

1. Title		Version 6, 2015
GES 17 Production of brazing alloys		
Life cycle	Formulation – DU of Ni metal	
Free short title	Production of brazing alloys	
Systematic title based on use descriptor	SU: SU 14 - Manufacture of basic metals and alloys PC: PC 7 Base metals and alloys ERC: SPERC, Formulation of massive metal (alloying) ERC3: Formulation in materials PROC: PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature 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 26: Handling of solid inorganic substances at ambient temperature PROC 0: Cleaning and maintenance	
Processes, tasks, activities covered (environment)	Production of brazing alloys	
Processes, tasks, activities covered (workers)	Raw Materials handling Melting or mixing Casting or filling Finishing Packing and shipping Cleaning and maintenance	
2. Operational conditions and risk management measures		
2.1 Control of environmental exposure		
Environmental related free short title	Production of brazing alloys	
Systematic title based on use descriptor (environment)	SPERC: Formulation of massive metal (alloying)	
Processes, tasks, activities covered (environment)	Production of brazing alloys	
Environmental Assessment Method	Estimation of local concentrations based on the use of SPERC for formulation of massive metal (alloying) and measured regional concentrations are used for calculation of PEC	
Product characteristics		
Ni: CuNi30 massive plates, pellets or foil, Ni-based brazing alloy powder Concentration of Ni: > 95% in pellets and foil, 4-82% Ni in brazing alloy powder		
Amounts used		
Maximum daily use at a site	2.2 kg/day Ni (median 50 th % emission days)	
Maximum annual use at a site	ES 1 & 2: 0.55 tonnes Ni (2007)	
Frequency and duration of use		
Pattern of release to the environment	252 days per year (median 50 th %)	
Environment factors not influenced by risk management		
Receiving surface water flow rate	ES 1 Discharge to STP: 18,000 m3/d (Effluent STP: 2000 m3/d)	
Dilution capacity, freshwater	ES 1 Discharge to STP: 10 (default)	
Dilution capacity, marine	ES 2 Marine discharge: 100 (default)	
Other given operational conditions affecting environmental exposure		
None		
Technical conditions and measures at process level (source) to prevent release		
None		

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Waste water: On-site waste water treatment in a physico-chemical treatment plant. Off site waste water treatment in municipal STP for ES 1. ES 1 Freshwater discharge to STP: Release factor after on-site treatment: 50 g/T (Sperc for formulation in alloys) ES 2 Marine direct discharge: Release factor after on-site treatment: 50 g/T (Sperc for formulation in alloys)	
Air: Treatment of air emissions by fabric or bag filters. ES 1 & 2: Release factor to air after on-site treatment: 50 g/T (Sperc for formulation in alloys)	
Organizational measures to prevent/limit release from site	
None	
Conditions and measures related to municipal sewage treatment plant	
Municipal Sewage Treatment Plant (STP)	Yes for ES 1 Discharge to STP
Discharge rate of the Municipal STP	2000 m ³ /d (default)
Incineration of the sludge of the Municipal STP	The sludge is applied to agricultural soil
Conditions and measures related to external treatment of waste for disposal	
Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the nickel content of the waste is elevated enough, internal or external recovery/recycling might be considered.	
Fraction of daily/annual use expected in waste:	
<ul style="list-style-type: none"> - Nickel producers = 0.05 % - DU: stainless steel and alloy steels = 0.6 % - DU: nickel alloys, copper alloys, foundry, batteries, catalysts, chemicals, dyes and others = 0.5 % - DU: Plating = 3% 	
Appropriate waste codes:	
01 03 07*, 02 01 10*, 06 03 13*, 06 03 15*, 06 04 05*, 06 05 02*, 10 08 04, 10 08 08*, 10 08 09, 10 08 15*, 10 08 16, 10 10 03, 10 10 05*, 10 10 07*, 10 10 09*, 10 10 10, 10 10 11*, 11 02 07*, 12 01 03*, 12 01 04, 15 01 04*, 15 01 10*, 16 01 04*, 16 01 06*, 16 01 08*, 16 06 02*, 16 06 05, 16 08 02*, 16 08 03*, 17 04 07*, 17 04 09*, 19 09 04*, 19 10 02*, 19 12 03*	
Suitable disposal: Keep separate and dispose of to either	
<ul style="list-style-type: none"> - Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006. - Hazardous landfill operated under Directive 1999/31/EC. 	
Conditions and measures related to external recovery of waste	
Shredders pre-treating metal wastes should have a maximum release factors to air of 0.0015 after RMM and no releases to water and soil.	
Q _{max} , local(shredding)=26kg Ni/day	
(Note: This Q _{max} , local for shredders is based on the existing information at the moment of the update. It will be reviewed when new information is available from the BREF for shredding)	
2.2 Control of workers exposure	
Production of brazing alloys	
Workers related free short title	Production of brazing alloys
Use descriptor covered	PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 22: Potentially closed processing operations with minerals/metals at

	<p>elevated temperature 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 26: Handling of solid inorganic substances at ambient temperature PROC 0: Cleaning and maintenance</p>						
Processes, tasks, activities covered	<p>Raw Materials handling Melting or mixing Casting or filling Finishing Packing and shipping Cleaning and maintenance</p>						
Assessment Method	Estimation of exposure based on measured data						
Product characteristic							
<p>Ni-pellets or foil, Ni-based brazing alloy powder Concentration of Ni: > 95% in pellets and foil, 4-82% Ni in brazing alloy powder</p>							
Amounts used							
Not relevant							
Frequency and duration of use/exposure							
8 hour workday							
Human factors not influenced by risk management							
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			
Other given operational conditions affecting workers exposure							
<p>Raw materials handling: Ambient temperatures Processing of foil or pellets: Heating of raw materials to form melt, that is then tapped and cast Processing of brazing alloy powder: Mixing of raw materials to form melt, that is then tapped and cast Product handling for foil and pellets: Cooling, finishing – may include cutting, grinding and/or polishing Product handling for brazing alloy powder: Cooling, filling for paste. Cleaning: Solid residues may be removed from process equipment using appropriate hand tools. Dust should be removed by hosing down (followed by appropriate waste water treatment) or vacuuming using a cleaner fitted with a High Efficiency Filter Maintenance of clean workplace to prevent accumulation of powders and dusts on surfaces. Avoidance of dust generation. Oral: Good workplace hygiene practice</p>							
Technical conditions and measures at process level (source) to prevent release							
<p>Enclosure and use of exhaust ventilation is required for handling of Ni-based brazing alloy powder. Enclosure is required for finishing processes likely to generate dust such as cutting and grinding and performed through each shift.</p>							
Technical conditions and measures to control dispersion from source towards the worker							
<p>Exhaust ventilation of fumes is required during heating and cooling.</p> <p>LEV is required for handling of Ni-based brazing alloy powder and where processes likely to generate dust such as cutting and grinding are performed intermittently.</p>							
Organisational measures to prevent /limit releases, dispersion and exposure							
None							
Conditions and measures related to personal protection, hygiene and health evaluation							
<p>Inhalation: RPE should be used for cleaning and maintenance where exposure to airborne powders and/or dust containing metallic nickel is possible. Dermal: Gloves and other suitable protective clothing to minimise skin contact with Ni metal are required.</p>							
3. Exposure and risk estimation							
Environment							
<p>SPERC: Formulation of massive metal (alloying) Production of brazing alloys</p>							
Compartment	Unit	PNEC	PEC _{Regional}	C _{local}	PEC	RCR	Methods for calculation

							of environmental concentrations
ES 1: Freshwater STP discharge							Metal SPERC for formulation massive metal is used for estimation of environmental concentrations
Freshwater	µg Ni/L	7.1	2.9	<0.01	2.90	0.41	
STP	mg Ni/L	0.33	-	-	<0.001	<0.001	
Sediment	mg Ni/kg	136	33.5	0.06	33.56	0.25	
Terrestrial	mg Ni/kg	29.9	16.2	<0.01	16.20	0.54	
ES 2: Marine direct discharge							
Marine water	µg Ni/L	8.6	0.3	<0.01	0.30	0.04	
Sediment	mg Ni/kg	136	16.1	0.01	16.11	0.12	
Terrestrial	mg Ni/kg	29.9	16.2	<0.01	16.20	0.54	

Workers

PROC 8a, PROC 22, PROC 23, PROC 24, PROC 26, PROC 0: Production of brazing alloys						
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure	
Dermal						
Acute systemic	mgNi/kg/day	-	NR			
Acute local	mgNi/cm ² /day	-	NR			
Long-term systemic	mgNi/kg/day	-	NR			
Long-term local	mgNi/cm ² /day	0.035	0.004	0.11	Estimated 75 th percentile for dermal exposure to insoluble Ni during alloy production	
Inhalation						
Acute local	mgNi/m ³	4.0	0.03	0.0075	3 x estimated 75 th percentile for long-term exposure, assumes effective LEV or containment in place	
Long-term systemic and local	mgNi/m ³	0.05	0.01	0.2	Estimate of the 75 th percentile of typical shift mean exposures, derived using expert judgement taking account of recent measurement data for powder metallurgy and data described in the EU RAR (2008-2009) for powder metallurgy and alloy production. Assumes process is entirely enclosed and fitted with LEV	
NR: Not Relevant						
<u>Acute local inhalation</u> DNEL 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_{local} approach).

Scaling of the PNEC for soil compartment by using a tiered approach for correction for bioavailability and background concentration (C_{local} approach).

Workers

Scaling considering duration and frequency of use

Collect process monitoring data with an inhalable sampler. The simultaneous use of a respirable sampler is encouraged. Use aerosol particle size information, when available, to confirm the appropriate use of the inhalable DNEL of 0.05 mg Ni/m³.

Respirable fraction exposure levels should be kept below 0.01 mg Ni/m³.

For further information and guidance on exposure scenarios, available tools, and scaling options, please visit the Nickel Consortia exposure scenario library at the following link: <http://www.nickelconsortia.eu/exposure-scenario-library.html>

Man via Environment exposure and risk characterisation assessments for the production of brazing alloys

Inhalation is the critical exposure pathway for humans via the environment. The PEC for air at site neighbouring residential areas should be lower than the chronic inhalation DNEL for the general public of 20 ng Ni/m³ as annual average in PM₁₀ in order to demonstrate adequate control of risk (RCR < 1) for Man via the Environment (MvE).

Hereto a Generic safe use Exposure Scenario for MvE was developed based on the EUSES model. The MvE GES is defined as the product of tonnage (T) and emission factor to air (EF) being lower than 18000 g Ni/year. The value of 18000 g Ni/year is derived by using EUSES model to back-calculate the product of T and EF that results in a local air concentration (C_{local}) of 15.5 ng Ni/m³. The value of 15.5 is derived from the difference between the DNEL of 20 ng Ni/m³ and the EU regional background concentration ($C_{regional}$) of 4.5 ng Ni/m³ (P90 annual concentration for 2012).

Generic safe use ES for all sectors according to Tier 1 (EUSES model)

Sector	Tonnage (Ni T /year)	Emission factor (g Ni/T)	Tonnage × emission factor (g /year)	C_{local} (ng/m ³)	$C_{regional}$ (ng/m ³)	PEC _{local} (ng/m ³)	RCR = PEC/DNEL (DNEL= 20 ng/m ³)
All	T	EF	T × EF < 18000	<15.5	4.5*	<20	<1

*: EU average of country P90 annual Ni concentrations (2012)

If a site is not compliant with these conditions, meaning that the product of tonnage and emission factor is above 18000 g Ni/year, a tiered approach including site-specific modelling can be applied to demonstrate safe use