

<b>1. TITLE</b>	
<b>GES 6 Stainless, special steels and special alloys manufacturing (S4A)</b>	
<b>Life cycle</b>	Formulation – DU of Ni metal
<b>Free short title</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Systematic title based on use descriptor</b>	<p><b>SU:</b> SU 14: Manufacture of basic metals and alloys</p> <p><b>PC:</b> PC 7- Base metals and alloys</p> <p><b>ERC:</b> ERC 5: Industrial use resulting in inclusion into or onto a matrix  ERC 12a: Industrial processing of articles with abrasive techniques (low release)  ERC 12b: Industrial processing of articles with abrasive techniques (high release)</p> <p><b>PROC:</b> PROC 4: Use in a batch and other process where opportunity for exposure arises  PROC 8b: Transfer of substance or preparation from/to vessels/large containers at dedicated facilities  PROC 13: Treatment of articles by dipping and pouring  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 23: Open processing and transfer operations with metals at elevated temperature  PROC 24: High (mechanical) energy work-up of substance bound in materials  PROC 25: Other hot work operations with metals  PROC 0: Cleaning and maintenance</p>
<b>Processes, tasks, activities covered (environment)</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Processes, tasks, activities covered (workers)</b>	<p>Contributing exposure scenario ES 6.1: PROC 8b: Raw material handling</p> <p>Contributing exposure scenario ES 6.2: PROC4, PROC 22, PROC 23: First processing</p> <p>Contributing exposure scenario ES 6.3: PROC 24: Further processing</p> <p>Contributing exposure scenario ES 6.4: PROC 13, PROC 24, PROC 25: Finishing</p> <p>Contributing exposure scenario ES 6.5: PROC 0: Cleaning and maintenance</p> <p>Contributing exposure scenario ES 6.6: PROC 21: Packaging, shipping and storage</p>

**2. OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES**

<b>2.1 Control of environmental exposure</b>	
<b>Environmental related free short title</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Systematic title based on use descriptor (environment)</b>	ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 12b: Industrial processing of articles with abrasive techniques (high release)
<b>Processes, tasks, activities covered (environment)</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Environmental Assessment Method</b>	Estimates based on monitoring local and regional concentrations are used for calculation of PEC
<b>Product characteristics</b>	
Ni metal is used in the form of Ni briquettes, Ni plates, shots or ingots, part of steel or alloys scrap, FeNi (ingots and granules) and nickel sinter oxide.	
<b>Amounts used</b>	
<b>Maximum daily use at a site</b>	ES 1: 4.2 tonnes/day (median 50 <sup>th</sup> % emission days, 25 <sup>th</sup> % tonnage) ES 2: 38 tonnes/day (median 50 <sup>th</sup> % emission days, 50 <sup>th</sup> % tonnage) ES 3: 152 tonnes/day (median 50 <sup>th</sup> % emission days, 90 <sup>th</sup> % tonnage)
<b>Maximum annual use at a site</b>	ES 1: 1520 tonnes (25 <sup>th</sup> %, 2007) ES 2: 14000 tonnes (50 <sup>th</sup> %, 2007) ES 3: 55300 tonnes (90 <sup>th</sup> %, 2007)
<b>Frequency and duration of use</b>	
<b>Pattern of release to the environment</b>	365 days per year per site (median 50 <sup>th</sup> %)
<b>Environment factors not influenced by risk management</b>	
<b>Receiving surface water flow rate</b>	ES 1: 18000 m <sup>3</sup> /d ES 2: 198000 m <sup>3</sup> /d ES 3: 2xE6 m <sup>3</sup> /d
<b>Dilution capacity, freshwater</b>	ES 1: 10 (default) ES 2: 100 (median) ES 3: 1000 (max)
<b>Dilution capacity, marine</b>	100 (default)
<b>Other given operational conditions affecting environmental exposure</b>	
None	
<b>Technical conditions and measures at process level (source) to prevent release</b>	
None	
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	
<b>Waste water:</b>	
On-site waste water treatment in a physico-chemical treatment plant by chemical precipitation, sedimentation, filtration, oiling removal or a combination of these methods.	
Release factor after on-site treatment to freshwater:	
ES 1: 3.89 g/T (median, RAR dataset)	
ES 2: 3.89 g/T (median, RAR dataset)	
ES 3: 7.25 g/T (75 <sup>th</sup> %, RAR dataset)	
Release factor after on-site treatment to marine water: 7.25 g/T (75 <sup>th</sup> %, RAR dataset)	
<b>Air:</b>	
Treatment of stack air emission by fabric or bag filters, or wet scrubbers.	
Efficiency min. 99%	
Release factor after on-site treatment: 31.6 g/T (75 <sup>th</sup> %, RAR dataset)	
<b>Organizational measures to prevent/limit release from site</b>	
None	
<b>Conditions and measures related to municipal sewage treatment plant</b>	
<b>Municipal Sewage Treatment Plant (STP)</b>	No
<b>Discharge rate of the Municipal STP</b>	Not relevant
<b>Incineration of the sludge of the Municipal STP</b>	Not relevant
<b>Conditions and measures related to external treatment of waste for disposal</b>	
Ni bearing waste shall be recovered or recycled if possible. Ni bearing waste mixtures may be assessed as substances according to regulation (EC) No. 1272/2008 criteria. Disposal of Ni bearing waste shall comply with local, state or national waste legislation and remains the responsibility of the waste treatment operator.	
<b>Conditions and measures related to external recovery of waste</b>	
Not applicable	

2.2 Control of workers exposure for contributing exposure scenario ES 6.1	
Raw material handling	
<b>Workers related free short title</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Use descriptor covered</b>	PROC 8b: Transfer of substance or preparation from / to vessels/large containers at dedicated facilities
<b>Processes, tasks, activities covered</b>	Raw material handling including unloading, transferring, storage and furnace charge
<b>Assessment Method</b>	Estimation of exposure based on measured data.
<b>Product characteristic</b>	
Ni metal is used in the form of Ni briquettes, Ni plates, shots or ingots, part of steel or alloys scrap and FeNi (ingots and granules) and nickel sinter oxide	
<b>Amounts used</b>	
Not relevant	
<b>Frequency and duration of use/exposure</b>	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins.	
<b>Human factors not influenced by risk management</b>	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	Not relevant
Body weight	Not relevant
<b>Other given operational conditions affecting workers exposure</b>	
Work is taken place outdoor. Oral: Good workplace hygiene practice	
<b>Technical conditions and measures at process level (source) to prevent release</b>	
None	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
None	
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
None	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Gloves are required for hand protection, coveralls and eye protection is required when handling dusty materials.	

2.3 Control of workers exposure for contributing exposure scenario ES 6.2	
First processing	
<b>Workers related free short title</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Use descriptor covered</b>	PROC 4: Use in a batch and other process where opportunity for exposure arises PROC 22: Potentially closed processing operations with metals at elevated temperature PROC 23: Open processing and transfer operations with metals at elevated temperature
<b>Processes, tasks, activities covered</b>	First processing including melting (EAF, VIM, BOF, induction furnace), decarburisation (AOD, VOD), secondary metallurgical processes ESR and VAR, and casting
<b>Assessment Method</b>	Estimation of exposure based on measured data and a Tier 1 model
<b>Product characteristic</b>	
Ni metal is used in the form of Ni briquettes, Ni plates, shots or ingots, part of steel or alloys scrap and FeNi (ingots and granules) and nickel sinter oxide. Ni metal is used in the form of molten metal charge when fed to the AOD, VOD, VIM, VAR or ESR and in the form of liquid or molten steel for casting.	
<b>Amounts used</b>	
Not relevant	
<b>Frequency and duration of use/exposure</b>	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins. Duration of task maximum 4 hours	
<b>Human factors not influenced by risk management</b>	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	1980 cm <sup>2</sup>
Body weight	Not relevant
<b>Other given operational conditions affecting workers exposure</b>	
Oral: Good workplace hygiene practice	
<b>Technical conditions and measures at process level (source) to prevent release</b>	

## GES - Generic Exposure Scenario

During charge and tapping the system is open, while in use the converters are considered as a closed system.
<b>Technical conditions and measures to control dispersion from source towards the worker</b>
General ventilation and LEV systems are required for steelmaking and casting and in dusty areas or when handling dusty materials. When adding alloying elements LEV system is required.
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>
None
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Gloves are required for hand protection, coveralls and eye protection is required when handling dusty materials. Steelmaking and casting: Gloves and coveralls suitable for handling hot metal are required. Eye/face protection against heat and splashing of hot metal is required.

### 2.4 Control of workers exposure for contributing exposure scenario ES 6.3

Further processing	
<b>Workers related free short title</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Use descriptor covered</b>	PROC 24: High (mechanical) energy work-up of substance bound in materials
<b>Processes, tasks, activities covered</b>	Further processing including hot and cold rolling, forging, die-forging, grinding, and welding
<b>Assessment Method</b>	Estimation of exposure based on measured data and a Tier 1 model
<b>Product characteristic</b>	
After casting Ni metal is incorporated in a chemical matrix such as massive stainless steel	
<b>Amounts used</b>	
Not relevant	
<b>Frequency and duration of use/exposure</b>	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins. Duration of task maximum 4 hours	
<b>Human factors not influenced by risk management</b>	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	1980 cm <sup>2</sup>
Body weight	Not relevant
<b>Other given operational conditions affecting workers exposure</b>	
Oral: Good workplace hygiene practice	
<b>Technical conditions and measures at process level (source) to prevent release</b>	
None	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
General ventilation is required for hot and cold rolling.	
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
None	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Hot rolling: Gloves and coveralls suitable for handling hot surfaces are required. Eye/face protection is required against heat. Cold rolling: Gloves and overalls suitable for handling metal are required.	

### 2.5 Control of workers exposure for contributing exposure scenario ES 6.4

Finishing	
<b>Workers related free short title</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Use descriptor covered</b>	PROC 13: Treatment of articles by dipping and pouring PROC24: High (mechanical) energy work-up of substance bound in materials PROC 25: Other hot operations with metals
<b>Processes, tasks, activities covered</b>	Finishing including annealing, pickling, grinding and welding
<b>Assessment Method</b>	Estimation of exposure based on measured data and a Tier 1 model
<b>Product characteristic</b>	
After casting and further processing Ni metal is incorporated in a chemical matrix such as massive stainless steel	
<b>Amounts used</b>	
Not relevant	
<b>Frequency and duration of use/exposure</b>	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins. Duration of task maximum 4 hours	
<b>Human factors not influenced by risk management</b>	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant

## GES - Generic Exposure Scenario

Area of skin contact with the substance under conditions of use	1980 cm <sup>2</sup>
Body weight	Not relevant
<b>Other given operational conditions affecting workers exposure</b>	
Oral: Good workplace hygiene practice	
<b>Technical conditions and measures at process level (source) to prevent release</b>	
None	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
General ventilation is required.	
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
None	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Annealing and pickling: Gloves and overalls suitable for handling hot surfaces and pickling media are required. Eye/face protection against heat and pickling media is required.	
Welding and grinding: Eye/face protection when welding and grinding is required. For manual welding and grinding respiration protection – Air purifying full mask (for example APF 10) is required.	

### 2.6 Control of workers exposure for contributing exposure scenario ES 6.5

Cleaning and maintenance	
<b>Workers related free short title</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Use descriptor covered</b>	PROC 0 – cleaning and maintenance
<b>Processes, tasks, activities covered</b>	Cleaning and maintenance
<b>Assessment Method</b>	Estimation of exposure based on measured data
<b>Product characteristic</b>	
Ni metal is in the form of dust, pickling residues, incorporated in a chemical matrix such as massive stainless steel or in an article	
<b>Amounts used</b>	
Not relevant	
<b>Frequency and duration of use/exposure</b>	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins.	
<b>Human factors not influenced by risk management</b>	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	Not relevant
Body weight	Not relevant
<b>Other given operational conditions affecting workers exposure</b>	
Oral: Good workplace hygiene practice	
<b>Technical conditions and measures at process level (source) to prevent release</b>	
None	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
General ventilation and LEV system when applicable.	
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
None	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Gloves and overalls suitable for handling metal should be worn when appropriate. Eye/face protection against dust and heat is required. Respiration protection, dust filter, half mask – P2 (APF=20) is required.	

### 2.7 Control of workers exposure for contributing exposure scenario ES 6.6

Packing, shipping and storage	
<b>Workers related free short title</b>	Stainless, special steels and special alloys manufacturing (S4A)
<b>Use descriptor covered</b>	PROC 21 Low energy manipulation of substances bound in materials and/or articles
<b>Processes, tasks, activities covered</b>	Packing, shipping and storage
<b>Assessment Method</b>	Estimation of exposure based on a Tier 1 model
<b>Product characteristic</b>	
Ni metal is incorporated in a chemical matrix such as massive stainless steel or in an article. Composition maximum 38 % in stainless steel, >35% in nickel alloys, <20% in other nickel containing alloys	
<b>Amounts used</b>	
Not relevant	
<b>Frequency and duration of use/exposure</b>	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins.	
Duration of task maximum 4 hours	
<b>Human factors not influenced by risk management</b>	

## GES - Generic Exposure Scenario

Respiration volume under conditions of use	Light to medium level work, 10 m <sup>3</sup> /d
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	1980 cm <sup>2</sup>
Body weight	70 kg
<b>Other given operational conditions affecting workers exposure</b>	
No direct handling involved.	
Oral: Good workplace hygiene practice	
<b>Technical conditions and measures at process level (source) to prevent release</b>	
None	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
None	
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
None	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Gloves and overalls suitable for handling metal are required.	

### 3. EXPOSURE AND RISK ESTIMATION

#### ENVIRONMENT

ERC 5, ERC12a, ERC12b: Stainless, special steels and special alloys manufacturing (S4A)							
Compartment	Unit	PNEC	PEC <sub>Regional</sub>	C <sub>local</sub>	PEC	RCR	Methods for calculation of environmental concentrations and PNEC
Freshwater ES 1	µg Ni/L	3.55	2.9	0.58	3.48	0.98	Measured values, Tier 3-RWC
Freshwater ES 2	µg Ni/L	3.55	2.9	0.39	3.29	0.93	Measured values, Tier 3-RWC
Freshwater ES 3	µg Ni/L	3.55	2.9	0.39	3.29	0.93	Measured values, Tier 3-RWC
Marine	µg Ni/L	8.6	0.3	3.94	4.24	0.49	Measured values, Tier 3-RWC
Terrestrial	mg Ni/kg	29.9	16.2	0.58	16.8	0.56	Measured values, Tier 3-RWC

#### WORKERS

ES 6.1: PROC 8b: Raw material handling						
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure	
Dermal						
Acute systemic	mgNi/kg/day	-	NR			
Acute local	mgNi/cm <sup>2</sup> /day	-	NR			
Long-term systemic	mgNi/kg/day	-	NR			
Long-term local	mgNi/cm <sup>2</sup> /day	0.070	0.0001	0.001	75 <sup>th</sup> percentile for alloy handler and raw material inspector	
Inhalation						
Acute systemic	mgNi/m <sup>3</sup>	680	0.018	<0.001	3 x 90 <sup>th</sup> percentile long-term inhalation exposure	
Acute local	mgNi/m <sup>3</sup>	4.0	0.018	0.004	90 <sup>th</sup> percentile long-term inhalation exposure for raw material handling, personal samples (n=5), inhalable measurement	
Long-term systemic	mgNi/m <sup>3</sup>	0.05	0.006	0.12		
Long-term local	mgNi/m <sup>3</sup>	0.05	0.006	0.12	90 <sup>th</sup> percentile long-term inhalation exposure for raw material handling, personal samples (n=5), inhalable measurement	

ES 6.2: PROC 4, PROC 22, PROC 23: FIRST PROCESSING					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
<b>Dermal</b>					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm <sup>2</sup> /day	-	NR		
Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm <sup>2</sup> /day	0.070	0.00003	< 0.001	Exposure estimated using a Tier 1 model for PROC 22 (concentration > 25%, non-dispersive use, non-direct handling, intermittent exposure for the maximum of 4 hours, and the use of properly designed gloves).
<b>Inhalation</b>					
Acute systemic	mgNi/m <sup>3</sup>	680	0.036	<0.001	3 x 75 <sup>th</sup> percentile long-term exposure for steelmaking and casting
Acute local	mgNi/m <sup>3</sup>	4	0.036	0.09	
Long-term systemic	mgNi/m <sup>3</sup>	0.05	0.012	0.24	75 <sup>th</sup> percentile for steelmaking and casting, personal samples (n=194), inhalable measurement
Long-term local	mgNi/m <sup>3</sup>	0.05	0.012	0.24	

ES 6.3: PROC 24: FURTHER PROCESSING					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
<b>Dermal</b>					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm <sup>2</sup> /day	-	NR		
Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm <sup>2</sup> /day	0.070	0.00003	< 0.001	Exposure estimated using a Tier 1 model for PROC 22 (concentration > 25%, non-dispersive use, non-direct handling, intermittent exposure for the maximum of 4 hours, and the use of properly designed gloves).
<b>Inhalation</b>					
Acute systemic	mgNi/m <sup>3</sup>	680	0.09	<0.001	3 x 75 <sup>th</sup> percentile long-term exposure for hot rolling
Acute local	mgNi/m <sup>3</sup>	4.0	0.09	0.0225	
Long-term systemic	mgNi/m <sup>3</sup>	0.05	0.03	0.6	75 <sup>th</sup> percentile for hot rolling, personal samples (n=61), inhalable measurement
			0.009	0.18	75 <sup>th</sup> percentile for cold rolling, personal samples (n=14), inhalable measurement
Long-term local	mgNi/m <sup>3</sup>	0.05	0.03	0.6	75 <sup>th</sup> percentile for hot rolling, personal samples (n=61), inhalable measurement
			0.009	0.18	75 <sup>th</sup> percentile for cold rolling, personal samples (n=14), inhalable measurement



ES 6.4: PROC 13, PROC 24, PROC 25: Finishing					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
<b>Dermal</b>					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm <sup>2</sup> /day	-	NR		
Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm <sup>2</sup> /day	0.070	0.00003	< 0.001	Exposure estimated using a Tier 1 model for PROC 25 (concentration > 25%, non-dispersive use, non-direct handling, intermittent exposure for the maximum of 4 hours, and the use of properly designed gloves).
<b>Inhalation</b>					
Acute systemic	mgNi/m <sup>3</sup>	680	0.114	<0.001	3 x 75 <sup>th</sup> percentile long-term exposure for annealing, pickling, and welding
Acute local	mgNi/m <sup>3</sup>	4.0	0.114	0.029	3 x 75 <sup>th</sup> percentile long-term exposure for annealing, pickling, and welding
Long-term systemic	mgNi/m <sup>3</sup>	0.05	0.038	0.76	75 <sup>th</sup> percentile for annealing, pickling, and welding, personal samples (n=41), inhalable measurements
Long-term local	mgNi/m <sup>3</sup>	0.05	0.038	0.76	

ES 6.5: PROC 0: CLEANING AND MAINTENANCE					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
<b>Dermal</b>					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm <sup>2</sup> /day	-	NR		
Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm <sup>2</sup> /day	0.070	0.00035	0.005	75 <sup>th</sup> percentile for maintenance (short-term exposure)
<b>Inhalation</b>					
Acute systemic	mgNi/m <sup>3</sup>	680	0.34	<0.001	3 x 75 <sup>th</sup> percentile for cleaning and maintenance (full shift)
Acute local	mgNi/m <sup>3</sup>	4	0.34	0.086	
Long-term systemic	mgNi/m <sup>3</sup>	0.05	0.115	2.3 excl. RPE By use of RPE (P2, APF 20): 0.115	75 <sup>th</sup> percentile for cleaning and maintenance, personal samples (n= 13), inhalable measurements
Long-term local	mgNi/m <sup>3</sup>	0.05	0.115	2.3 excl. RPE By use of RPE (P2, APF 20): 0.115	



ES 6.6: PROC 21: PACKING, SHIPPING AND STORAGE					
	Unit	DNEI	Exposure concentration	RCR	Methods for calculation of exposure
<b>Dermal</b>					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm <sup>2</sup> /day	-	NR		
Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm <sup>2</sup> /day	0.070	0.0003	0.004	Exposure estimated using MEASE, a tier 1 model for PROC 21 for a massive object, >25% composition, and industrial use <240 min assumed. It is also assumed that properly designed gloves for direct handling and incidental exposure occurs.
<b>Inhalation</b>					
Acute systemic	mgNi/m <sup>3</sup>	680	0.09	<0.001	Acute exposure assumed to be 3X long term calculated with MEASE
Acute local	mgNi/m <sup>3</sup>	4	0.09	0.0225	
Long-term systemic	mgNi/m <sup>3</sup>	0.05	0.03	0.6	Exposure estimated using MEASE, a tier 1 model for PROC 21 for a massive object, >25% composition, and industrial use <240 min assumed. Exposure estimated using MEASE, a tier 1 model for PROC 21 for a massive object, >25% composition, and industrial use <240 min assumed.
Long-term local	mgNi/m <sup>3</sup>	0.05	0.03	0.6	

**Notes**

Collect process monitoring data. Respirable fraction exposure levels should be kept below 0.01 mg Ni/m<sup>3</sup>. Use speciation to ensure that the appropriate inhalable DNEL is used (e.g., if only Ni metal and Ni oxide are present, an inhalable exposure of 0.2 mg Ni/m<sup>3</sup> could be reasonably assumed to be safe).

Acute local inhalation

Based on respirable size aerosols. Equivalent inhalable fraction levels expected to be at least 3-fold higher

**4. GUIDANCE TO DU TO EVALUATE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES**

**Environment**

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

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.

Scaling of the PNEC for aquatic environment by using a tiered approach for correction for bioavailability and background concentration (C<sub>local</sub> approach).

Scaling of the PNEC for soil compartment by using a tiered approach for correction for bioavailability and background concentration (C<sub>local</sub> approach)

**Workers**

Scaling considering duration and frequency of use

Collect process monitoring data. Use aerosol particle size information, when available, to confirm the appropriate use of an inhalable DNEL. Chemical speciation data showing that only Ni metal and/or Ni oxides are present in the workplace air can be used to indicate RCR <1 at inhalable exposure levels between 0.05 and 0.2 mg Ni/m<sup>3</sup>

Olivier Desevedavy – Cunico Resources

Source: Nickel Consortium GES library - 2011