ES FOR COMMUNICATION

Substance Name: NICKEL METAL (update 2020)
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CAS Number: 7440-02-0
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0. General provisions related to conditions of use and guidance to downstream users

All provisions given in this section apply to each exposure scenario (ES) contained in this document. They are to be supplemented or exchanged for more specific measures where indicated in the individual ES.

0.1. Good occupational hygiene practice

Good occupational hygiene practices are essential to ensure safe handling of the substance. Inhalation (e.g. dust should not be blown off with compressed air) and ingestion must be avoided (e.g. no eating and smoking in the workplace, regular cleaning with suitable cleaning devices). Contaminated clothing should not be taken home. Good general ventilation in the workplace must ensure an adequate supply of fresh air. Regular training in workplace hygiene practice and proper use of personal protective equipment (if relevant) is indispensable.

0.2. General provisions related to personal protective equipment for workers

Use of personal protective equipment (PPE) for each of the exposure routes listed below is required as described here, unless exposure to the substance can be excluded for the respective route(s) of exposure. Exposure exclusions may be determined by, for example:

(i) the physical appearance of the substance in the specific type of application (e.g. wetting the substance can effectively prevent from the emission of dust),
(ii) the emission potential resulting from the nature of the process (e.g. splashes, emission of dust can be excluded in a closed process),
(iii) exposure prevention measures in place (segregation of the emission source or separation of the worker from the emission source), and
(iv) the amount of handled/emitted material during use in relation to the room size (i.e. dilution factor), taking into consideration prevailing air exchange rates during use.

If PPE needs to be used, further information is provided in the applicable exposure scenarios, in the subsections of this document and in Section 8 of the SDS.

0.2.1. Dermal route (skin protection)

Skin protective equipment should be selected in consideration of mechanical (acc. to EN 388, mechanical risks), cold or heat stress (acc. to EN 407, thermal risks) or any other physico-chemical hazards as relevant for the conducted tasks and working environment in addition to the effectiveness of the equipment to control exposure. Certified safety clothing including coveralls and safety shoes have to be worn. The following requirements for gloves are to be met:

- Due to the classification of the substance, gloves and skin protective clothing have to be worn for precautionary reasons unless dermal exposure can be excluded (please see above).
- If gloves are to be worn, either due to these general provisions or due to specific requirements set in the ES, they have to comply with EN 374.
- Any prescribed gloves have to be changed according to manufacturer’s information or when damaged, whatever is the earlier.

0.2.2. Inhalation route (respiratory protection)

Occasionally, specific information on the required assigned protection factor (APF) is provided in the occupational exposure scenarios. Respiratory protective equipment (RPE) should be selected based on the given APF according to EN 529 and should comply with national legislation. The following requirements for RPE are to be met in any case:

- Due to the classification of the substance, RPE has to be worn for precautionary reasons unless inhalation exposure can be excluded (please see above).

- If RPE must be worn, either due to these general provisions or due to specific requirements set in the ES, an APF of 10 represents the required minimum level of protection.

If RPE is to be worn, the following should all be taken into account:

i) the additional physiological stress for the worker due to the increased breathing resistance,
ii) the mass of the RPE itself,
iii) the increased temperature by enclosing the head, and
iv) that the worker's capability of using tools and communicating are reduced whilst wearing RPE.

For the above-indicated reasons, the worker should therefore:

(i) be healthy (especially with regard to medical problems that may affect the use of RPE), and
(ii) have facial characteristics that ensure no leakages between face and mask (e.g. leakage risk from facial hair or scar tissue).

The devices recommended in the ES which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely. The employer and self-employed persons have legal responsibilities for the supply and maintenance of respiratory protective devices, and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme, including worker training.

0.2.3. Eye/face protection

Eye/face protective equipment is to be selected in consideration of local effects caused by the substance, mechanical, cold or heat stress or any other physico-chemical hazards as relevant for the conducted tasks and working environment in addition to the effectiveness of the equipment to control exposure. The following requirements for eye/face protective equipment are to be met:

- Avoid direct contact of the eyes with the substance.
- Suitable eye protection equipment (e.g. goggles or visors) must be worn.
- Face protection must be worn unless such protection is provided by any eye protection (e.g. face covering visor) and/or RPE used.

0.3. Generic guidance to DU to evaluate whether he works inside the boundaries set by the ES

For the exposure scenarios (ES) in this document, the Downstream User (DU) works within the boundaries set by the ES if the given operational conditions (OCs) and risk management measures (RMMs) as described in the ES are met. If the DU's conditions are not explicitly included in the generic conditions described in the ES, the DU must ensure that his specific OCs and implemented RMMs are compliant. If the concentration of the substance in mixture is not explicitly stated in the ES this does not represent a restriction (i.e. up to 100 % of the substance could be used). Depending on the basis for the exposure assessment conducted for the ES, the assessment needs to be done in multiple ways as described individually for environmental and occupational ES below.

0.3.1. Occupational exposure scenarios

The occupational exposure assessment may be either based on monitoring data (including analogous or published data) or based on exposure assessment models. Depending on which method has been used for exposure assessment, different ways for compliance checking are to be followed as given below.

0.3.1.1. Monitoring data used as basis for assessment

If the exposure assessment in the ES is based on monitoring data, the same approach can be used by DUs for compliance checking. Please note that 6 measurements per workplace are required for an exposure assessment as a minimum. Depending on the variability of the data sets (expressed as the geometric standard deviation) and the level of the resulting risk characterisation ratio, additional measurements may be required. Only measurements of personal exposure to the inhalable fraction of airborne dust (according to EN 481) should be used. The exposure data shall either be applicable to the length of a specific task to be assessed or to a full-shift (i.e. sampled over a duration of at least 120

min) if the task to be assessed is conducted for a significant portion of the work shift. From the exposure data set, the maximum likelihood estimate of the upper 90 % confidence limit for the 75th percentile of the exposure distribution is to be used as a reasonable worst case estimate for comparison with the reported exposure level in the associated contributing ES. Respiratory protective equipment (RPE) may be taken into account by applying the assigned protection factor as given in EN 529:2005.

0.3.1.1.1. Specific considerations for efficiency values for Risk Management Measures (RMMs) prescribed in occupational exposure scenarios

If your monitored exposure levels are following those reported for the ES after consideration of any PPE worn, the efficiency of the RMMs implemented at your facility can be considered compliant with the ES.

0.3.1.1.2. Deviations from the conditions of use if monitoring data were used for exposure assessment

Any deviations from the given conditions of use mean you need to either:

(i) inform the supplier of the eSDS about these deviations and request the ES be reviewed to include the identified deviations or
(ii) prepare your own DU CSR (according to Article 37(4)), which must be notified to ECHA and also be kept at your company as in-house documentation.

0.3.1.2. Use of exposure models

If the exposure assessment in the ES is based on modelled data, the same model can be used to justify specific slight deviations from the generic conditions described in the ES. All parameters needed to run the exposure estimation tool MEASE (version 1.02.01; available on www.ebrc.de/mease.html) can be found in the ES. It is noted that the installation of the prescribed RMMs is mandatory and that only the modification of the personal protective equipment (PPE) used is allowed as a deviation. The only parameters which may therefore be modified in the MEASE-calculation are consequently:

(i) concentration in mixture (only lower concentrations),
(ii) efficiency of the installed RMMs (only higher efficiencies), and
(iii) type of PPE to be used.

0.3.1.2.1. Specific considerations for efficiency values for RMMs prescribed in occupational exposure scenarios

Any efficiency values reported in the ES represent typical efficiencies for a given industry sector after evaluating conditions of use as made available to the consultants and are therefore considered to adequately approximate to actual efficiencies. If downstream users want to evaluate whether prescribed efficiencies are met, exposure monitoring could be conducted. In such a case, monitored exposure levels should be the same as or lower than those reported for the ES after consideration of any PPE worn. Further information on efficiency values can be found in the glossary of MEASE.

0.3.1.2.2. Deviations from the conditions of use if exposure models were used for exposure assessment

Further deviations from the given conditions of use, or if the DU assessment is to be based on monitoring data, require you either to:

(i) inform the supplier of the eSDS about these deviations and request the ES be reviewed to include the identified deviations or
(ii) prepare your own DU CSR (according to Article 37(4)) which must be notified to ECHA and also be kept at your company as in-house documentation.

0.3.2. Environmental exposure scenarios

0.3.2.1. Deviations from the conditions of use

This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be

scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

0.4. Man via the environment exposure and risk characterisation assessments

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 60 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 Generic ES is defined as the product of tonnage (T) and emission factor to air (EF) being lower than 74000 g Ni/year. The value of 74000 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 56.6 ng Ni/m^3. The value of 56.6 ng Ni/m^3 is derived from the difference between the DNEL of 60 ng Ni/m^3 and the EU regional background concentration ($C_{regional}$) of 3.4 ng Ni/m^3 (average of P90 annual concentration of Ni in PM_{10} for the years 2013, 2014 and 2015).

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 Ni/year)**	**C_{local} (ng/m^3)**	**$C_{regional}$ (ng/m^3)**	**PEC_{local} (ng/m^3)**	**RCR = PEC/DNEL (DNEL= 60 ng/m^3)**
All	T	EF	T × EF < 74000	<56.6	3.4*	<60	<1

*: EU average of country P90 annual Ni concentrations in PM_{10} (2013, 2014 and 2015)

If a site is not compliant with these conditions, meaning that the product of tonnage and emission factor is above 74000 g Ni/year, a tiered approach including site-specific modelling can be applied to demonstrate safe use.

11. ES 11: Use at industrial sites; Use of nickel powder or nickel alloy powder in powder metallurgy

11.1. Title section

Product category: Base metals and alloys (PC 7)
Sector of use: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment	
1: Use of nickel powder or nickel alloy powder in powder metallurgy - only air	ERC 5
Worker	
2: Raw material handling	PROC 26
3: Furnacing and atomisation	PROC 27a, PROC 22
4: Powder finishing - crushing, milling and sieving	PROC 24
5: Powder handling	PROC 26, PROC 5
6: Powder pressing	PROC 14
7: Sintering	PROC 22
8: Post-sintering operations	PROC 22
9: Wet cleaning	PROC 28
10: Cleaning/removal of dust	PROC 28

11.2. Conditions of use affecting exposure

11.2.1. Control of environmental exposure: Use of nickel powder or nickel alloy powder in powder metallurgy - only air (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 19.28 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 4.78E3 tonnes/year
Emission days >= 248 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
The substance should not be released to water
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

11.2.2. Control of worker exposure: Raw material handling (PROC 26)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Local exhaust ventilation
Semi-closed system

Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

11.2.3. Control of worker exposure: Furnacing and atomisation (PROC 27a, PROC 22)

Technical and organisational conditions and measures
Use in closed process
Use of an integrated local exhaust ventilation is required.
Automated task

11.2.4. Control of worker exposure: Powder finishing - crushing, milling and sieving (PROC 24)

Product (article) characteristics
Physical form of product; Solid
Maximum emission potential covered in this ES: High. Low to high level of abrasion possible.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
High temperature
Local exhaust ventilation
Automated task
Use in closed process

11.2.5. Control of worker exposure: Powder handling (PROC 26, PROC 5)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Local exhaust ventilation
Semi-closed system
Ensure automation of the process as far as technically feasible
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

11.2.6. Control of worker exposure: Powder pressing (PROC 14)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures

Local exhaust ventilation
Ensure automation of the process as far as technically feasible
Semi-closed system
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.

11.2.7. Control of worker exposure: Sintering (PROC 22)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Technical and organisational conditions and measures
Automated task
Use in closed process
Use of an integrated local exhaust ventilation is required.
High temperature processes slightly below melting point / degradation temperature.

11.2.8. Control of worker exposure: Post-sintering operations (PROC 22)

Product (article) characteristics
Physical form of product; Massive object
Maximum emission potential covered in this ES: Very low.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Automated task
Use in closed process

11.2.9. Control of worker exposure: Wet cleaning (PROC 28)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution and other liquid materials, e.g. suspensions are also covered.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Cleaning machines such as power sweeper, no direct manual cleaning.
Covers use at ambient temperatures.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection).

11.2.10. Control of worker exposure: Cleaning/removal of dust (PROC 28)

Product (article) characteristics
Physical form of product: Residual dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures

Cleaning is conducted using cleaning machines, in particular hovering is applied and the use of compressed air is omitted.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 20 (95% respiratory protection). For further specification, refer to section 8 of the SDS.

11.3. Exposure estimation and reference to its source

11.3.1. Environmental release and exposure: Use of nickel powder or nickel alloy powder in powder metallurgy - only air (ERC 5)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	2.22E-4 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Agricultural soil	16.2 mg/kg dw (EUSES 2.1.2)	0.542

11.3.2. Worker exposure: Raw material handling (PROC 26)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.28

11.3.3. Worker exposure: Furnacing and atomisation (PROC 27a, PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, acute	0.017 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.076 µg/cm² (Measured data)	< 0.01
Combined, systemic, long term		0.12

11.3.4. Worker exposure: Powder finishing - crushing, milling and sieving (PROC 24)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.024 mg/m³ (Measured data)	0.48
Inhalation, local, long term	0.024 mg/m³ (Measured data)	0.48
Inhalation, local, acute	0.096 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.48

11.3.5. Worker exposure: Powder handling (PROC 26, PROC 5)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.28

11.3.6. Worker exposure: Powder pressing (PROC 14)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	7E-3 mg/m³ (Measured data)	0.14
Inhalation, local, long term	7E-3 mg/m³ (Measured data)	0.14
Inhalation, local, acute	0.02 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	3.73 µg/cm² (Measured data)	0.107
Combined, systemic, long term		0.14

11.3.7. Worker exposure: Sintering (PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.015 mg/m³ (Measured data)	0.3
Inhalation, local, long term	0.015 mg/m³ (Measured data)	0.3
Inhalation, local, acute	0.044 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.3

11.3.8. Worker exposure: Post-sintering operations (PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	8E-3 mg/m³ (Measured data)	0.16
Inhalation, local, long term	8E-3 mg/m³ (Measured data)	0.16
Inhalation, local, acute	0.034 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.16

11.3.9. Worker exposure: Wet cleaning (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, acute	0.026 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.12

11.3.10. Worker exposure: Cleaning/removal of dust (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.032 mg/m³ (Measured data)	0.64

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m³ (Measured data)	0.016
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.64

11.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this “ES for Communication”.

12. ES 12: Use at industrial sites; Use of nickel-containing brazing alloys in industrial settings

12.1. Title section

Product category: Base metals and alloys (PC 7)
Sector of use: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment	
1: Use of nickel-containing brazing alloys in industrial settings - Discharge to fresh water via municipal sewage treatment plant	ERC 5
2: Use of nickel-containing brazing alloys in industrial settings - Direct discharge to marine water	ERC 5
Worker	
3: Melting and furnace brazing	PROC 23, PROC 22
4: Manual brazing	PROC 25
5: Packaging	PROC 21
6: Wet cleaning	PROC 28
7: Cleaning/removal of dust	PROC 28

12.2. Conditions of use affecting exposure

12.2.1. Control of environmental exposure: Use of nickel-containing brazing alloys in industrial settings - Discharge to fresh water via municipal sewage treatment plant (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.2E-3 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 0.55 tonnes/year
Emission days >= 252 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 10

12.2.2. Control of environmental exposure: Use of nickel-containing brazing alloys in industrial settings - Direct discharge to marine

water (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.2E-3 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 0.55 tonnes/year
Emission days >= 252 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
No discharge to freshwater assumed
Receiving water dilution (fresh or marine) >= 100
Assumed effluent discharge flow from site >= 2E3 m3/day

12.2.3. Control of worker exposure: Melting and furnace brazing (PROC 23, PROC 22)

Product (article) characteristics
Maximum emission potential covered in this ES: Medium (temperature based).
Physical form of product: Molten.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Assumes process temperature up to 1.6E3 °C
Local exhaust ventilation
Semi-closed system

12.2.4. Control of worker exposure: Manual brazing (PROC 25)

Product (article) characteristics
Maximum emission potential covered in this ES: High (temperature based).
Physical form of product: Molten.
Technical and organisational conditions and measures
High temperature
Local exhaust ventilation
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal contact with the substance has to be excluded.

12.2.5. Control of worker exposure: Packaging (PROC 21)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product; Massive object
Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

12.2.6. Control of worker exposure: Wet cleaning (PROC 28)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution and other liquid materials, e.g. suspensions are also covered.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Cleaning machines such as power sweeper, no direct manual cleaning.
Covers use at ambient temperatures.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection).

12.2.7. Control of worker exposure: Cleaning/removal of dust (PROC 28)

Product (article) characteristics
Physical form of product: Residual dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Cleaning is conducted using cleaning machines, in particular hovering is applied and the use of compressed air is omitted.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 20 (95% respiratory protection). For further specification, refer to section 8 of the SDS.

12.3. Exposure estimation and reference to its source

12.3.1. Environmental release and exposure: Use of nickel-containing brazing alloys in industrial settings - Discharge to fresh water via municipal sewage treatment plant (ERC 5)

Release route	Release rate	Release estimation method
Water	0.022 kg/day	Estimated release factor
Air	0.33 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	3.37E-3 mg/L (EUSES 2.1.2)	0.475
Sediment (freshwater)	45.85 mg/kg dw (PEC sediment calculation method for metals)	0.421
Sewage Treatment Plant	6.6E-3 mg/L (EUSES 2.1.2)	0.02
Agricultural soil	16.41 mg/kg dw (EUSES 2.1.2)	0.549

12.3.2. Environmental release and exposure: Use of nickel-containing brazing alloys in industrial settings - Direct discharge to marine water (ERC 5)

Release route	Release rate	Release estimation method
Water	0.022 kg/day	Estimated release factor
Air	0.33 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	3.79E-4 mg/L (EUSES 2.1.2)	0.044
Sediment (marine water)	18.16 mg/kg dw (PEC sediment calculation method for metals)	0.167
Agricultural soil	16.22 mg/kg dw (EUSES 2.1.2)	0.543

12.3.3. Worker exposure: Melting and furnace brazing (PROC 23, PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.016 mg/m³ (Measured data)	0.32
Inhalation, local, long term	0.016 mg/m³ (Measured data)	0.32
Inhalation, local, acute	0.065 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.32

12.3.4. Worker exposure: Manual brazing (PROC 25)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.015 mg/m³ (Measured data)	0.3
Inhalation, local, long term	0.015 mg/m³ (Measured data)	0.3
Inhalation, local, acute	0.044 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.3

12.3.5. Worker exposure: Packaging (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, acute	0.037 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.18

12.3.6. Worker exposure: Wet cleaning (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, acute	0.026 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.12

12.3.7. Worker exposure: Cleaning/removal of dust (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m³ (Measured data)	0.016
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.64

12.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this “ES for Communication”.

13. ES 13: Widespread use by professional workers; Use of nickel-containing brazing alloys in professional settings

13.1. Title section

Product category: Welding and soldering products, flux products (PC 38)
Sector of use: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment	
1: Use of nickel-containing consumables for welding/brazing by professionals - Discharge to fresh water via municipal sewage treatment plant	ERC 8f
Worker	
2: Handling of massive objects	PROC 21
3: Manual brazing	PROC 25
4: Manual welding	PROC 25

13.2. Conditions of use affecting exposure

13.2.1. Control of environmental exposure: Use of nickel-containing consumables for welding/brazing by professionals - Discharge to fresh water via municipal sewage treatment plant (ERC 8f)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

13.2.2. Control of worker exposure: Handling of massive objects (PROC 21)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product; Massive object
Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

13.2.3. Control of worker exposure: Manual brazing (PROC 25)

Product (article) characteristics
Maximum emission potential covered in this ES: Low (temperature based).
Physical form of product: Molten.
Technical and organisational conditions and measures
Covers use at temperatures below melting point.
Local exhaust ventilation
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal contact with the substance has to be excluded.

13.2.4. Control of worker exposure: Manual welding (PROC 25)

Product (article) characteristics

Maximum emission potential covered in this ES: High (temperature based).
Physical form of product: Molten.
Technical and organisational conditions and measures
Covers use at temperatures above melting point of the substance.
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal contact with the substance has to be excluded.
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.
Clothing and personal protective equipment that shields from the heat and other hazards of the specific task and welding method conducted. Such PPE may include fire-retardant clothing, heavy gloves, safety shoes, helmet or hair protection, and protective apron/leggings. Eye protection is also mandatory, both for reducing the effects of radiant energy and stopping any chips or fragments that may fly off the workpieces. Workers should also not carry flammable or explosive items such as butane cigarette lighters. Best practice advice for risk management measures can be found in a Communication statement from the European Welding Association, available at: https://european-welding.org/wp-content/uploads/2016/10/Communication-statements_july_2010.pdf.

13.3. Exposure estimation and reference to its source

13.3.1. Environmental release and exposure: Use of nickel-containing consumables for welding/brazing by professionals - Discharge to fresh water via municipal sewage treatment plant (ERC 8f)

Release route	Release rate	Release estimation method
Water	0.11 kg/day	ERC
Air	0.33 kg/day	ERC
Soil	0.011 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	5.27E-3 mg/L (EUSES 2.1.2)	0.742
Sediment (freshwater)	45.85 mg/kg dw (PEC sediment calculation method for metals local)	0.421
Marine water	5.37E-4 mg/L (EUSES 2.1.2)	0.062
Sediment (marine water)	17.34 mg/kg dw (PEC sediment calculation method for metals local)	0.159
Sewage Treatment Plant	0.033 mg/L (EUSES 2.1.2)	0.1
Agricultural soil	17.12 mg/kg dw (EUSES 2.1.2)	0.573

13.3.2. Worker exposure: Handling of massive objects (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, acute	0.037 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.18

13.3.3. Worker exposure: Manual brazing (PROC 25)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, acute	0.027 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.18

13.3.4. Worker exposure: Manual welding (PROC 25)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.041 mg/m³ (Measured data)	0.82
Inhalation, local, long term	0.041 mg/m³ (Measured data)	0.82
Inhalation, local, acute	0.122 mg/m³ (Measured data)	0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.82

13.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this “ES for Communication”.

17. ES 17: Formulation or re-packing; Use of nickel metal in formulating and repackaging of surface treatment products

17.1. Title section

Product category: Metal surface treatment products (PC 14)

Environment	
1: Use of nickel metal in formulating and repackaging of surface treatment products - Discharge to fresh water via municipal sewage treatment plant	ERC 2
2: Use of nickel metal in formulating and repackaging of surface treatment products - Direct discharge to fresh water	ERC 2
3: Use of nickel metal in formulating and repackaging of surface treatment products - Direct discharge to marine water	ERC 2
Worker	
4: Powder handling	PROC 26
5: Screening	PROC 3, PROC 2, PROC 1
6: Packaging of resin formulations	PROC 8b, PROC 9
7: Laboratory testing	PROC 15
8: Cleaning/removal of dust	PROC 28

17.2. Conditions of use affecting exposure

17.2.1. Control of environmental exposure: Use of nickel metal in formulating and repackaging of surface treatment products - Discharge to fresh water via municipal sewage treatment plant (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.186 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 41 tonnes/year
Emission days >= 220 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
No discharge to marine water assumed

Receiving water dilution (fresh or marine) >= 10

17.2.2. Control of environmental exposure: Use of nickel metal in formulating and repackaging of surface treatment products - Direct discharge to fresh water (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.096 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 21 tonnes/year
Emission days >= 220 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow >= 4.98E3 m3/day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 200
Assumed effluent discharge flow from site >= 25 m3/day

17.2.3. Control of environmental exposure: Use of nickel metal in formulating and repackaging of surface treatment products - Direct discharge to marine water (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.096 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 21 tonnes/year
Emission days >= 220 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
No discharge to freshwater assumed
Receiving water dilution (fresh or marine) >= 100
Assumed effluent discharge flow from site >= 25 m3/day

17.2.4. Control of worker exposure: Powder handling (PROC 26)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure

Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Local exhaust ventilation
Semi-closed system
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

17.2.5. Control of worker exposure: Screening (PROC 3, PROC 2, PROC 1)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Closed process with occasional opening
Ensure automation of the process as far as technically feasible.
Use of an integrated local exhaust ventilation is required.

17.2.6. Control of worker exposure: Packaging of resin formulations (PROC 8b, PROC 9)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product: Resins.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Covers use at ambient temperatures.

17.2.7. Control of worker exposure: Laboratory testing (PROC 15)

Product (article) characteristics
Physical form of product: Resins.
Amount used (or contained in articles), frequency and duration of use/exposure
Amount per use < 1 kg
Technical and organisational conditions and measures
Use of an extraction hood is required.

17.2.8. Control of worker exposure: Cleaning/removal of dust (PROC 28)

Product (article) characteristics
Physical form of product: Residual dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Cleaning is conducted using cleaning machines, in particular hovering is applied and the use of

compressed air is omitted.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 20 (95% respiratory protection). For further specification, refer to section 8 of the SDS.

17.3. Exposure estimation and reference to its source

17.3.1. Environmental release and exposure: Use of nickel metal in formulating and repackaging of surface treatment products - Discharge to fresh water via municipal sewage treatment plant (ERC 2)

Release route	Release rate	Release estimation method
Water	0.022 kg/day	Estimated release factor
Air	9.32E-3 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	3.37E-3 mg/L (EUSES 2.1.2)	0.474
Sediment (freshwater)	45.7 mg/kg dw (PEC sediment calculation method for metals)	0.419
Sewage Treatment Plant	6.49E-3 mg/L (EUSES 2.1.2)	0.02
Agricultural soil	16.38 mg/kg dw (EUSES 2.1.2)	0.548

17.3.2. Environmental release and exposure: Use of nickel metal in formulating and repackaging of surface treatment products - Direct discharge to fresh water (ERC 2)

Release route	Release rate	Release estimation method
Water	0.011 kg/day	Estimated release factor
Air	4.77E-3 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	4.49E-3 mg/L (EUSES 2.1.2)	0.632
Sediment (freshwater)	75.3 mg/kg dw (PEC sediment calculation method for metals)	0.691
Agricultural soil	16.2 mg/kg dw (EUSES 2.1.2)	0.542

17.3.3. Environmental release and exposure: Use of nickel metal in formulating and repackaging of surface treatment products - Direct discharge to marine water (ERC 2)

Release route	Release rate	Release estimation method
Water	0.011 kg/day	Estimated release factor
Air	4.77E-3 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	3.48E-3 mg/L (EUSES 2.1.2)	0.404

Protection target	Exposure estimate	RCR
Sediment (marine water)	99.7 mg/kg dw (PEC sediment calculation method for metals)	0.915
Agricultural soil	16.2 mg/kg dw (EUSES 2.1.2)	0.542

17.3.4. Worker exposure: Powder handling (PROC 26)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.28

17.3.5. Worker exposure: Screening (PROC 3, PROC 2, PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.02 mg/m³ (Measured data)	0.4
Inhalation, local, long term	0.02 mg/m³ (Measured data)	0.4
Inhalation, local, acute	0.06 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.4

17.3.6. Worker exposure: Packaging of resin formulations (PROC 8b, PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.012 mg/m³ (Measured data)	0.24
Inhalation, local, long term	0.012 mg/m³ (Measured data)	0.24
Inhalation, local, acute	0.047 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.24

17.3.7. Worker exposure: Laboratory testing (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	3E-3 mg/m³ (Measured data)	0.06
Inhalation, local, long term	3E-3 mg/m³ (Measured data)	0.06
Inhalation, local, acute	0.01 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.06

17.3.8. Worker exposure: Cleaning/removal of dust (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m³ (Measured data)	0.016

Route of exposure and type of effects	Exposure estimate	RCR
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.64

17.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this “ES for Communication”.

18. ES 18: Use at industrial sites; Use of nickel metal in metal surface treatment (nickel electroplating and nickel electroforming technologies)

18.1. Title section

Product category: Metal surface treatment products (PC 14)
Sector of use: Manufacture of fabricated metal products, except machinery and equipment (SU 15), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment	
1: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Discharge to fresh water via municipal sewage treatment plant	ERC 5
2: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Direct discharge to fresh water	ERC 5
3: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Direct discharge to marine water	ERC 5
Worker	
4: Handling of low dusty materials	PROC 26
5: Handling of solutions as raw material	PROC 8b, PROC 9
6: Mixing and blending	PROC 5, PROC 4, PROC 3
7: Nickel electroplating, nickel electroforming and electroless nickel plating	PROC 13
8: Testing of solution composition	PROC 15
9: Wet cleaning	PROC 28
10: Cleaning/removal of dust	PROC 28

18.2. Conditions of use affecting exposure

18.2.1. Control of environmental exposure: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Discharge to fresh water via municipal sewage treatment plant (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.033 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 8 tonnes/year
Emission days >= 240 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day

Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 10

18.2.2. Control of environmental exposure: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Direct discharge to fresh water (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 8.96E-3 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 2.15 tonnes/year
Emission days >= 240 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.23E4 m3/day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 50
Assumed effluent discharge flow from site >= 250 m3/day

18.2.3. Control of environmental exposure: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Direct discharge to marine water (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.016 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 3.8 tonnes/year
Emission days >= 240 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure

No discharge to freshwater assumed
Receiving water dilution (fresh or marine) >= 100
Assumed effluent discharge flow from site >= 250 m3/day

18.2.4. Control of worker exposure: Handling of low dusty materials (PROC 26)

Product (article) characteristics
Maximum emission potential covered in this ES: Low.
Physical form of product: Solid, pellet / pastille.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Local exhaust ventilation
Ensure automation of the process as far as technically feasible
Semi-closed system

18.2.5. Control of worker exposure: Handling of solutions as raw material (PROC 8b, PROC 9)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Covers use at ambient temperatures.

18.2.6. Control of worker exposure: Mixing and blending (PROC 5, PROC 4, PROC 3)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Covers use at ambient temperatures.

18.2.7. Control of worker exposure: Nickel electroplating, nickel electroforming and electroless nickel plating (PROC 13)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution.
Technical and organisational conditions and measures
Automated task
Use of a surfactant/wetting/foaming agent is required.
Use of a rim ventilation is required.

18.2.8. Control of worker exposure: Testing of solution composition (PROC 15)

Product (article) characteristics
Physical form of product: Solution.
Amount used (or contained in articles), frequency and duration of use/exposure
Amount per use < 1 kg
Technical and organisational conditions and measures
Use of an extraction hood is required.

18.2.9. Control of worker exposure: Wet cleaning (PROC 28)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution and other liquid materials, e.g. suspensions are also covered.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Cleaning machines such as power sweeper, no direct manual cleaning.
Covers use at ambient temperatures.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection).

18.2.10. Control of worker exposure: Cleaning/removal of dust (PROC 28)

Product (article) characteristics
Physical form of product: Residual dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Cleaning is conducted using cleaning machines, in particular hovering is applied and the use of compressed air is omitted.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 20 (95% respiratory protection). For further specification, refer to section 8 of the SDS.

18.3. Exposure estimation and reference to its source

18.3.1. Environmental release and exposure: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Discharge to fresh water via municipal sewage treatment plant (ERC 5)

Release route	Release rate	Release estimation method
Water	0.126 kg/day	Estimated release factor
Air	0.038 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	5.61E-3 mg/L (EUSES 2.1.2)	0.79
Sediment (freshwater)	104.8 mg/kg dw (PEC sediment calculation method for metals)	0.961
Sewage Treatment Plant	0.038 mg/L (EUSES 2.1.2)	0.114
Agricultural soil	17.26 mg/kg dw (EUSES 2.1.2)	0.577

18.3.2. Environmental release and exposure: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Direct discharge to fresh water (ERC 5)

Release route	Release rate	Release estimation method
Water	0.034 kg/day	Estimated release factor
Air	0.01 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	4.84E-3 mg/L (EUSES 2.1.2)	0.682
Sediment (freshwater)	84.6 mg/kg dw (PEC sediment calculation method for metals)	0.776
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

18.3.3. Environmental release and exposure: Use of nickel metal in surface treatment (nickel electroplating, nickel electroforming and nickel electroless technologies) - Direct discharge to marine water (ERC 5)

Release route	Release rate	Release estimation method
Water	0.06 kg/day	Estimated release factor
Air	0.018 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	2.02E-3 mg/L (EUSES 2.1.2)	0.234
Sediment (marine water)	61.2 mg/kg dw (PEC sediment calculation method for metals)	0.561
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

18.3.4. Worker exposure: Handling of low dusty materials (PROC 26)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.012 mg/m³ (Measured data)	0.24
Inhalation, local, long term	0.012 mg/m³ (Measured data)	0.24
Inhalation, local, acute	0.035 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	1 µg/cm² (Measured data)	0.029
Combined, systemic, long term		0.24

18.3.5. Worker exposure: Handling of solutions as raw material (PROC 8b, PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.012 mg/m³ (Measured data)	0.24
Inhalation, local, long term	0.012 mg/m³ (Measured data)	0.24
Inhalation, local, acute	0.047 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.24

18.3.6. Worker exposure: Mixing and blending (PROC 5, PROC 4, PROC 3)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.012 mg/m³ (Measured data)	0.24
Inhalation, local, long term	0.012 mg/m³ (Measured data)	0.24
Inhalation, local, acute	0.047 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.24

18.3.7. Worker exposure: Nickel electroplating, nickel electroforming and electroless nickel plating (PROC 13)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	5E-3 mg/m³ (Measured data)	0.1
Inhalation, local, long term	5E-3 mg/m³ (Measured data)	0.1
Inhalation, local, acute	0.015 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.076 µg/cm² (Measured data)	< 0.01
Combined, systemic, long term		0.1

18.3.8. Worker exposure: Testing of solution composition (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	3E-3 mg/m³ (Measured data)	0.06
Inhalation, local, long term	3E-3 mg/m³ (Measured data)	0.06
Inhalation, local, acute	0.01 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.06

18.3.9. Worker exposure: Wet cleaning (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, acute	0.026 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022

Route of exposure and type of effects	Exposure estimate	RCR
Combined, systemic, long term		0.12

18.3.10. Worker exposure: Cleaning/removal of dust (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m³ (Measured data)	0.016
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.64

18.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this “ES for Communication”.

21. ES 21: Use at industrial sites; Use of nickel metal for thermal spraying

21.1. Title section

Product category: Base metals and alloys (PC 7), Metal surface treatment products (PC 14), Welding and soldering products, flux products (PC 38)
Sector of use: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment	
1: Use of nickel metal for thermal spraying - only air	ERC 5
Worker	
2: Powder handling	PROC 26
3: Hand operated metal spraying operations	PROC 7
4: Thermal spraying and coating operations	PROC 7
5: Finishing	PROC 24, PROC 21, PROC 10
6: Cleaning/removal of dust	PROC 28

21.2. Conditions of use affecting exposure

21.2.1. Control of environmental exposure: Use of nickel metal for thermal spraying - only air (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.021 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 5 tonnes/year
Emission days >= 240 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
The substance should not be released to water
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

21.2.2. Control of worker exposure: Powder handling (PROC 26)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Local exhaust ventilation
Semi-closed system
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

21.2.3. Control of worker exposure: Hand operated metal spraying operations (PROC 7)

Product (article) characteristics
Maximum emission potential covered in this ES: Medium (spraying process).
Physical form of product: Solution.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Use of an integrated local exhaust ventilation with highly efficient ventilation (99-99.99% efficiency).
Ensure that a spraying booth is used.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.

21.2.4. Control of worker exposure: Thermal spraying and coating operations (PROC 7)

Product (article) characteristics
Maximum emission potential covered in this ES: Medium (spraying process). The emission potential may be lower for some coating operations.
Pysical form of prodcut: Molten. In cold coating processes, solutions and/or powders may be used.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Ensure automation of the process as far as technically feasible
Use in closed process
Use of an integrated local exhaust ventilation with high efficiency is required.

21.2.5. Control of worker exposure: Finishing (PROC 24, PROC 21, PROC 10)

Product (article) characteristics
Physical form of product; Massive object
Maximum emission potential covered in this ES: Low (abrasion based).
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Use in closed process
Use of an integrated local exhaust ventilation with high efficiency is required.

21.2.6. Control of worker exposure: Cleaning/removal of dust (PROC 28)

Product (article) characteristics
Physical form of product: Residual dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures

Cleaning is conducted using cleaning machines, in particular hovering is applied and the use of compressed air is omitted.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 20 (95% respiratory protection). For further specification, refer to section 8 of the SDS.

21.3. Exposure estimation and reference to its source

21.3.1. Environmental release and exposure: Use of nickel metal for thermal spraying - only air (ERC 5)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	0.104 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

21.3.2. Worker exposure: Powder handling (PROC 26)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.28

21.3.3. Worker exposure: Hand operated metal spraying operations (PROC 7)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	8E-3 mg/m³ (Measured data)	0.16
Inhalation, local, long term	8E-3 mg/m³ (Measured data)	0.16
Inhalation, local, acute	0.05 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.16

21.3.4. Worker exposure: Thermal spraying and coating operations (PROC 7)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (Measured data)	0.26
Inhalation, local, long term	0.013 mg/m³ (Measured data)	0.26
Inhalation, local, acute	0.039 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.26

21.3.5. Worker exposure: Finishing (PROC 24, PROC 21, PROC 10)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	5E-3 mg/m³ (Measured data)	0.1
Inhalation, local, long term	5E-3 mg/m³ (Measured data)	0.1
Inhalation, local, acute	0.014 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.1

21.3.6. Worker exposure: Cleaning/removal of dust (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m³ (Measured data)	0.016
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.64

21.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this “ES for Communication”.

31. ES 31: Use at industrial sites; Use of nickel metal powder in the production of magnets

31.1. Title section

Product category: Base metals and alloys (PC 7)
Sector of use: Manufacture of fabricated metal products, except machinery and equipment (SU 15), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment	
1: Use of nickel metal powder in the production of magnets - Discharge to fresh water via municipal sewage treatment plant	ERC 5
2: Use of nickel metal powder in the production of magnets - Direct discharge to fresh water	ERC 5
3: Use of nickel metal powder in the production of magnets - Direct discharge to marine water	ERC 5
Worker	
4: Raw material handling and mixing	PROC 26, PROC 5
5: Compacting and pressing	PROC 14
6: Smelting and casting	PROC 23
7: Sintering	PROC 22
8: Sand blasting	PROC 24
9: Grinding	PROC 24
10: Packaging	PROC 21
11: Wet cleaning	PROC 28
12: Cleaning/removal of dust	PROC 28

31.2. Conditions of use affecting exposure

31.2.1. Control of environmental exposure: Use of nickel metal powder in the production of magnets - Discharge to fresh water via municipal sewage treatment plant (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.192 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 45 tonnes/year
Emission days >= 235 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure

Receiving surface water flow >= 1.8E4 m3/day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 10

31.2.2. Control of environmental exposure: Use of nickel metal powder in the production of magnets - Direct discharge to fresh water (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.192 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 45 tonnes/year
Emission days >= 235 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow >= 199 m3/day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 200
Assumed effluent discharge flow from site >= 1 m3/day

31.2.3. Control of environmental exposure: Use of nickel metal powder in the production of magnets - Direct discharge to marine water (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.192 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 45 tonnes/year
Emission days >= 235 days/year
Technical and organisational conditions and measures
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
No discharge to freshwater assumed
Receiving water dilution (fresh or marine) >= 100
Assumed effluent discharge flow from site >= 1 m3/day

31.2.4. Control of worker exposure: Raw material handling and mixing (PROC 26, PROC 5)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Local exhaust ventilation
Semi-closed system
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

31.2.5. Control of worker exposure: Compacting and pressing (PROC 14)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Frequency of task: Once per shift.
Technical and organisational conditions and measures
Local exhaust ventilation
Use in closed process

31.2.6. Control of worker exposure: Smelting and casting (PROC 23)

Product (article) characteristics
Physical form of product: Molten.
Maximum emission potential covered in this ES: Medium.
Technical and organisational conditions and measures
Local exhaust ventilation
Semi-closed system
High temperature
Ensure automation of the process as far as technically feasible

31.2.7. Control of worker exposure: Sintering (PROC 22)

Product (article) characteristics
Maximum emission potential covered in this ES: Low (temperature based).
Physical form of product: Solids in various physical forms are possible (powders, pressed powders, pasted powders etc.).
Technical and organisational conditions and measures
Ensure automation of the process as far as technically feasible
Ensure closed vacuum furnace operation.
Use of an integrated local exhaust ventilation is required.
High temperature processes slightly below melting point / degradation temperature.

31.2.8. Control of worker exposure: Sand blasting (PROC 24)

Product (article) characteristics

Physical form of product; Massive object
Maximum emission potential covered in this ES: High (abrasion based).
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Use in closed process
Use of an integrated local exhaust ventilation with high efficiency is required.
Automated task

31.2.9. Control of worker exposure: Grinding (PROC 24)

Product (article) characteristics
Physical form of product; Massive object
Maximum emission potential covered in this ES: High (abrasion based).
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Use in closed process
Use of an integrated local exhaust ventilation with high efficiency is required.
Automated task

31.2.10. Control of worker exposure: Packaging (PROC 21)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product; Massive object
Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

31.2.11. Control of worker exposure: Wet cleaning (PROC 28)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution and other liquid materials, e.g. suspensions are also covered.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Cleaning machines such as power sweeper, no direct manual cleaning.
Covers use at ambient temperatures.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 10 (90% respiratory protection).

31.2.12. Control of worker exposure: Cleaning/removal of dust (PROC 28)

Product (article) characteristics
Physical form of product: Residual dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours

Technical and organisational conditions and measures
Cleaning is conducted using cleaning machines, in particular hovering is applied and the use of compressed air is omitted.
Conditions and measures related to personal protection, hygiene and health evaluation
APF of RPE = 20 (95% respiratory protection). For further specification, refer to section 8 of the SDS.

31.3. Exposure estimation and reference to its source

31.3.1. Environmental release and exposure: Use of nickel metal powder in the production of magnets - Discharge to fresh water via municipal sewage treatment plant (ERC 5)

Release route	Release rate	Release estimation method
Water	4.1E-4 kg/day	Estimated release factor
Air	0.033 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	2.91E-3 mg/L (EUSES 2.1.2)	0.41
Sediment (freshwater)	33.73 mg/kg dw (PEC sediment calculation method for metals)	0.309
Sewage Treatment Plant	1.23E-4 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

31.3.2. Environmental release and exposure: Use of nickel metal powder in the production of magnets - Direct discharge to fresh water (ERC 5)

Release route	Release rate	Release estimation method
Water	4.1E-4 kg/day	Estimated release factor
Air	0.033 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	4.37E-3 mg/L (EUSES 2.1.2)	0.615
Sediment (freshwater)	72.2 mg/kg dw (PEC sediment calculation method for metals)	0.662
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

31.3.3. Environmental release and exposure: Use of nickel metal powder in the production of magnets - Direct discharge to marine water (ERC 5)

Release route	Release rate	Release estimation method
Water	4.1E-4 kg/day	Estimated release factor
Air	0.033 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	3.24E-3 mg/L (EUSES 2.1.2)	0.377
Sediment (marine water)	93.4 mg/kg dw (PEC sediment calculation method for metals)	0.857
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

31.3.4. Worker exposure: Raw material handling and mixing (PROC 26, PROC 5)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.28

31.3.5. Worker exposure: Compacting and pressing (PROC 14)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.028 mg/m³ (Measured data)	0.56
Inhalation, local, long term	0.028 mg/m³ (Measured data)	0.56
Inhalation, local, acute	0.111 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.56

31.3.6. Worker exposure: Smelting and casting (PROC 23)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.021 mg/m³ (Measured data)	0.42
Inhalation, local, long term	0.021 mg/m³ (Measured data)	0.42
Inhalation, local, acute	0.085 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.42

31.3.7. Worker exposure: Sintering (PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.015 mg/m³ (Measured data)	0.3
Inhalation, local, long term	0.015 mg/m³ (Measured data)	0.3
Inhalation, local, acute	0.044 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.3

31.3.8. Worker exposure: Sand blasting (PROC 24)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.031 mg/m³ (Measured data)	0.62
Inhalation, local, long term	0.031 mg/m³ (Measured data)	0.62

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, acute	0.157 mg/m³ (Measured data)	0.013
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.62

31.3.9. Worker exposure: Grinding (PROC 24)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	5E-3 mg/m³ (Measured data)	0.1
Inhalation, local, long term	5E-3 mg/m³ (Measured data)	0.1
Inhalation, local, acute	0.014 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.1

31.3.10. Worker exposure: Packaging (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, acute	0.037 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.18

31.3.11. Worker exposure: Wet cleaning (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, acute	0.026 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.12

31.3.12. Worker exposure: Cleaning/removal of dust (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m³ (Measured data)	0.016
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.64

31.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this “ES for Communication”.

35. ES 35: Service life (professional worker); Service life of nickel alloys and nickel-coated metal objects (machining and handling) in professional settings

35.1. Title section

Article category: Machinery, mechanical appliances, electrical/electronic articles (AC 2), Metal articles (AC 7), Plastic articles (AC 13)

Environment	
1: Service life of nickel alloys and nickel-coated objects (machining and handling) in professional settings	ERC 11a
Worker	
2: Low energy handling of massive objects	PROC 21
3: Abrasive processes	PROC 24
4: Hot work operations	PROC 25

35.2. Conditions of use affecting exposure

35.2.1. Control of environmental exposure: Service life of nickel alloys and nickel-coated objects (machining and handling) in professional settings (ERC 11a)

Technical and organisational conditions and measures
The substance should not be released to air
The substance should not be released to water
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

35.2.2. Control of worker exposure: Low energy handling of massive objects (PROC 21)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Physical form of product; Massive object
Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

35.2.3. Control of worker exposure: Abrasive processes (PROC 24)

Product (article) characteristics
Physical form of product; Massive object
Maximum emission potential covered in this ES: High (abrasion based).
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Use in closed process
Use of an integrated local exhaust ventilation with high efficiency is required.

35.2.4. Control of worker exposure: Hot work operations (PROC 25)

Product (article) characteristics
Maximum emission potential covered in this ES: High.
Physical form of product: Molten.
Technical and organisational conditions and measures
High temperature
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal contact with the substance has to be excluded.
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.
Clothing and personal protective equipment that shields from the heat and other hazards of the specific task and welding method conducted. Such PPE may include fire-retardant clothing, heavy gloves, safety shoes, helmet or hair protection, and protective apron/leggings. Eye protection is also mandatory, both for reducing the effects of radiant energy and stopping any chips or fragments that may fly off the workpieces. Workers should also not carry flammable or explosive items such as butane cigarette lighters. Best practice advice for risk management measures can be found in a Communication statement from the European Welding Association, available at: https://european-welding.org/wp-content/uploads/2016/10/Communication-statements_july_2010.pdf.

35.3. Exposure estimation and reference to its source

35.3.1. Environmental release and exposure: Service life of nickel alloys and nickel-coated objects (machining and handling) in professional settings (ERC 11a)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	0 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

35.3.2. Worker exposure: Low energy handling of massive objects (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, acute	0.037 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.18

35.3.3. Worker exposure: Abrasive processes (PROC 24)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	5E-3 mg/m³ (Measured data)	0.1
Inhalation, local, long term	5E-3 mg/m³ (Measured data)	0.1
Inhalation, local, acute	0.014 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.1

35.3.4. Worker exposure: Hot work operations (PROC 25)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.041 mg/m³ (Measured data)	0.82
Inhalation, local, long term	0.041 mg/m³ (Measured data)	0.82
Inhalation, local, acute	0.122 mg/m³ (Measured data)	0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.82

35.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this “ES for Communicatio