

7. ES 7: Use at industrial sites; Production and industrial use of cobalt containing alloys, steels and tools

7.1. Title section

Product category: Base metals and alloys (PC 7), Metal surface treatment products (PC 14)
Sector of use: Manufacture of basic metals, including alloys (SU 14), Manufacture of fabricated metal products, except machinery and equipment (SU 15)

Environment	
1: Production and industrial use of cobalt containing alloys, steels and tools ES1 STP Discharge	ERC 5
2: Production and industrial use of cobalt containing alloys, steels and tools ES2 Direct Discharge	ERC 5
3: Production and industrial use of cobalt containing alloys, steels and tools ES3 Marine Discharge	ERC 5
Worker	
4: Handling of massive materials	PROC 21
5: Sintering, melting and casting	PROC 23, PROC 22
6: Finishing of massive objects	PROC 25, PROC 14, PROC 24, PROC 21, PROC 13
7: Handling of powders	PROC 26
8: Powder production	PROC 27a, PROC 27b, PROC 1
9: Further processing	PROC 24, PROC 1
10: Thermal spraying – fully automated	PROC 1, PROC 7
11: Thermal spraying – NOT fully automated	PROC 7
12: Cleaning & Maintenance	PROC 28
Subsequent service life exposure scenario(s)	
ES 10: Service life (worker at industrial site); Various articles; Service life of cobalt containing alloys, steels and tools in industrial settings	
ES 11: Service life (worker at industrial site); Metal articles; Welding in industrial settings	
ES 12: Service life (professional worker); Metal articles; Welding in professional settings	
ES 13: Service life (professional worker); Various articles; Service life of cobalt-containing tools in professional settings	
ES 14: Service life (professional worker); Metal articles; Service life of dental alloys containing cobalt in professional settings	
ES 15: Service life (consumers); Metal articles; dental alloys	
ES 16: Service life (consumers); Various articles; diamond tools and other cobalt-containing tools other than hard metal	

7.2. Conditions of use affecting exposure

7.2.1. Control of environmental exposure: Production and industrial use of cobalt containing alloys, steels and tools ES1 STP Discharge (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.232 tonnes/day
Annual amount per site <= 750 tonnes/year
Emission days >= 336 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
No discharge to marine water assumed
Local freshwater dilution factor 100

7.2.2. Control of environmental exposure: Production and industrial use of cobalt containing alloys, steels and tools ES2 Direct Discharge (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.232 tonnes/day
Annual amount per site <= 750 tonnes/year
Emission days >= 336 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
Assumed effluent discharge flow from site >= 2E3 m3/day
No discharge to marine water assumed
Local freshwater dilution factor 150

7.2.3. Control of environmental exposure: Production and industrial use of cobalt containing alloys, steels and tools ES3 Marine Discharge (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.232 tonnes/day

Annual amount per site <= 750 tonnes/year
Emission days >= 336 days/year
Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
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
Assumed effluent discharge flow from site >= 2E3 m3/day
No discharge to freshwater assumed
Local marine water dilution factor 100

7.2.4. Control of worker exposure: Handling of massive materials (PROC 21)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Concentration of the substance in mixture is not restricted.
Physical form covered in this ES: Massive cobalt and massive scrap (e.g. ingots, cathodes, rounds).
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of exposure: Not restricted.
Technical and organisational conditions and measures
Process is carried out at ambient temperature.
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.
Use suitable eye protection.; For further specification, refer to section 8 of the SDS.
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless inhalation exposure to the substance can be excluded. For further specification, refer to section 8 of the SDS.

7.2.5. Control of worker exposure: Sintering, melting and casting (PROC 23, PROC 22)

Product (article) characteristics
Maximum emission potential covered in this ES: Medium (temperature based).
Concentration of the substance in mixture is not restricted.
Physical form covered in this ES: Molten.
Physical form covered in this ES: Massive object (e.g. ingots, cathodes).
Technical and organisational conditions and measures
Limit the process temperature to 1.5E3 °C.
Ensure enclosure of furnace operation.
Use of a local exhaust ventilation with an efficiency of at least 78% is required.
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.
Use suitable eye protection.; For further specification, refer to section 8 of the SDS.

Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless inhalation exposure to the substance can be excluded. For further specification, refer to section 8 of the SDS.

7.2.6. Control of worker exposure: Finishing of massive objects (PROC 25, PROC 14, PROC 24, PROC 21, PROC 13)

Product (article) characteristics
Maximum emission potential covered in this ES: Very low.
Concentration of the substance in mixture is not restricted.
Physical form covered in this ES: Massive object.
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of exposure: Not restricted.
Technical and organisational conditions and measures
Process is carried out at ambient temperature.
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.
Use suitable eye protection.; For further specification, refer to section 8 of the SDS.
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless inhalation exposure to the substance can be excluded. For further specification, refer to section 8 of the SDS.

7.2.7. Control of worker exposure: Handling of powders (PROC 26)

Product (article) characteristics
Maximum emission potential covered in this ES: Medium.
Concentration of the substance in mixture is not restricted.
Physical form covered in this ES: Solid, powder / dust (scrap steel and alloy powders and solids).
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of exposure: Not restricted.
Technical and organisational conditions and measures
Process is carried out at ambient temperature.
Use of a local exhaust ventilation with an efficiency of at least 78% is required.
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.
Use suitable eye protection.; For further specification, refer to section 8 of the SDS.
APF of RPE = 40 (97.5% respiratory protection).
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.

7.2.8. Control of worker exposure: Powder production (PROC 27a, PROC 27b, PROC 1)

Product (article) characteristics
Maximum emission potential covered in this ES: Low.
Concentration of the substance in mixture is not restricted.
Physical form covered in this ES: Molten.

Amount used (or contained in articles), frequency and duration of use/exposure
Duration of exposure: Not restricted.
Technical and organisational conditions and measures
Limit the process temperature to 1.5E3 °C.
Ensure full containment of the process.
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.
Use suitable eye protection.; For further specification, refer to section 8 of the SDS.
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless inhalation exposure to the substance can be excluded. For further specification, refer to section 8 of the SDS.

7.2.9. Control of worker exposure: Further processing (PROC 24, PROC 1)

Product (article) characteristics
Maximum emission potential covered in this ES: Low (abrasion based).
Concentration of the substance in mixture is not restricted.
Physical form covered in this ES: Massive object (cobalt in alloy).
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of exposure: Not restricted.
Technical and organisational conditions and measures
Limit the process temperature to 1.2E3 °C.
Ensure full containment of the process.
Process pressure may exceed ambient pressure.
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.
Use suitable eye protection.; For further specification, refer to section 8 of the SDS.
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless inhalation exposure to the substance can be excluded. For further specification, refer to section 8 of the SDS.

7.2.10. Control of worker exposure: Thermal spraying – fully automated (PROC 1, PROC 7)

Product (article) characteristics
Maximum emission potential covered in this ES: High (temperature based).
Concentration of the substance in mixture is not restricted.
Physical form covered in this ES: Solid, powder / dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of exposure: Not restricted.
Technical and organisational conditions and measures
Limit the process temperature during flame spraying to 3.1E3 °C.
Limit the process temperature during plasma spraying to 3E4 °C.
High pressure applied during plasma and high-velocity flame spraying.
Ensure full containment of the process.
Segregated enclosed space of the emission source is required.

Process has to be fully automated.
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye 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.
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless inhalation exposure to the substance can be excluded. For further specification, refer to section 8 of the SDS.

7.2.11. Control of worker exposure: Thermal spraying – NOT fully automated (PROC 7)

Product (article) characteristics
Maximum emission potential covered in this ES: High (temperature based).
Physical form covered in this ES: Solid, powder / dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of exposure: Not restricted.
Technical and organisational conditions and measures
Limit the process temperature during flame spraying to 3.1E3 °C.
Limit the process temperature during plasma spraying to 3E4 °C.
High pressure applied during plasma and high-velocity flame spraying.
Use of a local exhaust ventilation with an efficiency of at least 78% is required.
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.
Use suitable eye protection.; For further specification, refer to section 8 of the SDS.
APF of RPE = 20 (95% respiratory protection).

7.2.12. Control of worker exposure: Cleaning & Maintenance (PROC 28)

Product (article) characteristics
Maximum emission potential covered in this ES: High.
Physical form covered in this ES: Solid, powder / dust.
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of exposure: Not restricted.
Technical and organisational conditions and measures
Process is carried out at ambient pressure.
Process is carried out at ambient temperature.
Maintenance and repair work only at facilities which are not in operation. Minor cleaning tasks may be conducted under operation.
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.
Use suitable eye protection.; For further specification, refer to section 8 of the SDS.
APF of RPE = 40 (97.5% respiratory protection).
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.

7.3. Exposure estimation and reference to its source

7.3.1. Environmental release and exposure: Production and industrial use of cobalt containing alloys, steels and tools ES1 STP Discharge (ERC 5)

Release route	Release rate	Release estimation method
Water	0.056 kg/day	Estimated release factor
Air	0.942 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	2.05E-4 mg/L (EUSES 2.1.2)	0.331
Sediment (freshwater)	8.31 mg/kg dw (PEC sediment calculation method for metals)	0.154
Sewage Treatment Plant	0.017 mg/L (EUSES 2.1.2)	0.045
Agricultural soil	0.712 mg/kg dw (EUSES 2.1.2)	0.065
Man via environment - Inhalation	2.41E-4 mg/m ³ (EUSES 2.1.2)	0.038

7.3.2. Environmental release and exposure: Production and industrial use of cobalt containing alloys, steels and tools ES2 Direct Discharge (ERC 5)

Release route	Release rate	Release estimation method
Water	0.056 kg/day	Estimated release factor
Air	0.942 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	2.17E-4 mg/L (EUSES 2.1.2)	0.35
Sediment (freshwater)	8.76 mg/kg dw (PEC sediment calculation method for metals)	0.163
Agricultural soil	0.244 mg/kg dw (EUSES 2.1.2)	0.022
Man via environment - Inhalation	2.41E-4 mg/m ³ (EUSES 2.1.2)	0.038

7.3.3. Environmental release and exposure: Production and industrial use of cobalt containing alloys, steels and tools ES3 Marine Discharge (ERC 5)

Release route	Release rate	Release estimation method
Water	0.056 kg/day	Estimated release factor
Air	0.942 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	0.135 µg/L (Clocal calculation with Kp susp. matter marine)	0.057
Sediment (marine water)	25.07 mg/kg dw (PEC sediment calculation method for metals)	0.359
Agricultural soil	0.244 mg/kg dw (EUSES 2.1.2)	0.022

Protection target	Exposure estimate	RCR
Man via environment - Inhalation	2.41E-4 mg/m ³ (EUSES 2.1.2)	0.038

7.3.4. Worker exposure: Handling of massive materials (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	8.6 µg/m ³ (Measured data)	0.215

7.3.5. Worker exposure: Sintering, melting and casting (PROC 23, PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	1.4 µg/m ³ (Measured data)	0.035

7.3.6. Worker exposure: Finishing of massive objects (PROC 25, PROC 14, PROC 24, PROC 21, PROC 13)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	23.6 µg/m ³ (Measured data)	0.59

7.3.7. Worker exposure: Handling of powders (PROC 26)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	27.3 µg/m ³ (Measured data)	0.682

7.3.8. Worker exposure: Powder production (PROC 27a, PROC 27b, PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	10 µg/m ³ (MEASE)	0.25

7.3.9. Worker exposure: Further processing (PROC 24, PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	10 µg/m ³ (MEASE)	0.25

7.3.10. Worker exposure: Thermal spraying – fully automated (PROC 1, PROC 7)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	10 µg/m ³ (MEASE)	0.25

7.3.11. Worker exposure: Thermal spraying – NOT fully automated (PROC 7)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	19.5 µg/m ³ (Measured data)	0.487

7.3.12. Worker exposure: Cleaning & Maintenance (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	20.2 µg/m ³ (Measured data)	0.505

7.4. 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”.