

9.3. Exposure scenario 3: Use at industrial site - Use as an intermediate in the catalyst industry

Market sector: Manufacture of other substances

PC 19: Intermediate

Sector of use:

SU 8, Manufacture of bulk, large scale chemicals (including petroleum products)

SU 9, Manufacture of fine chemicals

Environment contributing scenario(s):	
Use as an intermediate in the catalyst industry	ERC 6a
Worker contributing scenario(s):	
Handling/Transfer of solutions	PROC 8b
Small scale handling/transfer of solutions	PROC 9
Continuous process in closed system	PROC 2
Batch process in closed system	PROC 3
Open or semi-closed wet chemical reaction process	PROC 4
Mixing, blending	PROC 5
Wet cleaning	PROC 8a

Explanation on the approach taken for the ES

It is noted that this exposure scenario focusses on exposure to the substance to be registered. Please refer to information on safe use for the handling of the individual manufactured substances for process steps commencing the chemical transformation step.

9.3.1. Environmental contributing scenario 1: Use as an intermediate in the catalyst industry

9.3.1.1. Conditions of use

The conditions of use are as described in the generic exposure scenario (GES) below.

9.3.1.2. Releases

The GES and associated risk assessment are concerned with releases of Pd to wastewater and air occurring during the use of palladium dinitrate as an intermediate in the catalyst industry at an industrial facility. It is assumed that wastewater is discharged to freshwater following treatment at a municipal STP. Exposure assessment for the aquatic environment is based on parameter

Palladium dinitrate

values from the SpERC for 'Manufacture of metal-containing catalysts'¹ and calculation of the maximum tonnage (M_{safe}) of palladium dinitrate that can be used without risk to environment. M_{safe} is calculated using release factors (RFs) adjusted to 10% of the values recommend in the SpERC for base metals based on the monetary value of palladium (see Section 9.0.2).

A summary of the emission characteristics used to quantify the environmental aspects of the generic exposure scenario (GES) for industrial use of palladium dinitrate as an intermediate in the catalyst industry is detailed below.

1. Title	
ES3: Use as an intermediate in the catalyst industry	
Life cycle	Use as an intermediate in the catalyst industry
Systematic title based on use descriptor	ERC: ERC 6A Use as an intermediate – industrial
2. Operational conditions and risk management measures	
2.1 Control of environmental exposure	
Environmental related free short title	Use as an intermediate in the catalyst industry
Systematic title based on use descriptor (environment)	ERC 6A Use as an intermediate – industrial
Processes, tasks, activities covered (environment)	Use as an intermediate in the catalyst industry: As defined by SpERC for 'Manufacture of metal containing catalysts' ¹⁴ Raw material delivery and handling, Catalyst manufacture: dissolving, precipitating, filtrating, drying, mixing, forming, impregnation, calcination, sulfiding, stripping, regeneration, reduction, stabilisation, coating and screening, loading of reactor (transfer from big bags/drums/containers). Fresh catalyst packaging: filling operations, cleaning and maintenance and storage of final product.
Environmental Assessment Method	Estimates of environmental emissions based on adjusted

¹ CEFIC (2012) Manufacture of metal-containing catalysts. spERC code ECMA 1.1a, v2.0. Available online at <http://www.cefic.org/Documents/Industry%20sectors/ECMA/ECMA%20-%20SPERC%20Factsheet%20-%20Manufacture%20of%20Metal-containing%20Catalysts%20V5%2027Feb%202012.pdf>

Palladium dinitrate

	SpERC RFs are used for calculation of maximum tonnage that can be used safely without risk to the environment
Product characteristics	
Palladium dinitrate as solid or aqueous solution.	
Environmental assessment is based on the release factors detailed in the SpERC for 'Manufacture of metal-containing catalysts' and default characteristics for environmental compartments detailed in the ECHA technical guidance and EUSES model.	
Amounts used	
Maximum annual safe use at a site (M_{safe})	14.1 tonnes Palladium dinitrate (6.50 tonnes Pd equivalent)
Frequency and duration of use	
Pattern of release to the environment	280 days per year per site (SpERC ¹⁴)
Environment factors not influenced by risk management	
Receiving surface water flow rate	STP: 2,000 m ³ /d (default) Receiving water: 18,000 m ³ /d (default)
Dilution capacity, freshwater	Discharge to freshwater via STP: DF = 10 (default)
Dilution capacity, marine	Not relevant
Other given operational conditions affecting environmental exposure	
None	
Technical conditions and measures at process level (source) to prevent release	
Appropriate process control systems shall be implemented.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
<p>Waste water:</p> <p>ES Discharge to freshwater via STP:</p> <p>On-site wastewater treatment by chemical precipitation, sedimentation, electrolysis, reverse osmosis, ion exchange and/or filtration.</p> <p>Efficiency >99% (typical values reported in SpERC for 'Manufacture of metal-containing catalysts')</p> <p>and off-site municipal sewage treatment plant (STP)</p> <p>Efficiency 73.4 % (based on European STP monitoring programme)²</p>	

² Stutt E, Wilson I, Merrington G & Rothenbacher K (2016) Determining the Removal of Platinum Group Metals in Industrial Effluent during Sewage Treatment. In: Abstracts Book of the SETAC Europe 26th Annual Meeting – 22-26 May 2016, Nantes, France, Society of Environmental Toxicology and Chemistry

Palladium dinitrate

Release factor after on-site treatment: 67 g/T (10% of SpERC RF for wastewater)							
Air:							
Treatment of air emissions by cyclones, filters (e.g. fabric, bag, HEPA or ceramic), electrostatic precipitators and/or wet scrubbers.							
Efficiency 95 to >99% (typical values reported in SpERC for 'Manufacture of metal-containing catalysts')							
Release factor after on-site treatment: 25 g/T (10% of SpERC RF for air)							
Organizational measures to prevent/limit release from site							
Regular operator training.							
Conditions and measures related to municipal sewage treatment plant (if applicable)							
Municipal Sewage Treatment Plant (STP)	Yes						
Discharge rate of the Municipal STP	2 000 m ³ /d (default)						
Fate of the sludge from Municipal STP	The sludge is incinerated (with ash going to landfill)						
Conditions and measures related to external treatment of waste for disposal							
Palladium dinitrate- and other Pd-containing waste is filled into containers and transported to licensed recycling facilities for recovery or disposed of at landfill.							
Conditions and measures related to external recovery of waste							
Palladium dinitrate- and other Pd-containing waste suitable for recycling may be recycled either internally or at licensed recycling facility.							
3. Exposure and risk estimation							
Environment [based on total Pd emissions]							
ERC 6A Use as an intermediate – industrial							
ES 3 Use at industrial site – Use as an intermediate in the catalyst industry*							
Compartment	Unit	PNEC	PEC _{regional}	C _{local}	PEC	RCR	Methods for calculation of environmental concentrations
Discharge to STP	mg Pd/L	1.46 mg/L	1.75 x10 ⁻⁷ mg/L	2.07 x10 ⁻⁴ mg/L	2.07 x10 ⁻⁴ mg/L	1.4 x10 ⁻⁴	Adjusted SpERC emission factors applied to Msafe tonnage and dilution factor at municipal STP

Palladium dinitrate

Freshwater via STP	mg Pd/L	2.66 x10 ⁻⁵ mg/L	1.75 x10 ⁻⁷ mg/L	2.00 x10 ⁻⁵ mg/L	2.01 x10 ⁻⁵ mg/L	0.76	Adjusted SpERC emission factors applied to Msafe tonnage and value for measured STP removal efficiency. Plus, dilution in ultimate receiving water body based on TGD default
Freshwater sediment via STP	mg Pd/k g w.w.	0.060 mg/k g	3.33 x10 ⁻⁴ mg/kg	0.011 mg/k g	0.0111 mg/kg	0.18	Adjusted SpERC emission factors applied to Msafe tonnage. Partitioning to SPM/sediment based on measured partition coefficient.
Terrestrial (all scenarios)	mg Pd/k g w.w.	1.04 x 10 ⁻² mg/k g	1.64 x10 ⁻³ mg/kg	4.40 x10 ⁻⁸ mg/k g	1.64 x10 ⁻³ mg/kg	0.16	Modelled increase in soil concentrations due to deposition from atmospheric emissions (i.e. assuming no application of sewage sludge to land)

* All concentrations reported as Pd equivalent due to the Pd metal PNEC used for assessment.

4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES³

Environment

Scaling tool: Metals EUSES IT tool (free download: <http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool>)

³ Msafe exposure scenarios for downstream use of palladium dinitrate are based on the maximum amount of palladium (metal equivalent) that can be safely used in a specific application without an unacceptable level of risk to the environment. It is therefore important to consider the total use of palladium compounds for each specific downstream use at an individual site and where relevant, combine the contribution from each palladium compound if a number of different Pd compounds are used for the same downstream use.

Scaling of the release to air and water environment includes:

- Refining of the release factor to air and waste water and/or and the efficiency of the air filter and wastewater treatment facility.
- Adjustment of the flow rate for the receiving water body and subsequent dilution factor.

9.3.2. Worker contributing scenario 1: Handling/Transfer of solutions (PROC 8b)

9.3.2.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of substance: Solution	External Tool (MEASE)
• Maximum emission potential of the substance: Very low (Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.)	External Tool (MEASE)
• Content in preparation: Not restricted [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Amount used (or contained in articles), frequency and duration of use/exposure	
• Maximum duration of exposure: > 240 min (not restricted) [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Technical and organisational conditions and measures	
• Pattern of use: Non-dispersive use	External Tool (MEASE)
• Pattern of exposure control: Non-direct handling	External Tool (MEASE)
• Contact level: Intermittent	External Tool (MEASE)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes (Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.)	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation (Due to potential adverse effects of the substance to the respiratory tract, RPE (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be	

Palladium dinitrate

	Method
excluded.)	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (medium hazard) (Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.)	

9.3.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 1. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	10 µg/m³ (External Tool (MEASE))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	3.43 µg/kg bw/day (External Tool (MEASE))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Remarks on exposure data

External Tool (MEASE)

- Dermal, systemic, long-term:
For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Conclusion on risk characterisation

Further information on the risk characterisation for local effects via inhalation, for local dermal effects and local effects to the eyes is given in Section 9.0.2.3.

Under the prescribed conditions of use, exposure is well below the DNELs and no local effects

are expected. Therefore, risks are adequately controlled.

9.3.3. Worker contributing scenario 2: Small scale handling/transfer of solutions (PROC 9)

9.3.3.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of substance: Solution	External Tool (MEASE)
• Maximum emission potential of the substance: Very low (Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.)	External Tool (MEASE)
• Content in preparation: Not restricted [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Amount used (or contained in articles), frequency and duration of use/exposure	
• Maximum duration of exposure: > 240 min (not restricted) [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Technical and organisational conditions and measures	
• Pattern of use: Non-dispersive use	External Tool (MEASE)
• Pattern of exposure control: Direct handling	External Tool (MEASE)
• Contact level: Intermittent	External Tool (MEASE)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes (Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.)	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation (Due to potential adverse effects of the substance to the respiratory tract, RPE (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.)	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (medium hazard) (Due to the potential adverse effects of the	

Palladium dinitrate

	Method
substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.)	

9.3.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 2. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	10 µg/m³ (External Tool (MEASE))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	34.29 µg/kg bw/day (External Tool (MEASE))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Remarks on exposure data

External Tool (MEASE)

- Dermal, systemic, long-term:
For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Conclusion on risk characterisation

Further information on the risk characterisation for local effects via inhalation, for local dermal effects and local effects to the eyes is given in Section 9.0.2.3.

Under the prescribed conditions of use, exposure is well below the DNELs and no local effects are expected. Therefore, risks are adequately controlled.

9.3.4. Worker contributing scenario 3: Continuous process in

closed system (PROC 2)

9.3.4.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of substance: Solution	External Tool (MEASE)
• Maximum emission potential of the substance: Very low (Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.)	External Tool (MEASE)
• Content in preparation: Not restricted [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Amount used (or contained in articles), frequency and duration of use/exposure	
• Maximum duration of exposure: > 240 min (not restricted) [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Technical and organisational conditions and measures	
• Pattern of use: Non-dispersive use	External Tool (MEASE)
• Pattern of exposure control: Non-direct handling	External Tool (MEASE)
• Contact level: None	External Tool (MEASE)
• Level of containment: Closed process	External Tool (MEASE)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes (Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.)	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation (Due to potential adverse effects of the substance to the respiratory tract, RPE (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.)	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (medium hazard) (Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be	

	Method
worn as appropriate.)	

9.3.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 3. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	1 µg/m³ (External Tool (MEASE))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	3.43 µg/kg bw/day (External Tool (MEASE))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Remarks on exposure data

External Tool (MEASE)

- Dermal, systemic, long-term:
For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Conclusion on risk characterisation

Further information on the risk characterisation for local effects via inhalation, for local dermal effects and local effects to the eyes is given in Section 9.0.2.3.

Under the prescribed conditions of use, exposure is well below the DNELs and no local effects are expected. Therefore, risks are adequately controlled.

9.3.5. Worker contributing scenario 4: Batch process in closed system (PROC 3)

9.3.5.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of substance: Solution	External Tool (MEASE)
• Maximum emission potential of the substance: Very low (Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.)	External Tool (MEASE)
• Content in preparation: Not restricted [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Amount used (or contained in articles), frequency and duration of use/exposure	
• Maximum duration of exposure: > 240 min (not restricted) [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Technical and organisational conditions and measures	
• Pattern of use: Non-dispersive use	External Tool (MEASE)
• Pattern of exposure control: Non-direct handling	External Tool (MEASE)
• Contact level: Intermittent	External Tool (MEASE)
• Level of containment: Closed process	External Tool (MEASE)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes (Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.)	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation (Due to potential adverse effects of the substance to the respiratory tract, RPE (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.)	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (medium hazard) (Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.)	

9.3.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 4. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	10 µg/m³ (External Tool (MEASE))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	1.71 µg/kg bw/day (External Tool (MEASE))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Remarks on exposure data

External Tool (MEASE)

- Dermal, systemic, long-term:
For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Conclusion on risk characterisation

Further information on the risk characterisation for local effects via inhalation, for local dermal effects and local effects to the eyes is given in Section 9.0.2.3.

Under the prescribed conditions of use, exposure is well below the DNELs and no local effects are expected. Therefore, risks are adequately controlled.

9.3.6. Worker contributing scenario 5: Open or semi-closed wet chemical reaction process (PROC 4)

9.3.6.1. Conditions of use

Palladium dinitrate

	Method
Product (article) characteristics	
• Physical form of substance: Solution	External Tool (MEASE)
• Maximum emission potential of the substance: Very low (Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.)	External Tool (MEASE)
• Content in preparation: Not restricted [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Amount used (or contained in articles), frequency and duration of use/exposure	
• Maximum duration of exposure: > 240 min (not restricted) [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Technical and organisational conditions and measures	
• Pattern of use: Non-dispersive use	External Tool (MEASE)
• Pattern of exposure control: Non-direct handling	External Tool (MEASE)
• Contact level: Intermittent	External Tool (MEASE)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes (Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.)	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation (Due to potential adverse effects of the substance to the respiratory tract, RPE (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.)	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (medium hazard) (Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.)	

9.3.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following

table.

Table 5. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	50 µg/m ³ (External Tool (MEASE))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	3.43 µg/kg bw/day (External Tool (MEASE))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Remarks on exposure data

External Tool (MEASE)

- Dermal, systemic, long-term:
For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Conclusion on risk characterisation

Further information on the risk characterisation for local effects via inhalation, for local dermal effects and local effects to the eyes is given in Section 9.0.2.3.

Under the prescribed conditions of use, exposure is well below the DNELs and no local effects are expected. Therefore, risks are adequately controlled.

9.3.7. Worker contributing scenario 6: Mixing, blending (PROC 5)

9.3.7.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of substance: Solution	External Tool (MEASE)
• Maximum emission potential of the substance: Very low (Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials	External Tool (MEASE)

	Method
of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.)	
• Content in preparation: Not restricted [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Amount used (or contained in articles), frequency and duration of use/exposure	
• Maximum duration of exposure: > 240 min (not restricted) [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Technical and organisational conditions and measures	
• Pattern of use: Non-dispersive use	External Tool (MEASE)
• Pattern of exposure control: Non-direct handling	External Tool (MEASE)
• Contact level: Intermittent	External Tool (MEASE)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes (Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.)	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation (Due to potential adverse effects of the substance to the respiratory tract, RPE (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.)	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (medium hazard) (Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.)	

9.3.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 6. Exposure concentrations and risks for workers

Palladium dinitrate

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	50 µg/m ³ (External Tool (MEASE))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	3.43 µg/kg bw/day (External Tool (MEASE))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Remarks on exposure data

External Tool (MEASE)

- Dermal, systemic, long-term:
For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Conclusion on risk characterisation

Further information on the risk characterisation for local effects via inhalation, for local dermal effects and local effects to the eyes is given in Section 9.0.2.3.

Under the prescribed conditions of use, exposure is well below the DNELs and no local effects are expected. Therefore, risks are adequately controlled.

9.3.8. Worker contributing scenario 7: Wet cleaning (PROC 8a)

9.3.8.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of substance: Solution	External Tool (MEASE)
• Maximum emission potential of the substance: Very low (Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.)	External Tool (MEASE)

Palladium dinitrate

	Method
• Content in preparation: Not restricted [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Amount used (or contained in articles), frequency and duration of use/exposure	
• Maximum duration of exposure: > 240 min (not restricted) [Effectiveness Inhal: 0%; Dermal: 0%]	External Tool (MEASE)
Technical and organisational conditions and measures	
• Pattern of use: Non-dispersive use	External Tool (MEASE)
• Pattern of exposure control: Direct handling	External Tool (MEASE)
• Contact level: Extensive	External Tool (MEASE)
• Immediate removal of splashes: Splashes should be removed immediately before drying of the substance	External Tool (MEASE)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Gloves: Protective gloves according to EN 374 have to be worn. Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. [Effectiveness Dermal: 90%]	External Tool (MEASE)
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes (Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.)	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation (Due to potential adverse effects of the substance to the respiratory tract, RPE (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.)	

9.3.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 7. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	50 µg/m ³ (External Tool (MEASE))	RCR < 0.01

Palladium dinitrate

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	34.29 µg/kg bw/day (External Tool (MEASE))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Remarks on exposure data

External Tool (MEASE)

- Dermal, systemic, long-term:
For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Conclusion on risk characterisation

Further information on the risk characterisation for local effects via inhalation, for local dermal effects and local effects to the eyes is given in Section 9.0.2.3.

Under the prescribed conditions of use, exposure is well below the DNELs and no local effects are expected. Therefore, risks are adequately controlled.