491 68 0
 Telefax: +49 3491 68 4300

SDB@skwp.de

1.4 Emergency telephone number**SKW:** +49 3491 68 2202**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****Classification according to Regulation (EC) No 1272/2008 [CLP]:**

Hazard class / Hazard category	Hazard statements	Classification procedure
Ox. Liq. 2	H272	according to the Globally Harmonized System
Skin Corr. 1A	H314	according to the Globally Harmonized System
	EUH071	according to the Globally Harmonized System
Acute Tox. 1	H330	according to the Globally Harmonized System
Met. Corr. 1	H290	Information derived from practical experience.

2.2 Label elements**Labelling according to Regulation (EC) No 1272/2008 [CLP]:**

Product identifier: Nitric acid, highly concentrated
Index-No.: 007-004-00-1
EINECS-No.: 231-714-2

Hazard pictograms:**Signal word:**

Danger



GHS03



GHS05



GHS06

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**Hazard statements:**

H272	May intensify fire; oxidizer.
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H330	Fatal if inhaled.
EUH071	Corrosive to the respiratory tract.

Precautionary statements:

P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P220	Keep/ Store away from clothing/ combustible materials.
P221	Take any precaution to avoid mixing with combustibles.
P234	Keep only in original container.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash face, hands and any exposed skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
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.
P310	Immediately call a POISON CENTER/ doctor.
P321	Specific treatment (see supplemental first aid instructions on this label).
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use carbon dioxide for extinction.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards

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

Adverse human health effects and symptoms:

Causes severe skin burns and eye damage. Corrosive to the respiratory tract. Nitrous gases.

Other hazards:

NO_x vapours may develop in contact with reducing agents (f.e. base metals, wood or plastics) or during heating.
No other hazards identified.

3. COMPOSITION/INFORMATION ON INGREDIENTS**3.2 Mixture related information****Hazardous components:**

Substance name	% [Mass]		Classification according to Regulation (EC) No 1272/2008 [CLP]
Nitric acid	> 98,5	CAS-No.: 7697-37-2 EC-No.: 231-714-2 Index- No.: 007-004-00-1	Ox. Liq. 2, H272 Skin Corr. 1A, H314 EUH071 Acute Tox. 1, H330

Impurities:

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

4. FIRST AID MEASURES**4.1 Description of first aid measures****General Information:**

A quick response is important. Call a physician immediately. Ensure that eye flushing systems and safety showers are located close to the working place.
First aider needs to protect himself.(see section 8)

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If inhaled:	Move victims to fresh air and do not leave them without supervision. Keep affected person warm and in semi-upright resting position. Give artificial respiration if necessary. Call a physician immediately.
In case of skin contact:	Take off contaminated clothing and shoes immediately. Wash off immediately with plenty of water for at least 15 minutes. If skin burns occur, call a doctor immediately. Cover wound with sterile dressing.
In case of eye contact:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Consult an eye specialist immediately, even if there are no immediate symptoms.
If swallowed:	Solution with pH < 1.5 or unknown: Do not give anything to drink. Do NOT induce vomiting. If victim is conscious: Rinse mouth with water. Take victim immediately to hospital. Solution with pH > 1.5 and in small quantities: Give water to drink and consult a doctor immediately.

4.2 Most important symptoms and effects, both acute and delayed

Causes severe skin burns and eye damage. Nitric acid fumes may cause immediate irritation of the respiratory tract, pain, and dyspnea which are followed by a period of recovery that may last several weeks. After this time, a relapse may occur, which may be accompanied by death caused by bronchial pneumonia and/or pulmonary fibrosis.

4.3 Indication of any immediate medical attention and special treatment needed

Symptoms:

Highly corrosive, causes severe skin burns and eye damage. Nitric acid fumes may cause immediate irritation of the respiratory tract, pain, and dyspnea which are followed by a period of recovery that may last several weeks. After this time, a relapse may occur, which may be accompanied by death caused by bronchial pneumonia and/or pulmonary fibrosis.

Hazards:

Later control for pneumonia and lung oedema.

Treatment:

Control of circulatory system, shock therapy if needed. Oxygen, if needed. Early administration of cortisone spray. After inhalation of nitrous gas, medical supervision for at least 48 hours. After inhalation, symptoms usually only occur after several hours.

Follow the advises given in section 4.1. Following exposure to acid/NO_x fumes, the affected person should be kept under medical review for at least 48 hours, as delayed pulmonary edema may develop.

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media: Water mist. Carbon dioxide (CO₂). Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media: Powders / chemical extinguishers/ foam. Do not attempt to smother the fire with steam or sand.

5.2. Special hazards arising from the substance or mixture

Not combustible. If involved in a fire, use the best means available to extinguish the fire. May accelerate the burning of other combustible materials (wood, cotton, straw, ...). Toxic gases are released (NO_x). On contact with ordinary metals (steel, galvanized, aluminum) corrosion may occur and generate highly flammable hydrogen gas. May explode in contact with a powerful reducing agent (f.e organic solvents).

5.3 Advice for fire-fighters

Cool containers / equipment exposed to heat with water spray. Use water spray to disperse vapors and to protect personnel. Avoid disposal of contaminated fire fighting water to the environment.

Do not attempt to extinguish the fire without suitable protective equipment:

- Acid-resistant clothing
- Complete protective clothing
- Self-contained breathing apparatus

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**6. ACCIDENTAL RELEASE MEASURES****6.1 For non-emergency personnel & emergency responders**

Do not breathe vapours/dust. Suppress (knock down) gases/vapours/mists with a water spray jet. Do not attempt to intervene without suitable protective equipment (See section 8). Avoid any direct contact with the product.

6.2 Environmental precautions

Should not be released into the environment. Do not discharge into drains and / or rivers. Dilute with water and neutralize the acid with, for example soda or sodium carbonate, before discharging contaminated material into treatment plants or water courses.

6.3 Methods and materials for containment and cleaning up

Soak up with a liquid binder (e.g. sand, universal binder). Transfer into suitable containers and take for disposal. Dispose of recovered material according to the regulations. Do not direct water spray onto the leak. Use respiratory protection during cleaning up.

Recovery:

Stop the leak. Confine the product and direct it towards a watertight area. Pump up the product into a spare containersuitably labeled.

Neutralization:

Neutralize non-recoverable product with:

- slaked lime
- carbonates or bicarbonates

Cleaning/decontamination:

Wash dirty surfaces with water. Neutralize polluted soils with slaked lime, then wash. Never neutralize product whilst it is still inside closed packaging or in a closed emergency container.

Disposal:

Dispose of contaminated materials in accordance with current regulations.

6.4 Reference to other sections

For more details regarding exposure control / personal protection or disposal respectively, please refer to Sections 8 and 13 of this safety data sheet.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Ensure good ventilation of the work station. 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. Avoid breathing vapours, mist or gas. 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).

Fire prevention measures: The product is not flammable. Fire hazard in case of contact with combustible material.

Advice on general occupational hygiene:

Smoking, eating and drinking should be prohibited in the application area. Wash hands after use; and remove contaminated clothing and protective equipment before entering eating areas.

7.2 Conditions for safe storage, including any incompatibilities**Suitable material for containers:**

Packaging material recommended: Containers should be of Si-contained stainless steel and preferably of low carbon content such as 304L and/or 1.4306. Further suitable pure Aluminium containers, glass or PFTE.

Unsuitable material for containers:

Common metals, Carbon steel or rubberized steel, Polypropylene

Requirements for storage areas and containers: Acid resisting floor. Keep containers tightly closed in a cool, well-ventilated place. Avoid subsoil penetration.

Storage tanks must be: - earthed and equipped with an adequate safety valve
- linked to a desiccating column

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Storage: Keep in a cool, well-ventilated place. Keep away from heat, ignition sources, direct sunlight and incompatible substances (see section 10). Protect containers from corrosion and physical damage. TRGS 510 must be taken into account. Decomposition possible with prolonged exposure to light / heat.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Exposure limit(s):

Components	CAS-No.	Control parameters	Ceiling Limit Value		Update	Basis
Nitric acid	7697-37-2	1 ml/m ³ 2.6 mg/m ³		AGW	12/2007	TRGS 900
Nitrogen dioxide	10102-44-0	0.2 ml/m ³		AGW	2008	

Short-term exposure limit (EU-STEL): 2.6 mg/m³ (1 ppm)

DNEL - Workers:

Acute	2.6 mg/m ³ (1 ppm)
Long term	1.3 mg/m ³ (0.5 ppm)

DNEL - Consumers:

Acute	1.3 mg/m ³ (0.5 ppm)
Long term	0.65 mg/m ³ (0.25 ppm)

PNEC - aquatic:

pH approach	- Safe pH to be between 6 and 9.
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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 required except for closed processes and outdoor processes. Handle product only in closed system or provide appropriate exhaust ventilation at machinery.

Exposure controls:

Ensure good ventilation of the work station. Monitor the atmosphere at regular intervals.

Personal protective equipment:

Eyeface protection: Chemical safety goggles (EN 166) or full-face mask (EN 402).

Hand protection:

Glove material: Fluorinated rubber

Glove thickness: 0,4 mm

In case of potential dermal contact: use impervious chemical resistant protective gloves complying with EN 374. In case of contact through splashing.

Skin and body protection:

Acid-resistant boots. Acid-resistant clothing (EN 14605).

Respiratory protection:

Wear suitable apparatus if exposure level exceed or may exceed the DNEL, ex :

For short time exposure masks, EN149 type FF P3, EN 14387 type B or Type E model P3, EN 1827 class FMP3 are recommended (Non-exhaustive list). For longer time of exposure full masks or masks with an apparatus providing fresh air are recommended –Full mask EN 143, EN 14387, EN 12083 class P3 or class XP3, EN12941 class TH3, EN 12942 TM3, EN14593 or EN138. (Non-exhaustive list).

Thermal hazards:

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

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**Environmental exposure controls:****Industrial uses:**

Avoid uncontrolled discharging nitric 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.

Professional uses:

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

General protective measures:

Avoid contact with eyes. Avoid contact with skin. Do not breathe gases / vapours.

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

Physical state	liquid	
Colour	light yellow	
Odour	stinging	
Odour Threshold	0.75 mg/m ³ (0.29 ppm)	
pH	< 1	
Melting point/range	-41 °C	Pressure: 1013 hPa
Boiling point/boiling range	84 °C	Pressure: 1013 hPa
Decomposition temperature	83 °C	Pressure: 1013 hPa
Flash point		Not applicable, inorganic substance
Evaporation rate		not known
Ignition temperature		The product is not flammable.
Vapour pressure (20 °C)	56.6 hPa	
Vapour density (Air = 1.0)	2	
Relative density (20 °C)	1.506 g/cm ³	98.2 % HNO ₃
Water solubility (20 °C)		completely miscible
Partition coefficient: n-octanol/water		Not applicable, inorganic substance
Viscosity, dynamic (25 °C)	0.75 mPas	
Oxidizing properties		oxidizing
Auto-ignition temperature		Not applicable
Explosion limits		Not explosive
Explosive properties		Not explosive

9.2 Other data

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. If stored for a longer period of time, slow decomposition to water, NO_x and O₂ can be observed. Slight decomposition to nitrogen oxides on exposure to light. Significant decomposition possible in contact with organic material.

10.3 Possibility of hazardous reactions

May react violently with reducing agents as organic material, chlorides and finely divided metals and strong bases. Exothermic reaction with water

10.4. Conditions to avoid

Uncontrolled heating. Light. Containment.

10.5. Incompatible materials to avoid

reducing materials, Alkalis, Corrosive Substances, Powdered metals, Hydrogen sulphide, Chlorates, carbides, non-noble metals, Alcohols

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**10.6 Hazardous decomposition products****Heating can release hazardous gases:**Nitrogen oxides (NO_x).**11. TOXICOLOGICAL INFORMATION****11.1 Information on toxicological effects**

Absorption:	The primary health effect nitric acid is corrosion due to a pH shift. Therefore, absorption is not a relevant parameter for the effect.	
Acute oral toxicity:	No data available.	
Acute inhalation toxicity:	Dose LC50:	2500 mg/l
	Exposure time:	1 h
	Species:	Rat
	Method:	OECD Test Guideline 403
Acute dermal toxicity:	No data available.	
Skin irritation:	Result:	Corrosive
Eye irritation:	Acute eye irritation/corrosion.	
Sensitisation:	Corrosive substance – Not relevant.	
Mutagenicity:	Result:	Non mutagenic
	Method:	OECD Test Guideline 471
	From the results obtained on nitric acid (OECD 471), sodium (OECD 471, 473+in vivo test) and potassium (OECD 471, 473 and 476) nitrate	
Carcinogenicity:	Inconclusive data.	
Repeated dose toxicity:	Application Route:	oral
	NOAEL:	1500 mg/m ³
	Species:	Rat
	Method:	OECD Test Guideline 422
	Application Route:	Inhalation
	Test substance:	Nitrogen oxides (NO _x)
	NOAEL:	2.15 ppm
	Species:	Rat
	Method:	OECD Test Guideline 413
Reproductive toxicity:	Application Route:	oral
	Test substance:	Potassium nitrate
	Species:	Rat
	NOAEL:	1500 mg/kg
	Method:	OECD Test Guideline 422
	Result:	no adverse effects
Other data:	The most likely route of exposure to nitric acid is via inhalation. If inhaled Nitric acid fumes may cause immediate irritation of the respiratory tract. Via dermal contact, nitric acid causes skin and eye burns. Via ingestion, nitric acid causes burns of the digestive tract.	

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish:	pH:	3 – 3.5
	Species:	Lepomis macrochirus (Bluegill sunfish)
	Exposure time:	96 h
	pH:	3.7
	Species:	Oncorhynchus mykiss (rainbow trout)
	Exposure time:	96 h
Toxicity to daphnia and other aquatic invertebrates:	Species:	Ceriodaphnia dubia (Water flea)
	pH:	4.6
	Method:	US EPA
Toxicity to algae:	No data available.	

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Toxicity to microorganisms: No data available.

Chronic toxicity to aquatic organisms: No data available

Toxicity to soil dwelling organisms: No data available.

Toxicity to terrestrial plants: No data available

General effects: Impairment of the pH value An increase in the nitrate concentrations has little effect only.

12.2 Elimination information (persistence and degradability)

Persistence and degradability: Not relevant to inorganic materials

Biological degradability: Not relevant to inorganic materials.

12.3 Bioaccumulative potential

Not relevant to inorganic materials.

Partition coefficient: n-octanol/water Not applicable inorganic substance

12.4 Mobility in soil

No data available.

12.5 Results of PBT and vPvB assessment

Not relevant to inorganic materials.

12.6 Endocrine disrupting properties

No data available.

12.7 Other adverse effects

Additional ecological information: The product can damage activated sludge in a water treatment plant by changing its pH value. Obtain the approval of the local authorities before discharging into water treatment plants. After neutralization, no negative effects are expected on the degradability of activated sludge. Do not allow uncontrolled discharge of the product into the environment.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Waste from residues:**

In accordance with the waste recycling/disposal regulations, has to be taken to an approved waste disposal facility. The classification of the waste has to be made according to its source in accordance with the European waste code regulations.

Contaminated packaging:

Disposal according to the regulations, contaminated packaging has to be treated in the same way as the substance itself. Packaging should be completely emptied, and then taken to an approved recycler after appropriate cleaning.

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14. TRANSPORT INFORMATION**Land transport (ADR/RID/GGVSEB):**

UN number:	2031
Proper technical name:	NITRIC ACID
Class:	8
Hazard Identification Number:	885
Classification Code:	CO1
Packing group	I
Labels:	8 + 5.1
Tunnel restriction code:	(E)
Special precaution for user:	No special precaution identified

Inland waterway transport (ADN(R)):

UN number:	2031
Proper technical name:	NITRIC ACID
Class:	8
Classification Code:	CO1
Packing group	I
Labels:	8 + 5.1

Sea transport (IMDG-Code/GGVSee):

UN number:	2031
Proper technical name:	NITRIC ACID
Class:	8
Subsidiary hazard class:	5.1
Packing group	I
Labels:	8 + 5.1
Marine pollutant:	no
EmS:	F-A, S-Q

Air transport ICAO/IATA:

UN number:	2031
Proper technical name:	NITRIC ACID
Class:	8
Subsidiary hazard class:	5.1
Packing group	I
passenger aircraft:	FORBIDDEN
Labelling:	Corrosive + Oxidising

**15. REGULATORY INFORMATION****15.1 Safety, Health and Environmental Regulations specific for the substance or mixture
European Union:**

Regulation:	1907/2006 (EG)
	(EG) Nr. 1272/2008

National legislation (Germany):

Accident Regulation:	In accordance to 12. BImSchV Anhang I
Water hazard class:	WGK 2, water hazard ID-Nr. 211 (BAnz. 10.08.2017)

Other regulations:

Occupational restrictions for pregnant and breast feeding women
TRGS 515 "Storage of Oxidising Substances in Packages and Moveable Containers"
Work restrictions for young people.
TRGS 510 "Storage of hazardous substances in non-stationary containers"

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**15.2 Chemical safety assessment:**

A Chemical Safety Assessment has been carried out for this substance.

16. OTHER INFORMATION**Relevant R-, H- and EUH-phrases (Number and full text):**

EUH071:	Corrosive to the respiratory tract.
H272:	May intensify fire; oxidizer.
H290:	May be corrosive to metals.
H314:	Causes severe skin burns and eye damage.
H330:	Fatal if inhaled.

Precautionary statement:

P260:	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
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.
P304 + P340:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P309 + P311:	IF exposed or if you feel unwell: Call a POISON CENTER or doctor/ physician.
P390:	Absorb spillage to prevent material damage.

Modification notice:

This data sheet contains changes from the previous version in section(s): 2

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.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Ox. Liq.	Oxidising Liquid
Skin. Corr.	Skin corrosion
Met. Corr.	Corrosive to metals
CAS	Chemical Abstracts Service
CLP	Classification, Labelling and Packing of Chemicals
EC	European Community
EN	European Norm
EUH	European Hazard Statement
GHS	Globally Harmonized System
LCx	Lethal concentration
NOAEL	No observed adverse effect level
OECD	Organization for Economic Co-Operation and Development
PBT	Persistent, Bioaccumulative and Toxic
REACH	Registration, Evaluation and Authorisation and Restriction of Chemicals
US EPA	United States Environmental Protection Agency
vPvB	very Persistent and very Bioaccumulative

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**17. ANNEX: EXPOSITION SZENARIO****1. Short title of exposure scenario 1**

Manufacture and industrial use of nitric acid – Concentration > 75%

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

Sector of use (SU)	SU3, SU 8, SU9, SU10, SU16, SU24
Product category (PC)	PC14, PC15, PC19, PC20, PC21, PC33, PC35
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 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.</p> <p>PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</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>
Article category (AC)	Not applicable
Environmental release category (ERC)	<p>ERC 1 Manufacture of substances</p> <p>ERC 2 Formulation of preparations</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 aids</p> <p>ERC 7 Industrial use of substances in closed 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	Liquid
Concentration of substance in mixture	Concentrated aqueous solutions contain more than 75% nitric acid up to 100% nitric 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 manufacture concentrated liquid HNO₃ with a concentration above 75%.

4. Risk Management Measures

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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 nitric 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: low carbon austenitic stainless steel, glass • Local exhaust ventilation is required. (except in close system)
Respiratory protection	Respiratory protection is required is required to usual works. (except in close system) Generally masks with an Assigned Protection Factor (APF) = 20 as given in BS EN 529:2005 are recommended. For short time exposure masks , EN149 type FF P3, EN 14387 type B or Type E model P3, EN 1827 class FMP3 are recommended (Non exhaustive list). For longer time of exposure full masks or masks with an apparatus providing fresh air are recommended – Full mask EN 143, EN 14387, EN 12083 class P3 or class XP3, EN12941 class TH3, EN 12942 TM3, EN14593 or EN138. (Non exhaustive list)
Hand protection	Hand protection is required: use impervious chemical resistant protective gloves complying with EN 374 (required): material: butyl rubber, PVC, PTFE fluoro elastomer..
Eye protection	Wearing of eye/face protection is required. Chemical goggles EN166 or face protection shield EN 402 or equivalent are required.
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	Nitric acid wastewater should be reused or discharged to the industrial wastewater and further neutralized if needed
Abatement measures waste air and solid waste	Nitric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure and degradation in NOx.
4.3 Waste related measures	
Type of waste	Liquid waste. Packaging material

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Disposal technique	The neutralised liquid can be spilled in accordance to regulatory normative. 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 = 1.3 mg/m³</i>	Liquid – Calculated with MEASE		RCR
PROC 1	0.026 mg/m ³		0.02
PROC 2	0.129 mg/m ³		0.1
PROC3	0.322 mg/m ³		0.25
PROC 4	0.258 mg/m ³		0.2
PROC5	0.644 mg/m ³		0.5
PROC 8b	0.193 mg/m ³		0.15
PROC 9	0.644 mg/m ³		0.5
PROC 13	0.644 mg/m ³		0.5
PROC 14	0.644 mg/m ³		0.5
PROC 15	0.129 mg/m ³		0.1
Workers (dermal)	As reported in the CLP Regulation No 1272/2008 Annex VI Table 3.1, nitric acid is corrosive above the 20% concentration limit. Therefore effective control measures are in place to prevent dermal exposure. Furthermore protective clothing and gloves are considered to be used consistently when handling corrosive substances. Production companies report the use of protective gloves and thus repeated daily dermal exposure to commercial product is considered negligible.		

5.2. Environmental exposure (qualitative assessment)

Environmental release	The production of nitric acid can potentially result in aquatic emissions and locally increase the nitrate 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. Nitric acid dissociates in H ⁺ and NO ³⁻ and will be neutralized before reaching WWTP.
Aquatic pelagic compartment	Due to its high water solubility, nitric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, nitric 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	Nitric acid is highly soluble and in air will react into NO _x . These NO _x emissions in the troposphere are small compared to releases from combustion processes

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Secondary poisoning	Bioaccumulation in organisms is not relevant for nitric acid.
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1. Short title of exposure scenario 2	
Manufacturing and industrial use of nitric acid – Concentration <75%	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU 3, SU4, SU 8, SU 9, SU 10, SU12, SU14, SU 15, SU 16
Product category (PC)	PC0, PC7, PC12, PC14, PC15, PC19, PC20, PC33, PC35, PC37
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>
Article category (AC)	Not applicable
Environmental release category (ERC)	<p>ERC 1 Manufacture of substances</p> <p>ERC 2 Formulation of preparations</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> <p>ERC 7 Industrial use of substances in closed 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	Liquid
Concentration of substance in mixture	Aqueous solutions contain more than 25% nitric acid up to a maximum of 75% nitric acid.

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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 nitric acid in industrial application range from 25 to 75% 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 nitric 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 like spraying, use of a spreading over all facemask with a suitable inorganic acid filler. In case of spraying a mask with an Assigned Protection Factor (APF) = 20 as given in BS EN 529:2005 are recommended. For short time exposure masks , EN149 type FF P3, EN 14387 type B or Type E model P3, EN 1827 class FMP3 are recommended (Non exhaustive list). For longer time of exposure full masks or masks with an apparatus providing fresh air are recommended – Full mask EN 143, EN 14387, EN 12083 class P3 or class XP3, EN12941 class TH3, EN 12942 TM3, EN14593 or EN138. (Non exhaustive list)
Hand protection	Hand protection is required: use impervious chemical resistant protective gloves complying with EN 374 (required): material: butyl rubber, PVC, PTFE fluoro elastomer.
Eye protection	Wearing of eye/face protection is required. Chemical goggles EN166 or face protection shield EN 402 or equivalent are required.
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	

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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	Nitric acid wastewater should be reused or discharged to the industrial wastewater and further neutralized if needed
Abatement measures waste air and solid waste	Nitric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure and degradation in NOx.

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 .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) DNEL = 1.3 mg/m ³	Liquid - Calculated with MEASE	RCR
PROC 1	0.001 mg/m ³	0.0008
PROC 2	0.001 mg/m ³	0.0008
PROC3	0.01 mg/m ³	0.0077
PROC 4	0.05 mg/m ³	0.0385
PROC 5	0.05 mg/m ³	0.0385
PROC 8a	0.05 mg/m ³	0.0385
PROC 8b	0.01 mg/m ³	0.0077
PROC 9	0.01 mg/m ³	0.0077
PROC 10	0.05 mg/m ³	0.0385
PROC 13	0.01 mg/m ³	0.0077
PROC 14	0.01 mg/m ³	0.0077
PROC15	0.01 mg/m ³	0.0077
PROC 7 – With mask APF 20	0.05 mg/m ³	0.0385
Workers (dermal)	As reported in the CLP Regulation No 1272/2008 Annex VI Table 3.1, nitric acid is corrosive above the 20% concentration limit. Therefore effective control measures are in place to prevent dermal exposure. Furthermore protective clothing and gloves are considered to be used consistently when handling corrosive substances. Production companies report the use of protective gloves and thus repeated daily dermal exposure to commercial product is considered negligible.	

5.2. Environmental exposure (qualitative assessment)

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Environmental release	The production of nitric acid can potentially result in aquatic emissions and locally increase the nitrate 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. Nitric acid dissociates in H ⁺ and NO ³⁻ and will be neutralized before reaching WWTP.
Aquatic pelagic compartment	Due to its high water solubility, nitric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, nitric 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	Nitric acid is highly soluble and in air will react into NO _x . These NO _x emissions in the troposphere are small compared to releases from combustion processes
Secondary poisoning	Bioaccumulation in organisms is not relevant for nitric acid.

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1. Short title of exposure scenario 3	
Professional use of nitric acid – Concentration < 75%	
2. Description of activities and processes covered in the exposure scenario	
Sector of use (SU)	SU 1, SU 22
Product category (PC)	PC12, PC14, PC15, PC20, PC21, PC35
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 15: Use as laboratory reagent</p> <p>PROC 19: Hand-mixing with intimate contact and only PPE available.</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 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	Liquid
Concentration of substance in mixture	Nitric 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% nitric acid but always less than 75%.
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	

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Organisational measures	Because nitric 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 nitric acid and prevent formation of aerosols and splashes are more important along with the personal protective equipment measures.		
	<i>HNO3 concentration in product > 20%:</i>	<i>HNO3 concentration in product between 5% and 20%:</i>	<i>HNO3 concentration in product < 5%</i>
Respiratory protection	Compulsory	Recommended	Good practice
Hand protection	Compulsory	Recommended	Good practice
Eye protection	Compulsory	Recommended	Good practice
Skin and body protection	Compulsory	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	Nitric acid is not expected to be found in the solid waste nor to reach the air compartment, due to its low vapour pressure and degradation in NOx. 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. 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, nitric acid is corrosive above the 20% concentration limit. Therefore effective control measures are in place to prevent dermal exposure. Furthermore protective clothing and gloves are considered to be used consistently when handling corrosive substances. Production companies report the use of protective gloves and thus repeated daily dermal exposure to commercial product is considered negligible.

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Professional (inhalation) DNEL = 1.3 mg/m ³	Calculated with MEASE	RCR
PROC 5,	0.1 mg/m ³	0.08
PROC8a	0.05 mg/m ³	0.04
PROC8b	0.05 mg/m ³	0.04
PROC9	0.05 mg/m ³	0.04
PROC10	0.05 mg/m ³	0.04
PROC 13	0.05 mg/m ³	0.04
PROC14	0.1 mg/m ³	0.08
PROC15	0.01 mg/m ³	0.01
PROC19	0.05 mg/m ³	0.04
PROC 11 with mask APF40	0.5 mg/m ³	0.38

5.2. Environmental exposure (qualitative assessment)

Environmental release	The production of nitric acid can potentially result in aquatic emissions and locally increase the nitrate 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. Nitric acid dissociates in H ⁺ and NO ³⁻ and will be neutralized before reaching WWTP.
Aquatic pelagic compartment	Due to its high water solubility, nitric acid is mainly found in soil (migrating towards the groundwater table) and water compartments: there, nitric 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. Nitric acid release is negligible, due to its low vapour pressure and degradation in NO _x .
Secondary poisoning	Bioaccumulation in organisms is not relevant for nitric acid.