1. Title GES 18 Use of brazing alloys	Version 6, 2015
Life cycle	End use – DU of Ni metal
Free short title	Use of brazing alloys
Systematic title based on use descriptor	SU: SU 3 Industrial use PC: PC 7 Base metals and alloys ERC: ERC 8c,8f wide dispersive indoor/outdoor use resulting in inclusion into or onto a matrix PROC: PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature
Processes, tasks, activities covered (environment)	Use of brazing alloys
Processes, tasks, activities covered (workers)	Use of brazing alloys to join metal parts Manual and furnace brazing
2. Operational conditions and risk management measures	
2.1 Control of environmental exposure	
Environmental related free short title	Use of brazing alloys, Processing of massive metal
Systematic title based on use descriptor (environment)	ERC 8c,8f wide dispersive indoor/outdoor use resulting in inclusion into or onto a matrix
Processes, tasks, activities covered (environment)	Use of brazing alloys
Environmental Assessment Method	Estimation of local concentrations based on the use of ERC 8c,8f wide dispersive indoor/outdoor use resulting in inclusion into or onto a matrix (use of brazing alloys) and measured regional concentrations are used for calculation of PEC
Product characteristics	
Ni solid: CuNi30 massive plates, pellets or foil Rod, ribbon, powder, paste, cream, wire or pre-forms	
Amounts used	
Maximum daily use at a site	2.2 kg/day Ni (median 50th % 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 50th %)
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: ES 1 Freshwater discharge to STP: ERC default release factor: 10,000 g/T ES 2 Marine direct discharge: ERC default release factor: 10,000 g/T **Air:** ES 1 & 2: ERC default release factor: 150,000 g/T	
Organizational measures to prevent/limit release from site	
None	
Conditions and measures related to municipal sewage treatment plant	
Municipal Sewage Treatment Plant (STP)	No
Discharge rate of the Municipal STP	Not relevant
Incineration of the sludge of the Municipal	Not relevant

STP	

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:

- 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

- 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.
Qmax, local(shredding)=26kg Ni/day
(Note: This Qmax, 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

Use of brazing alloys

Workers related free short title	Use of brazing alloys
Use descriptor covered	PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature
Processes, tasks, activities covered	Use of brazing alloys to join metal parts Manual and furnace brazing
Assessment Method	Estimation of exposure based on measured data

Product characteristic

Ni solid: CuNi30 massive plates, pellets or foil
Rod, ribbon, powder, paste, cream, wire or pre-forms

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

Brazing alloy is melted and distributed between two or more close-fitting parts by capillary action while protected by a suitable atmosphere or flux. Furnace brazing processes are usually automated with the alloy being placed before heating.

Brazing undertaken intermittently during the working day.
Maintenance of clean workplace to prevent accumulation of powders and dusts on surfaces.
Oral: Good workplace hygiene practice

Technical conditions and measures at process level (source) to prevent release

None

Technical conditions and measures to control dispersion from source towards the worker

LEV is required for: Manual processes that are undertaken on a regular basis; extraction of fumes from furnace or automated processes to prevent discharge into workplace air; processes involving powder handling

Organisational measures to prevent /limit releases, dispersion and exposure

None

Conditions and measures related to personal protection, hygiene and health evaluation

Inhalation: RPE (P3, APF = 20) is required where manual processes are undertaken infrequently.
Dermal: The use of gloves for handling brazing alloys should minimise exposure.

3. Exposure and risk estimation

Environment

ERC 8c, 8f
Use of brazing alloys

Compartment	Unit	PNEC	$PEC_{Regional}$	C_{local}	PEC	RCR	Methods for calculation of environmental concentrations
ES 1: Freshwater STP discharge							ERC 8c, f
Freshwater	µg Ni/L	7.1	2.9	0.47	3.37	0.48	
STP	mg Ni/L	0.33	-	-	0.007	0.02	
Sediment	mg Ni/kg	136	33.5	12.4	45.9	0.34	
Terrestrial	mg Ni/kg	29.9	16.2	0.23	16.43	0.55	
ES 2: Marine direct discharge							
Marine water	µg Ni/L	8.6	0.3	0.08	0.38	0.04	
Sediment	mg Ni/kg	136	16.1	2.06	18.16	0.13	
Terrestrial	mg Ni/kg	29.9	16.2	0.03	16.23	0.54	

Workers

PROC 22: Use of brazing alloys

	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR		
Acute local	mg Ni/cm^2/day	-	NR		
Long-term systemic	mg Ni/kg/day	-	NR		
Long-term local	mg Ni/cm^2/day	0.035	0.004	0.11	Estimated 75th percentile for dermal exposure to insoluble Ni during alloy production
Inhalation					
Acute local	mg Ni /m^3	4.0	0.2	0.05	Estimated 75th percentile of short term peak exposures based on 4 x 75th percentile long-term estimate. Assumes exposure would be more variable through the working day than for typical industrial

					operations for which a factor of 3 would be employed but less variable than for operations involving powders. Assumes effective LEV or containment in place.
Long-term systemic and local	mg Ni /m^3	0.05	0.05	1 (excl. RPE) By use of RPE (P3, APF 20): 0.05	Estimated 75th percentile shift mean concentration for manual operations based on professional judgement taking account of measurement data for alloy production which employs some similar processes and may give rise to similar levels of exposure. Assumes effective LEV employed and where brazing is undertaken intermittently during working day
NR: Not Relevant Acute local inhalation 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/m^3. Respirable fraction exposure levels should be kept below 0.01 mg Ni/m^3.

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 use 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/m^3 as annual average in PM_{10} 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/m^3. The value of 15.5 is derived from the difference between the DNEL of 20 ng Ni/m^3 and the EU regional background concentration ($C_{regional}$) of 4.5 ng Ni/m^3 (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