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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 (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 must comply with EN 374.
- Any prescribed gloves must be changed according to manufacturer's information or when damaged, whatever is the earlier.

0.2.2. Inhalation (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 has to 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. 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 Scenario

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. In any case, it needs to be ensured that the final exposure estimate remains well below the respective DNEL. For systemic effects (if relevant), the sum of the RCRs for the dermal and for the inhalation route needs to be below 1.

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 90th percentile is to be used as a reasonable worst case estimate for comparison with the reported exposure level in the associated contributing ES (given that the dataset consists of at least 6 data points). 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 www.ebrc.de/mease.html) (version 1.02.01: available on or ART (version 1.5; available on https://www.advancedreachtool.com/), can be found in the contributing scenario (CS). In case of a multiple PROC assessment, the PROC used for the exposure estimation is provided in brackets with the corresponding exposure estimate. In cases where specific modifications of the tool estimate were required, further information for recalculation is provided with the corresponding exposure estimate. Please note regarding the five cobalt salts (i.e., cobalt carbonate, cobalt dichloride, cobalt dinitrate, cobalt sulphate, and cobalt di(acetate)) that if appropriate information on frequency and duration of tasks was available, derived exposure estimates were adopted to reflect actual exposure duration by calculating TWAs. It is noted that TWAs were not calculated by using the tool, but instead linear interpolation was conducted by considering zero exposure in the remaining time.

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 exposure calculation are:

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

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 Scenario

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.

1. Exposure Scenario 1: Manufacture; Manufacture of cobalt

SECTION 1:	1.1 Title of exposure scenario			
	Manufacture; Manufacture of cobalt			
Contributing scenario controlling environmental exposure				
Manufacture of cobalt ES 1 STP I	Manufacture of cobalt ES 1 STP Discharge ERC1			
Manufacture of cobalt ES 2 Direct	Discharge	ERC1		
Manufacture of cobalt ES 3 Marine	e Discharge	ERC1		
Contributing scenario controllir	ng worker exposure			
Raw material handling		PROC 26, PROC 21, PROC 8b		
Leaching unit		PROC 3, PROC 1		
Solvent extraction unit		PROC 3, PROC 1		
Tankhouse (electrowinning)		PROC 24, PROC 21, PROC 1, PROC 25		
Shearhouse (cutting)		PROC 24, PROC 21		
Powder production and milling		PROC 27a		
Screening and packaging		PROC 26		
Packaging of metal chips		PROC 21		
Supervision		PROC 4		
Cleaning & Maintenance		PROC 28		
SECTION 2:	1.2 Operational conditions and risk manage	ement measures		
2.1	Contributing scenario controlling environm	ental exposure		
2.1.1	Manufacture of cobalt ES 1 STP Discharge (El	RC 1)		
Frequency and duration of use	Frequency and duration of use			
Daily amount per site <= 25.34 tor	nnes/day			
Annual amount per site <= 9.25E3	s tonnes/year			
Emission days >= 365 days/year				
	I measures to reduce or limit discharges, air			
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber.				
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmo	sis or ion exchange.		
Conditions and measures related to municipal sewage treatment plant				
Provide onsite wastewater treatme	ent.			
Assumed domestic sewage treatment plant flow >= 8.89E3 m ³ /day				
Conditions and measures relate	ed to external treatment of waste for disposal			
Dispose of waste product or used containers according to local regulations.				
Other given operational conditions affecting environmental exposure				
No discharge to marine water assumed.				
Local freshwater dilution factor 1E3.				
2.1.2	Manufacture of cobalt ES 2 Direct Discharge (ERC 1)			
Frequency and duration of use				
Daily amount per site <= 25.34 tonnes/day				
Annual amount per site <= 9.25E3 tonnes/year				
Emission days >= 365 days/year				

Technical onsite conditions and	measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ctrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sediment	ation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ns affecting environmental exposure
Assumed effluent discharge flow fr	om site >= 8.89E3 m³/day
No discharge to marine water assu	imed.
Local freshwater dilution factor 1E	3.
2.1.3	Manufacture of cobalt ES 3 Marine Discharge (ERC 1)
Frequency and duration of use	
Daily amount per site <= 25.34 ton	nes/day
Annual amount per site <= 9.25E3	tonnes/year
Emission days >= 365 days/year	
Technical onsite conditions and	measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ctrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sediment	ation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ns affecting environmental exposure
No discharge to freshwater assum	ed.
Assumed effluent discharge flow fr	om site >= 8.89E3 m³/day
Local marine water dilution factor 1	100.
2.2	Contributing scenario controlling worker exposure
2.2.1	Raw material handling (PROC 26, PROC 21, PROC 8b)
Product characteristics	
Physical form of product: Solid, hig	h dustiness
Additional physical form of product	: Solid, Granulate
Additional physical form of product	: Aqueous solution
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and measu	res to control dispersion from source towards the worker
Segregated ball mill (Ni matte)	
Covers use at ambient temperature	es.
Kept under low-pressure (partly en	capsulated) when bags are opened and material is dropped.
Use of an integrated local exhaust	ventilation is required. Inhalation - minimum efficiency of 90 %
Conditions and measures relate	d to personal protection, hygiene and health evaluation
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.
Wear respiratory protection providi specification, refer to section 8 of t	ng a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further

2.2.2	Leaching unit (PROC 3, PROC 1)		
Product characteristics			
Physical form of product: Solid,	medium dustiness		
Additional physical form of prod	uct: Solid, Granulate		
Additional physical form of prod	uct: Aqueous solution		
Frequency and duration of us	e		
Covers daily exposures up to 8	hours.		
Technical conditions and mea	sures to control dispersion from source towards the worker		
Assumes process temperature	up to 150 °C.		
Use in closed process.			
Conditions and measures rela	ted 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 E	N374. For further specification, refer to section 8 of the SDS.		
	viding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ance can be excluded. For further specification, refer to section 8 of the SDS.		
2.2.3	Solvent extraction unit (PROC 3, PROC 1)		
Product characteristics			
Physical form of product: Aqueo	us solution		
Maximum emission potential: V	ery low		
Frequency and duration of us	e		
Covers daily exposures up to 8	hours.		
Technical conditions and mea	sures to control dispersion from source towards the worker		
Covers use at ambient tempera			
Use in closed process.			
Conditions and measures rela	ted to personal protection, hygiene and health evaluation		
Wear respiratory protection pro- specification, refer to section 8 d	viding a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further of the SDS.		
Use suitable eye protection. For	further specification, refer to section 8 of the SDS.		
	N374. For further specification, refer to section 8 of the SDS.		
2.2.4	Tankhouse (electrowinning) (PROC 24, PROC 21, PROC 1, PROC 25)		
Product characteristics			
Physical form of product: Aqueo	us solution		
Maximum emission potential: V			
Frequency and duration of us	-		
Covers daily exposures up to 8			
	sures to control dispersion from source towards the worker		
Covers use at ambient tempera			
Use in closed process.			
•	ted to personal protection, hygiene and health evaluation		
Conditions and measures rela			
	riding a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further of the SDS.		
Wear respiratory protection prov specification, refer to section 8 of			

2.2.5	Shoothourse (sutting) (PROC 24, PROC 21)			
	Shearhouse (cutting) (PROC 24, PROC 21)			
Product characteristics				
Physical form of product: Massive	•			
Maximum emission potential: Ver	y low			
Frequency and duration of use				
Covers daily exposures up to 8 ho				
Technical conditions and meas	ures to control dispersion from source towards the worker			
Covers use at ambient temperatu				
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	I374. For further specification, refer to section 8 of the SDS.			
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nce can be excluded. For further specification, refer to section 8 of the SDS.			
2.2.6	Powder production and milling (PROC 27a)			
Product characteristics				
Physical form of product: Solid, P	owder / Dust			
Maximum emission potential: Low				
Frequency and duration of use				
Covers daily exposures up to 8 ho	Durs.			
Technical conditions and meas	ures to control dispersion from source towards the worker			
Use of an exterior local exhaust v	entilation with an efficiency of at least 86% is required.			
	e at temperatures below melting point.			
Ensure enclosure of furnace oper	ation.			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless not can be excluded. For further specification, refer to section 8 of the SDS.			
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	I374. For further specification, refer to section 8 of the SDS.			
2.2.7	Screening and packaging (PROC 26)			
Dreduct chorectoristics				
Product characteristics				
Physical form of product: Solid, m Additional physical form of produc				
Frequency and duration of use				
Covers daily exposures up to 8 ho				
	ures to control dispersion from source towards the worker			
Semi-automated task. Covers use at ambient temperatures.				
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 %				
-	ed to personal protection, hygiene and health evaluation			
	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.				
Wear protective suit conforming to	DEN 13982 in cases where direct contact with the substance cannot be avoided.			

2.2.8	Packaging of metal chips (PROC 21)
Product characteristics	
Physical form of product: Massive	
Maximum emission potential: Ver	y low
Frequency and duration of use	
Covers daily exposures up to 8 ho	
Technical conditions and meas	ures to control dispersion from source towards the worker
Covers use at ambient temperature	
	ed to personal protection, hygiene and health evaluation
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nce can be excluded. For further specification, refer to section 8 of the SDS.
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	I374. For further specification, refer to section 8 of the SDS.
2.2.9	Supervision (PROC 4)
Product characteristics	
Physical form of product: Various	
Frequency and duration of use	
Covers daily exposures up to 8 ho	Durs.
Technical conditions and meas	ures to control dispersion from source towards the worker
Covers use at ambient temperatu	res.
Conditions and measures relate	ed to personal protection, hygiene and health evaluation
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless not can be excluded. For further specification, refer to section 8 of the SDS.
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.
Other conditions affecting work	ters exposure
For supervision activities it is important process that are supervised, as re-	ortant to also respect the RMMs as prescribed in the contributing scenarios for the specific elevant.
2.2.10	Cleaning & Maintenance (PROC 28)
Product characteristics	
Physical form of product: Solid, hi	ah dustiness
Frequency and duration of use	
Covers daily exposures up to 8 ho	DUIS.
	ures to control dispersion from source towards the worker
Process is carried out at ambient	
Process is carried out at ambient	•
	v at facilities which are not in operation. Minor cleaning tasks may be conducted under
Conditions and measures relate	ed to personal protection, hygiene and health evaluation
Wear respiratory protection provid specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.

SECTION 3: 1	1.3 Exposure estimation				
3.1 Environment					
Release estimation method: Estimated	release factor				
			Release rate		
	W	ater	Air		Soil
Manufacture of cobalt ES 1 STP Discharge	0.963	kg/day	3.928 kg/day	/	0 kg/day
Manufacture of cobalt ES 2 Direct Discharge	0.963	kg/day	3.928 kg/day	/	0 kg/day
Manufacture of cobalt ES 3 Marine Discharge	0.963	kg/day	3.928 kg/day	/	0 kg/day
Manufacture of cobalt ES 1 STP Discha	arge				
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk ch	aracterisation ratio (RCR)
Fresh water			1E-4 mg/l SES 2.1.2)		0.133
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method metals)		0.109
Sewage Treatment Plant			065 mg/l SES 2.1.2)		0.176
Agricultural soil			′ mg/kg dw SES 2.1.2)		0.191
Man via Environment - Inhalation (Systemic effects)			E-3 mg/m ³ 0.135 SES 2.1.2)		0.135
Man via Environment - Inhalation (Local	effects)		E-3 mg/m³ SES 2.1.2)		0.173
Man via Environment - Oral			mg/kg bw/day sured data)		0.036
Man via Environment - Combined routes	8				0.171
Manufacture of cobalt ES 2 Direct Discl	narge				
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk ch	aracterisation ratio (RCR)
Fresh water			3E-4 mg/l SES 2.1.2)		0.159
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method metals)		0.129
Agricultural soil			8 mg/kg dw SES 2.1.2)		0.024
Man via Environment - Inhalation (Syste	mic effects)		E-3 mg/m³ SES 2.1.2)		0.135
Man via Environment - Inhalation (Local	effects)		E-3 mg/m³ SES 2.1.2)		0.173
Man via Environment - Oral			mg/kg bw/day sured data)		0.036
Man via Environment - Combined routes	3				0.171

Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	0.485 μg/l (Clocal calculation with Kp susp. matter marine)	0.206
Sedimentation (Marine water)	54 mg/kg dw (PEC sediment calculation method for metals)	0.774
Agricultural soil	0.263 mg/kg dw (EUSES 2.1.2)	0.024
Man via Environment - Inhalation (Systemic effects)	1.09E-3 mg/m ³ (EUSES 2.1.2)	0.135
Man via Environment - Inhalation (Local effects)	1.09E-3 mg/m³ (EUSES 2.1.2)	0.173
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.17
3.2 Worker		
Raw material handling (PROC 26, PROC 21, PROC 8	3b)	
Exposure route	Exposure estimation	Risk characterisation ratio
Inhalation, Systemic effects, Long Term	9.6 µg/m³	0.177
Inhalation, Local effects, Long Term	9.6 µg/m³	0.24
Dermal, Systemic effects, Long Term	92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term		0.19
Leaching unit (PROC 3, PROC 1)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	6 µg/m³	0.111
Inhalation, Local effects, Long Term	6 µg/m³	0.15
Dermal, Systemic effects, Long Term	0.4 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.111
Solvent extraction unit (PROC 3, PROC 1)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	0.5 μg/m³	< 0.01
Inhalation, Local effects, Long Term	0.5 μg/m³	0.013
Dermal, Systemic effects, Long Term	0.4 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		< 0.01

Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	5.2 µg/m³	0.096
Inhalation, Local effects, Long Term	5.2 μg/m³	0.13
Dermal, Systemic effects, Long Term	1.3 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.096
Shearhouse (cutting) (PROC 24, PROC 21)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	23.6 µg/m³	0.436
Inhalation, Local effects, Long Term	23.6 µg/m³	0.59
Dermal, Systemic effects, Long Term	106.9 µg/kg bw/day	0.015
Combined routes, Systemic effects, Long Term		0.451
Powder production and milling (PROC 27a)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18 μg/m³	0.333
Inhalation, Local effects, Long Term	18 μg/m³	0.45
Dermal, Systemic effects, Long Term	1.3 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.333
Screening and packaging (PROC 26)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	23.5 µg/m³	0.434
Inhalation, Local effects, Long Term	23.5 µg/m³	0.588
Dermal, Systemic effects, Long Term	3.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.435
Packaging of metal chips (PROC 21)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term	8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term	62.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.168

Supervision (PROC 4)			
Exposure route		Exposure estimation	Risk characterisation ratio
Inhalation, Systemic effects, Long T	erm	10 μg/m³	0.185
Inhalation, Local effects, Long Term		10 μg/m³	0.25
Dermal, Systemic effects, Long Terr	า	0.4 μg/kg bw/day	< 0.01
Combined routes, Systemic effects,	Long Term		0.185
Cleaning & Maintenance (PROC 28)			<u>·</u>
Exposure route		Exposure estimation	Risk characterisation ratio
Inhalation, Systemic effects, Long Term		10.9 µg/m³	0.201
Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects,	Long Term		0.214
SECTION 4: 1.4 Guidance to DU to evaluate whether he works inside the boundaries set the ES		nside the boundaries set by	
Health/ Environment			
met or the downstream user can der measures are adequate. For human below the DNEL (given that the proc If measured data are not available, t (www.ebrc.de/mease.html) to estimat	nonstrate on his of health, this has t esses and activit he DU may make te the associated	either the proposed risk management me own that his operational conditions and in o be done by showing that they limit the ies in question are covered by the PROC e use of an appropriate scaling tool such d exposure. For the environment, this has environmental compartment. If measure	mplemented risk management inhalation exposure to a level Cs listed above) as given below. as MEASE s to be done by showing that

may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

2. Exposure Scenario 2: Manufacture; Manufacture of cobalt within catalyst or catalyst precursors (including regeneration)

SECTION 1:	2.1 Title of exposure scenario		
	Manufacture; Manufacture of cobalt within catalyst or catalyst precursors (including regeneration)		
Contributing scenario controllir	ng environmental exposure		
Manufacture of cobalt within catalyst or catalyst precursors (including regeneration) ES 1 STP Discharge ERC1			
Manufacture of cobalt within catalyst or catalyst precursors (including regeneration) ES 2 Direct Discharge ERC1		ERC1	
lanufacture of cobalt within catalyst or catalyst precursors (including ERC1 egeneration) ES 3 Marine Discharge			
Contributing scenario controllir	ng worker exposure		
Reduction of cobalt carbonate and cobalt dihydroxide to form cobalt metal		PROC 1	
Closed screening of cobalt metal	containing catalysts	PROC 3	
Closed filling and storage of final of	cobalt metal containing catalysts	PROC 8b	
Cleaning & Maintenance	-	PROC 28	
SECTION 2:	2.2 Operational conditions and risk man		
	•		
2.1	Contributing scenario controlling enviro		
2.1.1	Manufacture of cobalt within catalyst or cata ES 1 STP Discharge (ERC 1)	alyst precursors (including regeneration)	
Frequency and duration of use			
Daily amount per site <= 0.272 tor	nnes/day		
Annual amount per site <= 98 ton	nes/year		
Emission days >= 360 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges,	air emissions and releases to soil	
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/ba	ag filter or ceramic/metal mesh filter or wet	
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse os	mosis or ion exchange.	
Conditions and measures relate	ed to municipal sewage treatment plant		
Municipal sewage treatment plant	is assumed.		
Assumed domestic sewage treatm	nent plant flow >= 2E3 m³/day		
Conditions and measures relate	ed to external treatment of waste for dispo	sal	
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
No discharge to marine water ass	umed.		
Local freshwater dilution factor 10	0.		
2.1.2	Manufacture of cobalt within catalyst or cata ES 2 Direct Discharge (ERC 1)	alyst precursors (including regeneration)	
Frequency and duration of use			
Daily amount per site <= 0.272 tor	nnes/day		
Annual amount per site <= 98 ton	nes/year		
Emission days >= 360 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges,	air emissions and releases to soil	
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/ba	ag filter or ceramic/metal mesh filter or wet	
Chamical procipitation or sodimon	tation or filtration or electrolysis or reverse os	mosis or ion exchange	

Conditions and measures relate	ed to external treatment of waste for disposal			
Dispose of waste product or used	containers according to local regulations.			
Other given operational conditions affecting environmental exposure				
Assumed effluent discharge flow from site >= 250 m ³ /day				
No discharge to marine water ass				
Local freshwater dilution factor 50				
2.1.3	Manufacture of cobalt within catalyst or catalyst precursors (including regeneration)			
2.1.5	ES 3 Marine Discharge (ERC 1)			
Frequency and duration of use				
Daily amount per site <= 0.272 tor	nnes/day			
Annual amount per site <= 98 tonr	nes/year			
Emission days >= 360 days/year				
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil			
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet			
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.			
Conditions and measures relate	ed to external treatment of waste for disposal			
Dispose of waste product or used	containers according to local regulations.			
Other given operational condition	ons affecting environmental exposure			
Assumed effluent discharge flow f	rom site >= 250 m³/day			
No discharge to freshwater assum	ned.			
Local marine water dilution factor	100.			
2.2	Contributing scenario controlling worker exposure			
2.2.1	Reduction of cobalt carbonate and cobalt dihydroxide to form cobalt metal (PROC 1)			
Product characteristics				
Physical form of product: Solid, Po	owder / Dust, Shaped catalysts			
Covers percentage substance in the	he product up to 100 %.			
Maximum emission potential: High	1			
Frequency and duration of use				
Covers daily exposures up to 8 ho	urs.			
Technical conditions and measu	ures to control dispersion from source towards the worker			
Assumes process temperature up	to 600 °C.			
Use in closed process.				
Use of an integrated local exhaust	Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 %			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
Wear respiratory protection providing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.				
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.				
2.2.2 Closed screening of cobalt metal containing catalysts (PROC 3)				
Product characteristics				
Product characteristics Physical form of product: Solid, Po	owder / Dust, Shaped catalysts			

Frequency and duration of use Covers daily exposures up to 8 hours. Technical exposures in the exposure to explain the explanation of the explanat			
Technical conditions and measures to control dispersion from source towards the worker			
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 %			
Use in closed process.			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear respiratory protection providing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.3 Closed filling and storage of final cobalt metal containing catalysts (PROC 8b)			
Product characteristics			
Physical form of product: Solid, Powder / Dust, Shaped catalysts			
Covers percentage substance in the product up to 100 %.			
Maximum emission potential: High			
Frequency and duration of use			
Covers daily exposures up to 8 hours.			
Technical conditions and measures to control dispersion from source towards the worker			
Use in closed process.			
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 %			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear respiratory protection providing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.4 Closed filling and storage of final cobalt metal containing catalysts (PROC 8b)			
Product characteristics			
Physical form of product: Solid, Powder / Dust, Shaped catalysts			
Covers percentage substance in the product up to 100 %.			
Maximum emission potential: High			
Frequency and duration of use			
Covers daily exposures up to 8 hours.			
Technical conditions and measures to control dispersion from source towards the worker			
Use in closed process.			
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 %			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear respiratory protection providing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.5 Cleaning & Maintenance (PROC 28)			
Product characteristics			
Physical form of product: Various			

Covers percentage substance in the product up to 100 %.

Maximum emission potential: Low

Frequency and duration of use

Typical duration per shift = 120 min

Typical number of shifts per year = 48 Shifts/year

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

Process is carried out at ambient pressure.

Covers use at ambient temperatures.

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

Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.

Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.

SECTION 3:

2.3 Exposure estimation

3.1 Environment

Release estimation method: Estimated release factor

	Release rate			
	Water	Air	Soil	
Manufacture of cobalt within catalyst or catalyst precursors (including regeneration) ES 1 STP Discharge	8.7E-3 kg/day	7.89E-3 kg/day	0 kg/day	
Manufacture of cobalt within catalyst or catalyst precursors (including regeneration) ES 2 Direct Discharge	8.7E-3 kg/day	7.89E-3 kg/day	0 kg/day	
Manufacture of cobalt within catalyst or catalyst precursors (including regeneration) ES 3 Marine Discharge	8.7E-3 kg/day	7.89E-3 kg/day	0 kg/day	

Manufacture of cobalt within catalyst or catalyst precursors (including regeneration) ES 1 STP Discharge

Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)	
Fresh water	1.16E-4 mg/l (EUSES 2.1.2)	0.11	
Sedimentation (Fresh water)	4.89 mg/kg dw (PEC sediment calculation method for metals)	0.091	
Sewage Treatment Plant	2.61E-3 mg/l (EUSES 2.1.2)	< 0.01	
Agricultural soil	0.312 mg/kg dw (EUSES 2.1.2)	0.029	
Man via Environment - Inhalation (Systemic effects)	2.31E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Inhalation (Local effects)	2.31E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Oral	3.21E-4 mg/kg bw/day (Measured data)	0.036	

Man via Environment - Combined routes		0.036	
Manufacture of cobalt within catalyst or catalyst preci	ursors (including regeneration) ES 2 Dire	ect Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)	
Fresh water	1.44E-4 mg/l (EUSES 2.1.2)	0.136	
Sedimentation (Fresh water)	5.95 mg/kg dw (PEC sediment calculation method for metals)	0.111	
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022	
Man via Environment - Inhalation (Systemic effects)	2.31E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Inhalation (Local effects)	2.31E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Oral	3.21E-4 mg/kg bw/day (Measured data)	0.036	
Man via Environment - Combined routes		0.036	
Manufacture of cobalt within catalyst or catalyst prece	ursors (including regeneration) ES 3 Mar	ine Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)	
Marine water	0.166 µg/l (Clocal calculation with Kp susp. matter marine)	0.07	
Sedimentation (Marine water)	26.1 mg/kg dw (PEC sediment calculation method for metals)	0.374	
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022	
Man via Environment - Inhalation (Systemic effects)	2.31E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Inhalation (Local effects)	2.31E-6 mg/m ³ (EUSES 2.1.2)	0.036	
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036	
Man via Environment - Combined routes		0.036	
3.2 Worker			
Reduction of cobalt carbonate and cobalt dihydroxide	, , , , , , , , , , , , , , , , ,		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	0.8 µg/m³	0.015	
Inhalation, Local effects, Long Term	0.8 µg/m³	0.02	
Dermal, Systemic effects, Long Term	0.4 μg/kg bw/day	< 0.01	

0.8 µg/m³		
	0.015	
0.8 µg/m³	0.02	
0.4 μg/kg bw/day	< 0.01	
n	0.015	
containing catalysts (PROC 8b)	I	
Exposure estimation	Risk characterisation ratio (RCR)	
0.8 µg/m³	0.015	
0.8 µg/m³	0.02	
0.4 μg/kg bw/day	< 0.01	
n	0.015	
Exposure estimation	Risk characterisation ratio (RCR)	
2.4 µg/m³	0.044	
2.4 µg/m³	0.06	
23.2 µg/kg bw/day	< 0.01	
n	0.048	
2.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES		
	n containing catalysts (PROC 8b) Exposure estimation 0.8 µg/m³ 0.8 µg/m³ 0.4 µg/kg bw/day n Exposure estimation 2.4 µg/m³ 2.4 µg/m³ 23.2 µg/kg bw/day n	

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

3. Exposure Scenario 3: Manufacture; Recycling of hardmetal-containing scrap materials

SECTION 1:	3.1 Title of exposure scenario			
	Manufacture; Recycling of hardmetal-containing scrap materials			
Contributing scenario controlling environmental exposure				
Recycling of hardmetal-containing scrap materials ES 1 STP Discharge		ERC1		
Recycling of hardmetal-containing scrap materials ES 2 Marine Discharge ERC1				
Contributing scenario controllir	ng worker exposure			
Scrap handling PROC 8b				
Processing operation		PROC 5, PROC 21		
Transfer to recycling unit		PROC 8b		
Chemical recycling		PROC 1		
Mechanical recycling (zinc or cold	stream)	PROC 1		
Transfer to milling after mechanica	al recycling	PROC 8b		
Milling		PROC 3		
Filling		PROC 9		
Cleaning & Maintenance		PROC 28		
SECTION 2:	3.2 Operational conditions and risk management measures			
2.1	Contributing scenario controlling environmental exposure			
2.1.1	Recycling of hardmetal-containing scrap materials ES 1 STP Discharge (ERC 1)			
Frequency and duration of use				
Daily amount per site <= 0.654 tor	nnes/dav			
Annual amount per site <= 170 tor				
Emission days >= 260 days/year				
	I measures to reduce or limit discharges, a	ir emissions and releases to soil		
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber.				
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse os	mosis or ion exchange.		
Conditions and measures related to municipal sewage treatment plant				
Municipal sewage treatment plant	is assumed.			
Assumed domestic sewage treatment	nent plant flow >= 2E3 m³/day			
Conditions and measures relate	d to external treatment of waste for dispos	al		
Dispose of waste product or used	containers according to local regulations.			
Other given operational condition	ons affecting environmental exposure			
No discharge to marine water assumed.				
Local freshwater dilution factor 100.				
2.1.2	Recycling of hardmetal-containing scrap ma	terials ES 2 Marine Discharge (ERC 1)		
Frequency and duration of use				
Daily amount per site <= 0.654 tonnes/day				
Annual amount per site <= 170 tonnes/year				
Emission days >= 260 days/year				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber.				

Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.				
Conditions and measures related to external treatment of waste for disposal					
Dispose of waste product or used containers according to local regulations.					
Other given operational conditions affecting environmental exposure					
Assumed effluent discharge flow f	rom site >= 2E3 m ³ /day				
No discharge to freshwater assum					
Local marine water dilution factor	100.				
2.2					
2.2.1	Scrap handling (PROC 8b)				
Product characteristics					
Physical form of product: Bound ir	article.				
Covers percentage substance in t					
Maximum emission potential: Very					
Frequency and duration of use					
Covers daily exposures up to 8 ho	urs.				
Technical conditions and meas	ures to control dispersion from source towards the worker				
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %				
Conditions and measures relate	ed to personal protection, hygiene and health evaluation				
Wear respiratory protection provid specification, refer to section 8 of	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.				
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.				
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.				
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.					
2.2.2	Processing operation (PROC 5, PROC 21)				
Product characteristics					
Physical form of product: Bound in	n article.				
Covers percentage substance in t	he product up to 25 %.				
Maximum emission potential: Mec	lium (abrasion based)				
Frequency and duration of use					
Covers daily exposures up to 8 ho	urs.				
Technical conditions and meas	ures to control dispersion from source towards the worker				
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 84 %					
Use in closed process.					
Conditions and measures relate	ed to personal protection, hygiene and health evaluation				
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.					
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.					
Near protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.					
2.2.3	Transfer to recycling unit (PROC 8b)				
Product characteristics					
Physical form of product: Solid, Granulate					
Covers percentage substance in t	he product up to 25 %.				
Maximum emission potential: Very	/ low				

Frequency and duration of use				
Covers daily exposures up to 8 hours.				
Technical conditions and measures to control dispersion from source towards the worker				
local exhaust ventilation. Inhalation	n - minimum efficiency of 78 %			
Conditions and measures relate	d to personal protection, hygiene and health evaluation			
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless access a minimum efficiency of 90%.			
Use suitable eye protection. For fu	Irther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.4	Chemical recycling (PROC 1)			
Product characteristics				
	ranulate			
Physical form of product: Solid, G				
Covers percentage substance in the				
Maximum emission potential: Med Frequency and duration of use				
Covers daily exposures up to 8 ho				
	ures to control dispersion from source towards the worker			
•	at temperatures below melting point.			
	ventilation is required. Inhalation - minimum efficiency of 84 %			
Use in closed process.				
	d to personal protection, hygiene and health evaluation			
Wear respiratory protection provid specification, refer to section 8 of t	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.			
Use suitable eye protection. For fu	Irther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.5	Mechanical recycling (zinc or cold stream) (PROC 1)			
Product characteristics				
Physical form of product: Solid, G	ranulate			
Covers percentage substance in the	ne product up to 25 %.			
Maximum emission potential: Med	ium (abrasion based)			
Frequency and duration of use				
Covers daily exposures up to 8 hours.				
Technical conditions and measures to control dispersion from source towards the worker				
Elevated temperature. Covers use at temperatures below melting point.				
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 84 %				
Use in closed process.				
Conditions and measures related to personal protection, hygiene and health evaluation				
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further specification, refer to section 8 of the SDS.				
Use suitable eye protection. For further specification, refer to section 8 of the SDS.				
	374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.			

2.2.6	Transfer to milling after mechanical recycling (PROC 8b)		
Product characteristics			
Physical form of product: Solid, Granulate			
Covers percentage substance in the product up to 25 %.			
Maximum emission potential: Low			
Frequency and duration of use			
Covers daily exposures up to 8 ho	burs.		
Technical conditions and meas	ures to control dispersion from source towards the worker		
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %		
Conditions and measures relate	ed to personal protection, hygiene and health evaluation		
Wear respiratory protection provid specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.		
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.		
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.		
2.2.7	Milling (PROC 3)		
Product characteristics			
Physical form of product: Solid, m	edium dustiness		
Frequency and duration of use			
Covers daily exposures up to 8 ho	burs.		
Technical conditions and measured	ures to control dispersion from source towards the worker		
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %		
Use in closed process.			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation		
Wear respiratory protection provid specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.		
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.		
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.		
2.2.8	Filling (PROC 9)		
Product characteristics			
Physical form of product: Solid, m	edium dustiness		
Frequency and duration of use			
Covers daily exposures up to 8 hours.			
Technical conditions and measures to control dispersion from source towards the worker			
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 84 %			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.9	Cleaning & Maintenance (PROC 28)		
Product characteristics			
Physical form of product: Solid, medium dustiness			

Frequency and duration of use						
Avoid carrying out activities involving	exposure for mo	ore than 1 hour pe	er day.			
Technical conditions and measure	es to control dis	persion from so	urce towards the wor	ker		
Use of an integrated local exhaust ve	entilation is requir	red. Inhalation - m	ninimum efficiency of 8	4 %		
Conditions and measures related t	o personal prot	ection, hygiene	and health evaluation	า		
Wear respiratory protection providing inhalation exposure to the substance		0 1	`		,	
Use suitable eye protection. For furth	er specification,	refer to section 8	of the SDS.			
Wear suitable gloves tested to EN37	4. For further spe	ecification, refer to	section 8 of the SDS.			
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.						
SECTION 3:	3.3 Exposure estimation					
3.1 Environment						
Release estimation method: Estimate	ed release factor					
			Release rate			
	Wa	ater	Air		Soil	
Recycling of hardmetal-containing scrap materials ES 1 STP Discharge	0.065	kg/day	0.196 kg/da	y	0 kg/day	
Recycling of hardmetal-containing scrap materials ES 2 Marine Discharge	0.065	0.065 kg/day 0.196 kg/		y	0 kg/day	
Recycling of hardmetal-containing sc	rap materials ES	S 1 STP Discharg	e			
Protection target	(PEC, Pred	concentration icted Exposure entration)	Risk ch	aracterisation ratio (RCR)		
Fresh water		2.24E-4 mg/l (EUSES 2.1.2)			0.211	
Sedimentation (Fresh water)		9.02 mg/kg dw (PEC sediment calculation method for metals)			0.168	
Sewage Treatment Plant		0.02 mg/l (EUSES 2.1.2)			0.053	
Agricultural soil		0.791 mg/kg dw (EUSES 2.1.2)			0.073	
Man via Environment - Inhalation (Systemic effects)		3.9E-5 mg/m ³ (EUSES 2.1.2)			< 0.01	
Man via Environment - Inhalation (Local effects)		3.9E-5 mg/m ³ (EUSES 2.1.2)			< 0.01	
Man via Environment - Oral		3.24E-4 mg/kg bw/day (Measured data)		0.036		
Man via Environment - Combined routes				0.041		
Recycling of hardmetal-containing scrap materials ES 2 Marine Discharge						
Protection target		Exposure concentration (PEC, Predicted Exposure Concentration)		Risk ch	aracterisation ratio (RCR)	
Marine water 0.157 µg/l 0.067 (Clocal calculation with Kp susp. matter marine)			0.067			
Sedimentation (Marine water) 25.3 mg/kg dw 0.362 (PEC sediment calculation method)						

	for metals)		
Agricultural soil	0.24 mg/kg dw 0.022 (EUSES 2.1.2)		
Man via Environment - Inhalation (Systemic effects)	3.9E-5 mg/m ³ < 0.01 (EUSES 2.1.2)		
Man via Environment - Inhalation (Local effects)	3.9E-5 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036	
Man via Environment - Combined routes		0.04	
3.2 Worker			
Scrap handling (PROC 8b)			
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	3.3 µg/m³	0.061	
Inhalation, Local effects, Long Term	3.3 µg/m³	0.083	
Dermal, Systemic effects, Long Term	15.5 µg/kg bw/day	< 0.01	
Combined routes, Systemic effects, Long Term	0.063		
Processing operation (PROC 5, PROC 21)			
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	15 μg/m ³ 0.277		
Inhalation, Local effects, Long Term	15 μg/m³	0.375	
Dermal, Systemic effects, Long Term	0.2 μg/kg bw/day	< 0.01	
Combined routes, Systemic effects, Long Term		0.277	
Transfer to recycling unit (PROC 8b)			
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	12 µg/m³	0.222	
Inhalation, Local effects, Long Term	12 µg/m³	0.3	
Dermal, Systemic effects, Long Term	15.5 µg/kg bw/day < 0.01		
Combined routes, Systemic effects, Long Term		0.224	
Chemical recycling (PROC 1)			
Exposure route	Exposure estimation Risk characterisation (RCR)		
Inhalation, Systemic effects, Long Term	20 µg/m³	0.37	
Inhalation, Local effects, Long Term	20 µg/m³	0.5	
Dermal, Systemic effects, Long Term	0.1 μg/kg bw/day	< 0.01	

Combined routes, Systemic effects, Long Term		0.37
Mechanical recycling (zinc or cold stream) (PROC	1)	· · · · ·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	4.9 µg/m³	0.091
Inhalation, Local effects, Long Term	4.9 µg/m³	0.123
Dermal, Systemic effects, Long Term	0.1 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.091
Transfer to milling after mechanical recycling (PRO	C 8b)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	4.9 µg/m³	0.091
Inhalation, Local effects, Long Term	4.9 µg/m³	0.123
Dermal, Systemic effects, Long Term	15.5 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.093
Milling (PROC 3)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	4.9 µg/m³	0.091
Inhalation, Local effects, Long Term	4.9 µg/m³	0.123
Dermal, Systemic effects, Long Term	0.4 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.091
Filling (PROC 9)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	4.9 µg/m³	0.091
Inhalation, Local effects, Long Term	4.9 µg/m³	0.123
Dermal, Systemic effects, Long Term	62.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.099
Cleaning & Maintenance (PROC 28)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	1.5 µg/m³	0.028
Inhalation, Local effects, Long Term	1.5 µg/m³	0.037
Dermal, Systemic effects, Long Term	7.8 μg/kg bw/day	< 0.01

Combined routes, Systemic effects, Long Term			0.029
SECTION 4:	3.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES		
Health/ Environment	Health/ Environment		
met or the downstream user can dem measures are adequate. For human h below the DNEL (given that the proce If measured data are not available, the (www.ebrc.de/mease.html) to estimate they limit the PEC below the PNEC for	onstrate on his o health, this has to sses and activitie e DU may make e the associated r the respective e ng tool such as t	ither the proposed risk management mea wn that his operational conditions and im be done by showing that they limit the in es in question are covered by the PROCs use of an appropriate scaling tool such as exposure. For the environment, this has environmental compartment. If measured he DU-Scaling tool (http://www.arche-cor	plemented risk management halation exposure to a level listed above) as given below. s MEASE to be done by showing that data are not available, the DU

4. Exposure Scenario 4: Use at industrial sites; Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use)

SECTION 1:	4.1 Title of exposure scenario		
	Use at industrial sites; Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use)		
Sectors of use [SU]	·		
Manufacture of bulk, large scale	chemicals (including petroleum products)	SU 8	
Manufacture of fine chemicals		SU 9	
Contributing scenario controll	ing environmental exposure	-	
Use of cobalt in the manufacture use) ES 1 STP Discharge	e of inorganic cobalt substances (intermediate	ERC 6a	
Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 2 Direct Discharge		ERC 6a	
Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 3 Marine Discharge		ERC 6a	
Contributing scenario control	ing worker exposure		
Raw material handling		PROC 26, PROC 21, PROC 8b	
Preparation of raw material		PROC 3, PROC 1	
Wet process		PROC 4, PROC 1	
Hot process		PROC 22, PROC 27a, PROC 1	
Further processing		PROC 5, PROC 1	
Filling of solutions		PROC 8b	
Handling of powders with moderate dustiness potential		PROC 26	
Handling of powders with high d	ustiness potential	PROC 26	
Cleaning & Maintenance		PROC 28	

SECTION 2:	4.2 Operational conditions and risk management measures		
2.1	Contributing scenario controlling environmental exposure		
2.1.1	Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 1 STP Discharge (ERC 6a)		
Frequency and duration of use			
Daily amount per site <= 1.48 tonr	nes/day		
Annual amount per site <= 533 tor	nnes/year		
Emission days >= 360 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.		
Conditions and measures relate	d to municipal sewage treatment plant		
Municipal sewage treatment plant	is assumed.		
Assumed domestic sewage treatm	nent plant flow >= 2E3 m ³ /day		
Conditions and measures relate	d to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
No discharge to marine water ass	umed.		
Local freshwater dilution factor 10	0.		
2.1.2	Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 2 Direct Discharge (ERC 6a)		
Frequency and duration of use			
Daily amount per site <= 1.48 tonr	nes/day		
Annual amount per site <= 533 tor	nnes/year		
Emission days >= 360 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.		
Conditions and measures relate	d to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
Assumed effluent discharge flow f	rom site >= 2E3 m³/day		
No discharge to marine water ass	umed.		
Local marine water dilution factor	1E3.		
2.1.3	Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 3 Marine Discharge (ERC 6a)		
Frequency and duration of use			
Daily amount per site <= 1.48 tonr	nes/day		
Annual amount per site <= 533 tor	nnes/year		
Emission days >= 360 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.		

Conditions and measures relate	d to external treatment of waste for disposal	
	containers according to local regulations.	
	ons affecting environmental exposure	
Assumed effluent discharge flow fi	-	
No discharge to freshwater assum	ed	
Local marine water dilution factor	100.	
2.2	Contributing scenario controlling worker exposure	
2.2.1	Raw material handling (PROC 26, PROC 21, PROC 8b)	
Product characteristics		
Physical form of product: Solid, me	adium dustiness	
Additional physical form of product	: Massive object	
Additional physical form of product	: Aqueous solution	
Covers percentage substance in the	ne product up to 100 %.	
Frequency and duration of use		
Covers daily exposures up to 8 ho	urs.	
Technical conditions and measu	ires to control dispersion from source towards the worker	
Covers use at ambient temperatur	es.	
Conditions and measures relate	d to personal protection, hygiene and health evaluation	
Wear respiratory protection provid specification, refer to section 8 of t	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS.	
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.	
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.	
2.2.2	Preparation of raw material (PROC 3, PROC 1)	
Product characteristics		
Physical form of product: Aqueous	solution	
Covers percentage substance in the		
Maximum emission potential: Very		
Frequency and duration of use		
Covers daily exposures up to 8 ho	urs.	
Technical conditions and measu	Ires to control dispersion from source towards the worker	
Assumes process temperature up		
	ist ventilation (Use of an integrated local exhaust ventilation is required. Inhalation -	
Ensure enclosure of reaction vess	el.	
Conditions and measures relate	d to personal protection, hygiene and health evaluation	
1 21 1	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ice can be excluded. For further specification, refer to section 8 of the SDS.	
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.		
2.2.3	Wet process (PROC 4, PROC 1)	
Product characteristics		
Physical form of product: Aqueous	solution	
Covers percentage substance in the		
Maximum emission potential: Very		

Frequency and duration of use			
Covers daily exposures up to 8 hours.			
Technical conditions and measures to control dispersion from source towards the worker			
Covers use at ambient temperatu	res.		
Use in closed process.			
Semi-automated task.			
Vapour extraction units in the tanl 90 %)	k (Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of		
Conditions and measures relate	ed to personal protection, hygiene and health evaluation		
Wear respiratory protection provio specification, refer to section 8 of	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.		
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.		
2.2.4	Hot process (PROC 22, PROC 27a, PROC 1)		
Product characteristics			
Physical form of product: Solution	n / Filter cake / Damp powder / Dried powder		
Maximum emission potential: Low	v (temperature based)		
Frequency and duration of use			
Covers daily exposures up to 8 ho	purs.		
Technical conditions and meas	ures to control dispersion from source towards the worker		
Elevated temperature. Covers us	e at temperatures below melting point.		
Use of an exterior local exhaust v	entilation with an efficiency of at least 86% is required.		
Ensure enclosure of furnace oper			
Conditions and measures related	ed to personal protection, hygiene and health evaluation		
Wear respiratory protection provid specification, refer to section 8 of	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.		
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	V374. For further specification, refer to section 8 of the SDS.		
2.2.5 Further processing (PROC 5, PROC 1)			
Product characteristics			
	igh dustinoss		
Physical form of product: Solid, high dustiness			
Additional physical form of product: Aqueous solution			
Frequency and duration of use			
Covers daily exposures up to 8 hours.			
Technical conditions and measures to control dispersion from source towards the worker			
Use in closed process.			
Covers use at ambient temperatures.			
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 %			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.			
2.2.6	Filling of solutions (PROC 8b)		
Product characteristics			
Physical form of product: Aqueou	s solution		

Maximum emission potential: Very low		
Frequency and duration of use		
Covers daily exposures up to 8 hours.		
Technical conditions and meas	ures to control dispersion from source towards the worker	
Covers use at ambient temperatu	res.	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation	
	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nce can be excluded. For further specification, refer to section 8 of the SDS.	
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.	
2.2.7	Handling of powders with moderate dustiness potential (PROC 26)	
Product characteristics		
Physical form of product: Solid, m	edium dustiness	
Frequency and duration of use		
Covers daily exposures up to 8 ho	ours.	
Technical conditions and meas	sures to control dispersion from source towards the worker	
Covers use at ambient temperatu	res.	
Use of an integrated local exhaus	t ventilation is required. Inhalation - minimum efficiency of 90 %	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation	
Wear respiratory protection provid specification, refer to section 8 of	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.	
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.	
Wear protective suit conforming to	o EN 13982 in cases where direct contact with the substance cannot be avoided.	
2.2.8	Handling of powders with high dustiness potential (PROC 26)	
Product characteristics		
Physical form of product: Solid, m	nedium dustiness	
Frequency and duration of use		
Covers daily exposures up to 8 ho	ours.	
Technical conditions and meas	ures to control dispersion from source towards the worker	
Covers use at ambient temperatu	res.	
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear respiratory protection provic specification, refer to section 8 of	ding a minimum assigned protection factor of 40 (a minimum efficiency of 97.5%). For further the SDS.	
Use suitable eye protection. For fi	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.	
Wear protective suit conforming to	o EN 13982 in cases where direct contact with the substance cannot be avoided.	
2.2.9	Cleaning & Maintenance (PROC 28)	
Product characteristics		
Physical form of product: Solid, m	nedium dustiness	
Frequency and duration of use		
Covers daily exposures up to 8 ho		
Technical conditions and measures to control dispersion from source towards the worker		
Process is carried out at ambient pressure		
	pressure	
	·	

Maintenance and repair work only at operation.	facilities which a	re not in operatio	n. Minor cleaning tasks	s may be co	nducted under	
Conditions and measures related t	o personal prot	ection, hygiene	and health evaluation	า		
Wear respiratory protection providing specification, refer to section 8 of the		igned protection f	actor of 10 (a minimum	efficiency	of 90%). For further	
Use suitable eye protection. For further specification, refer to section 8 of the SDS.						
Wear suitable gloves tested to EN374	4. For further spe	ecification, refer to	section 8 of the SDS.			
Wear protective suit conforming to El	N 13982 in cases	s where direct cor	ntact with the substanc	e cannot be	e avoided.	
SECTION 3:	4.3 Exposure	estimation				
3.1 Environment						
Release estimation method: Estimate	ed release factor					
			Release rate			
	Wa	ater	Air		Soil	
Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 1 STP Discharge	0.075	kg/day	0.019 kg/da	y	0 kg/day	
Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 2 Direct Discharge	0.075	kg/day	0.019 kg/day		0 kg/day	
Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 3 Marine Discharge	0.075 kg/day		0.019 kg/day		0 kg/day	
Use of cobalt in the manufacture of ir	norganic cobalt s	ubstances (intern	nediate use) ES 1 STP	Discharge		
Protection target		(PEC, Pred	concentration licted Exposure entration)	ted Exposure (RCR)		
Fresh water			1.14E-4 mg/l (EUSES 2.1.2)		0.108	
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method r metals)		0.09	
Sewage Treatment Plant	Sewage Treatment Plant		0.023 mg/l (EUSES 2.1.2)		0.061	
Agricultural soil			i mg/kg dw 0.08 SES 2.1.2)		0.08	
Man via Environment - Inhalation (Systemic effects)			E-6 mg/m ³ < 0.01 SES 2.1.2)		< 0.01	
Man via Environment - Inhalation (Local effects)			34E-6 mg/m ³ USES 2.1.2)		< 0.01	
Man via Environment - Oral			mg/kg bw/day 0.036 asured data)		0.036	
Man via Environment - Combined rou	tes				0.037	
Use of cobalt in the manufacture of inorganic cobalt substances (intermediate use) ES 2 Direct Discharge						
Protection target		(PEC, Pred	concentration licted Exposure entration)	Risk ch	aracterisation ratio (RCR)	
Fresh water			4E-4 mg/l SES 2.1.2)		0.117	

Sedimentation (Fresh water)	5.19 mg/kg dw	0.096	
	(PEC sediment calculation method for metals)		
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022	
Man via Environment - Inhalation (Systemic effects)	5.43E-6 mg/m ³ < 0.01 (EUSES 2.1.2)		
Man via Environment - Inhalation (Local effects)	5.43E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Oral	3.21E-4 mg/kg bw/day (Measured data)	0.036	
Man via Environment - Combined routes		0.037	
Use of cobalt in the manufacture of inorganic cobalt s	ubstances (intermediate use) ES 2 Direc	ct Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)		
Marine water	0.179 μg/l (Clocal calculation with Kp susp. matter marine)	0.076	
Sedimentation (Marine water)	27.36 mg/kg dw (PEC sediment calculation method for metals)	0.392	
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022	
Man via Environment - Inhalation (Systemic effects)	5.43E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Inhalation (Local effects)	5.43E-6 mg/m³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036	
Man via Environment - Combined routes		0.036	
3.2 Worker			
Raw material handling (PROC 26, PROC 21, PROC 8	8b)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	17.2 µg/m³	0.318	
Inhalation, Local effects, Long Term	17.2 μg/m³	0.43	
Dermal, Systemic effects, Long Term	92.8 μg/kg bw/day	0.013	
Combined routes, Systemic effects, Long Term		0.331	
Preparation of raw material (PROC 3, PROC 1)			
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	12 μg/m³	0.222	
Inhalation, Local effects, Long Term	12 µg/m³	0.3	
Dermal, Systemic effects, Long Term	0.4 µg/kg bw/day	< 0.01	

Combined routes, Systemic effects, Long Term		0.222
Wet process (PROC 4, PROC 1)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	2.1 µg/m³	0.039
Inhalation, Local effects, Long Term	2.1 µg/m³	0.053
Dermal, Systemic effects, Long Term	1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.039
Hot process (PROC 22, PROC 27a, PROC 1)		·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18.1 µg/m³	0.335
Inhalation, Local effects, Long Term	18.1 µg/m³	0.453
Dermal, Systemic effects, Long Term	1.3 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.335
Further processing (PROC 5, PROC 1)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	23.9 µg/m³	0.442
Inhalation, Local effects, Long Term	23.9 µg/m³	0.597
Dermal, Systemic effects, Long Term	1 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.442
Filling of solutions (PROC 8b)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10 µg/m³	0.185
Inhalation, Local effects, Long Term	10 µg/m³	0.25
Dermal, Systemic effects, Long Term	0.8 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.185
Handling of powders with moderate dustiness poter	ntial (PROC 26)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	14.9 µg/m³	0.275
Inhalation, Local effects, Long Term	14.9 µg/m³	0.372
Dermal, Systemic effects, Long Term	92.8 µg/kg bw/day	0.013

Combined routes, Systemic effects, Long Term			0.288
Handling of powders with high dustine	ess potential (PR	OC 26)	•
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	20.8 µg/m³	0.384
Inhalation, Local effects, Long Term		20.8 µg/m³	0.52
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, L	ong Term		0.397
Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	10.9 µg/m³	0.201
Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		92.8 μg/kg bw/day	0.013
Combined routes, Systemic effects, L	ong Term		0.214
SECTION 4:	4.4 Guidance t the ES	o DU to evaluate whether he works i	nside the boundaries set by
Health/ Environment			
met or the downstream user can dem measures are adequate. For human h below the DNEL (given that the proce If measured data are not available, th (www.ebrc.de/mease.html) to estimat they limit the PEC below the PNEC for	onstrate on his or nealth, this has to esses and activitie e DU may make e the associated or the respective e ing tool such as the	ither the proposed risk management me win that his operational conditions and i be done by showing that they limit the es in question are covered by the PROC use of an appropriate scaling tool such exposure. For the environment, this has environmental compartment. If measure he DU-Scaling tool (http://www.arche-co	mplemented risk management inhalation exposure to a level Cs listed above) as given below. as MEASE s to be done by showing that ed data are not available, the DU

5. Exposure Scenario 5: Use at industrial sites; Use of cobalt in the manufacture of cobalt carboxylates and resinates (intermediate use)

SECTION 1:	5.1 Title of exposure scenario		
	Use at industrial sites; Use of cobalt in the manufacture of cobalt carboxylates and resinates (intermediate use)		
Sectors of use [SU]			
Manufacture of bulk, large scale c	hemicals (including petroleum products)	SU 8	
Manufacture of fine chemicals		SU 9	
Contributing scenario controllir	ng environmental exposure		
Use of cobalt in the manufacture of (intermediate use)	of cobalt carboxylates and resinates	ERC 6a	
Contributing scenario controllin	ng worker exposure		
Raw material handling		PROC 26, PROC 8b	
Reaction		PROC 4, PROC 3, PROC 1	
Packaging of powders		PROC 26	
Filling of liquids		PROC 9, PROC 8b	
Packaging of low and/or medium of	dusty materials	PROC 26, PROC 8b	
Cleaning & Maintenance	·	PROC 28	
SECTION 2:	5.2 Operational conditions and risk mana	igement measures	
2.1	Contributing scenario controlling environmental exposure		
2.1.1	Use of cobalt in the manufacture of cobalt carboxylates and resinates (intermediate use) (ERC 6a)		
Frequency and duration of use			
Daily amount per site <= 1.8 tonne	es/day		
Annual amount per site <= 250 tor	Annual amount per site <= 250 tonnes/year		
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil			
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 municipal sewage treatment plant			
Provide onsite wastewater treatme			
Assumed domestic sewage treatm			
	ed to external treatment of waste for dispos	al	
	containers according to local regulations.		
	ons affecting environmental exposure		
No discharge to marine water assumed.			
Local freshwater dilution factor 10.			
2.2	Contributing scenario controlling worker exposure		
2.2.1	Raw material handling (PROC 26, PROC 8t)	
Product characteristics			
Physical form of product: Solid, medium dustiness			
Additional physical form of produc	t: Aqueous solution		
Covers percentage substance in t	he product up to 100 %.		

Frequency and duration of use				
Covers daily exposures up to 8 ho	Covers daily exposures up to 8 hours.			
Technical conditions and measures to control dispersion from source towards the worker				
Covers use at ambient temperatur	res.			
Use of an integrated local exhaust	t ventilation is required. Inhalation - minimum efficiency of 90 %			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
Wear respiratory protection provid specification, refer to section 8 of 1	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.			
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.2	Reaction (PROC 4, PROC 3, PROC 1)			
Product characteristics				
Physical form of product: Aqueous	solution			
Covers percentage substance in the				
Maximum emission potential: Very				
Frequency and duration of use				
Covers daily exposures up to 8 ho	NURS .			
	ures to control dispersion from source towards the worker			
Assumes process temperature up				
Use in closed process.	10 100 °C.			
	ed to personal protection, hygiene and health evaluation			
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. 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 suitable gloves tested to EN	Wear suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.			
2.2.3	Packaging of powders (PROC 26)			
Product characteristics				
Physical form of product: Solid, high	gh dustiness			
Covers percentage substance in the				
Frequency and duration of use				
Covers daily exposures up to 8 hours.				
	ures to control dispersion from source towards the worker			
Covers use at ambient temperatures.				
Semi-automated task.				
Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 %				
Semi-closed system.				
Conditions and measures related to personal protection, hygiene and health evaluation				
Wear respiratory protection providing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.				
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.				
2.2.4	Filling of liquids (PROC 9, PROC 8b)			
Product characteristics				
Physical form of product: Aqueous	solution			

Maximum emission potential: Very low Covers percentage substance in the product up to 100 %. Frequency and duration of use Covers daily exposures up to 8 hours. Technical conditions and measures to control dispersion from source towards the worker Covers use at ambient temperatures. Conditions and measures related to personal protection, hygiene and health evaluation 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. 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. 2.2.5 Packaging of low and/or medium dusty materials (PROC 26, PROC 8b) **Product characteristics** Physical form of product: Solid, Pellets / Pastille Covers percentage substance in the product up to 100 %. Maximum emission potential: Medium Frequency and duration of use Covers daily exposures up to 8 hours. Technical conditions and measures to control dispersion from source towards the worker Semi-automated task. Covers use at ambient temperatures. Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of 90 % Conditions and measures related to personal protection, hygiene and health evaluation Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS. Cleaning & Maintenance (PROC 28) 2.2.6 **Product characteristics** Physical form of product: Solid, high dustiness Frequency and duration of use Covers daily exposures up to 8 hours. Technical conditions and measures to control dispersion from source towards the worker Process is carried out at ambient pressure. Covers use at ambient temperatures. 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 respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.

Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.

SECTION 3:	5.3 Exposure	estimation				
3.1 Environment						
Release estimation method: Estimate	ed release factor					
	Release rate					
	Wa	ater	Air		Soil	
Use of cobalt in the manufacture of cobalt carboxylates and resinates (intermediate use)	0.061	kg/day	0.013 kg/da	у	0 kg/day	
Use of cobalt in the manufacture of c	obalt carboxylate	es and resinates (intermediate use)			
Protection target		Exposure concentration (PEC, Predicted Exposure Concentration)		Risk ch	Risk characterisation ratio (RCR)	
Fresh water			3E-4 mg/l SES 2.1.2)		0.149	
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method metals)		0.121	
Sewage Treatment Plant			3E-4 mg/l SES 2.1.2)		< 0.01	
Agricultural soil		0.265 mg/kg dw (EUSES 2.1.2)		0.024		
Man via Environment - Inhalation (Systemic effects)		1.48E-6 mg/m³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Inhalation (Local effects)		1.48E-6 mg/m ³ < 0.01 (EUSES 2.1.2)		< 0.01		
Man via Environment - Oral			3.22E-4 mg/kg bw/day 0.036 (Measured data)		0.036	
Man via Environment - Combined routes					0.036	
3.2 Worker						
Raw material handling (PROC 26, PI	ROC 8b)					
Exposure route		Exposure estimation		Risk cl (RCR)	naracterisation ratio	
Inhalation, Systemic effects, Long Te	erm	17.2 µg/m³		0.318		
Inhalation, Local effects, Long Term		17.2 µg/m³		0.43		
Dermal, Systemic effects, Long Term	1	92.8 µg/kg bw/day		0.013		
Combined routes, Systemic effects, Long Term				0.331		
Reaction (PROC 4, PROC 3, PROC	1)	_		T		
Exposure route		Exposure est	mation	Risk cl (RCR)	naracterisation ratio	
Inhalation, Systemic effects, Long Term		6 μg/m³ 0.111				
Inhalation, Local effects, Long Term		6 µg/m³	g/m³ 0.15			
Dermal, Systemic effects, Long Term		1 µg/kg bw/day	ay < 0.01			
Combined routes, Systemic effects, Long Term				0.111		

Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	23.4 µg/m³	0.433
Inhalation, Local effects, Long Term		23.4 µg/m³	0.585
Dermal, Systemic effects, Long Term		3.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.433
Filling of liquids (PROC 9, PROC 8b)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	10 µg/m³	0.185
Inhalation, Local effects, Long Term		10 µg/m³	0.25
Dermal, Systemic effects, Long Term		1 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.185
Packaging of low and/or medium dust	y materials (P	ROC 26, PROC 8b)	
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	14.9 µg/m³	0.275
Inhalation, Local effects, Long Term		14.9 µg/m³	0.372
Dermal, Systemic effects, Long Term		3.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			0.276
Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	10.9 µg/m³	0.201
Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, L	ong Term		0.214
SECTION 4:	5.4 Guidanc the ES	e to DU to evaluate whether he w	orks inside the boundaries set by
Health/ Environment			
met or the downstream user can dem measures are adequate. For human h below the DNEL (given that the proce If measured data are not available, th (www.ebrc.de/mease.html) to estimat	onstrate on his lealth, this has sses and activ e DU may make the associate	s own that his operational conditions to be done by showing that they lin ities in question are covered by the se use of an appropriate scaling too ed exposure. For the environment, t	nit the inhalation exposure to a level PROCs listed above) as given below. I such as MEASE

they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

6. Exposure Scenario 6: Use at industrial sites; Industrial use of cobalt containing catalysts

SECTION 1:	6.1 Title of exposure scenario	
	Use at industrial sites; Industrial use of cobalt containing catalysts	
Chemical product category [PC]		
Other PC 0		
Products such as ph-regulators, flo	occulants, precipitants, neutralization agents	PC 20
Laboratory chemicals		PC 21
Sectors of use [SU]		
	hemicals (including petroleum products)	SU 8
Manufacture of fine chemicals		SU 9
Contributing scenario controllin	g environmental exposure	1
Industrial use of cobalt containing	catalysts	ERC 4
Industrial use of cobalt containing	catalysts	ERC 6b
Contributing scenario controllin	g worker exposure	
Industrial use of cobalt containing	catalysts in closed conditions	PROC 1, PROC 2
Industrial use of cobalt containing	catalysts in semi-closed conditions	PROC 3, PROC 9, PROC 4, PROC 8b
Cleaning & Maintenance		PROC 28
SECTION 2:	6.2 Operational conditions and risk management measures	
2.1	Contributing scenario controlling environmental exposure	
2.1.1	Industrial use of cobalt containing catalysts (ERC 4)	
Frequency and duration of use		
Daily amount per site <= 75 tonnes/day		
Annual amount per site <= 75 tonr	nes/year	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		
Fugitive dust emissions (during loading/unloading) should be minimized by use of LEV and vacuum extraction on equipment where possible. To prevent the contamination of air remove spillages immediately and dispose of waste safely.		
One or more of the following measures should be present to reduce emissions to water: Where possible, loading/unloading activities should be sited on impermeable surfaces and away from surface water drains. Where it is impractical or impossible to handle catalysts away from surface drains, appropriate protective equipment, such as drain covers and flexible dams, should be used. Appropriate containment systems, including bunding where necessary, should be in place to ensure that spills can be properly contained. Drainage from bunded or hard surfaced areas shall be diverted for collection and safe disposal.		
Conditions and measures relate	d to external treatment of waste for disposa	
Dispose of waste product or used	containers according to local regulations.	
2.1.1	Industrial use of cobalt containing catalysts (E	RC 6b)
Frequency and duration of use		
Daily amount per site <= 75 tonnes	s/day	
Annual amount per site <= 75 tonr	nes/year	
Technical onsite conditions and	measures to reduce or limit discharges, air	emissions and releases to soil
Fugitive dust emissions (during loading/unloading) should be minimized by use of LEV and vacuum extraction on equipment where possible. To prevent the contamination of air remove spillages immediately and dispose of waste safely.		
One or more of the following measures should be present to reduce emissions to water: Where possible, loading/unloading activities should be sited on impermeable surfaces and away from surface water drains. Where it is impractical or impossible to handle catalysts away from surface drains, appropriate protective equipment, such as drain covers and flexible dams, should be used. Appropriate containment systems, including bunding where necessary, should be in place to ensure that spills can be properly contained. Drainage from bunded or hard surfaced areas shall be diverted for collection and safe disposal.		

Conditions and measures related	to external treatment of waste for	or disposal	
Dispose of waste product or used co	ontainers according to local regulat	ions.	
2.2	ontributing scenario controlling worker exposure		
2.2.1	ndustrial use of cobalt containing catalysts in closed conditions (PROC 1, PROC 2)		
Product characteristics			
Physical form of product: Solid, Pow	vder / Dust, Shaped catalysts		
Covers percentage substance in the	e product up to 100 %.		
Maximum emission potential: High			
Frequency and duration of use			
Covers daily exposures up to 8 hou	rs.		
Technical conditions and measur	res to control dispersion from so	urce towards the worker	
Assumes process temperature up to	o 160 °C.		
Semi-closed system.			
Use of an integrated local exhaust v	ventilation is required. Inhalation - m	inimum efficiency of 90 %	
Conditions and measures related	to personal protection, hygiene	and health evaluation	
Wear respiratory protection providin specification, refer to section 8 of th		actor of 20 (a minimum efficiency	v of 95%). For further
Use suitable eye protection. For furt	ther specification, refer to section 8	of the SDS.	
Wear suitable gloves tested to EN3	74. For further specification, refer to	section 8 of the SDS.	
Wear protective suit conforming to E	EN 13982 in cases where direct cor	tact with the substance cannot b	e avoided.
2.2.2	Cleaning & Maintenance (PROC 28	3)	
Product characteristics			
Physical form of product: Various			
Covers percentage substance in the	e product up to 100 %.		
Maximum emission potential: Low			
Frequency and duration of use			
Typical duration per shift = 120 min			
Typical number of shifts per year =	48 Shifts/year		
Technical conditions and measur	es to control dispersion from so	urce towards the worker	
Covers use at ambient temperature	S.		
Process is carried out at ambient pr			
Conditions and measures related	to personal protection, hygiene	and health evaluation	
Wear respiratory protection providin specification, refer to section 8 of th		actor of 10 (a minimum efficiency	v of 90%). For further
Use suitable eye protection. For furt	ther specification, refer to section 8	of the SDS.	
Wear suitable gloves tested to EN3	74. For further specification, refer to	section 8 of the SDS.	
Wear protective suit conforming to E			be avoided.
SECTION 3:	6.3 Exposure estimation		
3.1 Environment			
Release estimation method: Estima	tod rologgo factor		
Norvase estimation method. Estima	וכע ובובמסב ומטוטו		
		Release rate	1
	Water	Air	Soil
Industrial use of cobalt containing	0 kg/day	0 kg/day	0 kg/day
catalysts			

catalysts			
Industrial use of cobalt containing	g catalysts in closed	d conditions (PROC 1, PROC 2)	
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Lor	ıg Term	0.8 µg/m³	0.015
Inhalation, Local effects, Long T	erm	0.8 µg/m³	0.02
Dermal, Systemic effects, Long	īerm	0.4 μg/kg bw/day	< 0.01
Combined routes, Systemic effect	cts, Long Term		0.015
Industrial use of cobalt containing	g catalysts in semi-	closed conditions (PROC 3, PROC	9, PROC 4, PROC 8b)
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Lor	ıg Term	0.8 µg/m³	0.015
Inhalation, Local effects, Long T	erm	0.8 µg/m³	0.02
Dermal, Systemic effects, Long Term		1.3 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			0.015
Cleaning & Maintenance (PROC	28)		
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Lor	ıg Term	2.4 µg/m³	0.044
Inhalation, Local effects, Long T	erm	2.4 µg/m³	0.06
Dermal, Systemic effects, Long	ērm	23.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			0.048
SECTION 4: 6.4 Guidance to the ES		e to DU to evaluate whether he w	orks inside the boundaries set by
Health/ Environment			
Health/ Environment The DU works inside the bounda met or the downstream user can measures are adequate. For hun	ries set by the ES in demonstrate on his nan health, this has	f either the proposed risk managem s own that his operational conditions s to be done by showing that they lin rities in question are covered by the	ent measures a and implemen nit the inhalatior

measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

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

SECTION 1:	7.1 Title of exposure scenario		
	Use at industrial sites; Production and industrial use of cobalt containing alloys, steels and tools		
Chemical product category [PC	1		
Base metals and alloys		PC 7	
Metal surface treatment products		PC 14	
Sectors of use [SU]		-	
Manufacture of basic metals, inclu	uding alloys	SU 14	
Manufacture of fabricated metal p	roducts, except machinery and equipment	SU 15	
Contributing scenario controllin	ng environmental exposure		
Production and industrial use of co STP Discharge	obalt containing alloys, steels and tools ES 1	ERC 5	
Production and industrial use of conduction and industrial use of conduction descent and the second	obalt containing alloys, steels and tools ES 2	ERC 5	
Production and industrial use of control Marine Discharge	obalt containing alloys, steels and tools ES 3	ERC 5	
Contributing scenario controlling	ng worker exposure		
Handling of massive materials		PROC 21	
Sintering, melting and casting		PROC 23, PROC 22	
Finishing of massive objects		PROC 25, PROC 14, PROC 24, PROC 21, PROC 13	
Handling of powders		PROC 26	
Powder production		PROC 27a, PROC 27b, PROC 1	
Further processing		PROC 24, PROC 1	
Thermal spraying-fully automated		PROC 1, PROC 7	
Thermal spraying- NOT fully auto	mated	PROC 7	
Cleaning & Maintenance		PROC 28	
Subsequent service life exposu	re scenario(s)		
Service life (worker at industrial site); Service life of cobalt containing alloys, steels and tools in industrial settings		ES10	
Service life (worker at industrial site); Welding in industrial settings		ES11	
Service life (Professional worker); Welding in professional settings		ES12	
Service life (Professional worker); Service life of cobalt-containing tools in professional settings		ES13	
Service life (Professional worker); Service life of dental alloys containing cobalt in professional settings		ES14	
Service life (Consumers); Service life of dental alloys		ES15	
Service life (Consumers); Service life of diamond tools and other cobalt- containing tools other than hard metal used by consumers		ES16	

SECTION 2:	7.2 Operational conditions and risk management measures		
2.1	Contributing scenario controlling environmental exposure		
2.1.1	Production and industrial use of cobalt containing alloys, steels and tools ES 1 STP Discharge (ERC 5)		
Frequency and duration of use			
Daily amount per site <= 2.232 tor	nnes/day		
Annual amount per site <= 750 tor	nnes/year		
Emission days >= 336 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.		
Conditions and measures relate	ed to municipal sewage treatment plant		
Municipal sewage treatment plant	is assumed.		
Assumed domestic sewage treatment	nent plant flow >= 2E3 m³/day		
Conditions and measures relate	ed to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
No discharge to marine water ass	umed.		
Local freshwater dilution factor 10	0.		
2.1.2	Production and industrial use of cobalt containing alloys, steels and tools ES 2 Direct Discharge (ERC 5)		
Frequency and duration of use			
Daily amount per site <= 2.232 tonnes/day			
Annual amount per site <= 750 tonnes/year			
Emission days >= 336 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil		
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 for disposal			
Dispose of waste product or used containers according to local regulations.			
Other given operational condition	ons affecting environmental exposure		
Assumed effluent discharge flow f	rom site >= 2E3 m ³ /day		
No discharge to marine water ass	umed.		
Local freshwater dilution factor 150.			
2.1.3	Production and industrial use of cobalt containing alloys, steels and tools ES 3 Marine Discharge (ERC 5)		
Frequency and duration of use			
Daily amount per site <= 2.232 tor	nnes/day		
Annual amount per site <= 750 tonnes/year			
Emission days >= 336 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	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 relate	d to external treatment of waste for disposal	
Dispose of waste product or used	containers according to local regulations.	
Other given operational condition	ons affecting environmental exposure	
No discharge to freshwater assum	ed.	
Assumed effluent discharge flow fr	rom site >= 2E3 m³/day	
Local freshwater dilution factor 100).	
2.2	Contributing scenario controlling worker exposure	
2.2.1	Handling of massive materials (PROC 21)	
Product characteristics		
	cobalt and massive scrap (e.g. ingots, cathodes, rounds)	
Covers percentage substance in the		
Maximum emission potential: Very		
Frequency and duration of use	IUW	
Covers daily exposures up to 8 ho		
	ares to control dispersion from source towards the worker	
Covers use at ambient temperatur		
	d to personal protection, hygiene and health evaluation	
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ice can be excluded. For further specification, refer to section 8 of the SDS.	
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.	
2.2.2	Sintering, melting and casting (PROC 23, PROC 22)	
Product characteristics		
Physical form of product: Molten		
Additional physical form of product: Massive object (e.g., ingots, cathodes)		
Maximum emission potential: Med	ium (temperature based)	
Covers percentage substance in the	ne product up to 100 %.	
Technical conditions and measu	ires to control dispersion from source towards the worker	
Assumes process temperature up	to 1.5E3 °C.	
local exhaust ventilation. Inhalation - minimum efficiency of 78 %		
Ensure enclosure of furnace operation	ntion.	
Conditions and measures relate	d to personal protection, hygiene and health evaluation	
1 11 1	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ce can be excluded. For further specification, refer to section 8 of the SDS.	
	rther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.		
2.2.3	Finishing of massive objects (PROC 25, PROC 14, PROC 24, PROC 21, PROC 13)	
Product characteristics		
Physical form of product: Massive object		
Maximum emission potential: Very low		
Covers percentage substance in the product up to 90 %.		
Frequency and duration of use		
Covers daily exposures up to 8 hours.		
Technical conditions and measures to control dispersion from source towards the worker		
Covers use at ambient temperatur		

Conditions and measures relate	Conditions and measures related to personal protection, hygiene and health evaluation		
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.			
Use suitable eye protection. For further specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.		
2.2.4	Handling of powders (PROC 26)		
Product characteristics			
Physical form of product: Solid, P	owder / Dust (scrap steel and alloy powders and solids)		
Maximum emission potential: Med	dium		
Covers percentage substance in t	the product up to 100 %.		
Frequency and duration of use			
Covers daily exposures up to 8 ho	burs.		
Technical conditions and meas	ures to control dispersion from source towards the worker		
Covers use at ambient temperatu	res.		
local exhaust ventilation. Inhalatic	on - minimum efficiency of 78 %		
Conditions and measures relate	ed to personal protection, hygiene and health evaluation		
Wear respiratory protection provid specification, refer to section 8 of	ding a minimum assigned protection factor of 40 (a minimum efficiency of 97.5%). For further the SDS.		
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.		
Wear protective suit conforming to	DEN 13982 in cases where direct contact with the substance cannot be avoided.		
2.2.5	Powder production (PROC 27a, PROC 27b, PROC 1)		
Product characteristics			
Physical form of product: Molten			
Maximum emission potential: Low			
Covers percentage substance in the product up to 100 %.			
Frequency and duration of use			
Covers daily exposures up to 8 ho	Durs.		
Technical conditions and meas	ures to control dispersion from source towards the worker		
Assumes process temperature up	o to 1.5E3 °C.		
Use in closed process.			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation		
	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nce can be excluded. For further specification, refer to section 8 of the SDS.		
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.		
2.2.6	Further processing (PROC 24, PROC 1)		
Product characteristics			
Physical form of product: Massive	e object (cobalt in alloy)		
Maximum emission potential: Low (abrasion based)			
Covers percentage substance in the product up to 100 %.			
Frequency and duration of use			
Covers daily exposures up to 8 hours.			
Technical conditions and measures to control dispersion from source towards the worker			
Assumes process temperature up to 1.2E3 °C.			
Process pressure may exceed ambient pressure.			

Use in closed process.					
Conditions and measures relate	ed to personal protection, hygiene and health evaluation				
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.				
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.				
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.				
2.2.7	Thermal spraying – fully automated (PROC 1, PROC 7)				
Product characteristics					
Physical form of product: Solid, Po	owder / Dust				
Maximum emission potential: Hig	h (temperature based)				
Covers percentage substance in t	he product up to 100 %.				
Frequency and duration of use					
Covers daily exposures up to 8 ho	burs.				
Technical conditions and meas	ures to control dispersion from source towards the worker				
Limit the process temperature dur	ing flame spraying to 3.1E3 °C.				
Limit the process temperature dur	ing plasma spraying to 3E4 °C.				
High pressure applied during plas	ma and high-velocity flame spraying.				
Ensure complete segregation.					
Automated task.					
Use in closed process.					
Conditions and measures relate	ed to personal protection, hygiene and health evaluation				
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.				
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.				
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.				
2.2.8	Thermal spraying – NOT fully automated (PROC 7)				
Product characteristics					
Physical form of product: Solid, Powder / Dust					
Maximum emission potential: High (temperature based)					
Frequency and duration of use					
Covers daily exposures up to 8 hours.					
Technical conditions and meas	ures to control dispersion from source towards the worker				
Limit the process temperature dur	ing flame spraying to 3.1E3 °C.				
Limit the process temperature dur	ing plasma spraying to 3E4 °C.				
High pressure applied during plas	ma and high-velocity flame spraying.				
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %				
Conditions and measures related to personal protection, hygiene and health evaluation					
Wear respiratory protection provic specification, refer to section 8 of	ling a minimum assigned protection factor of 20 (a minimum efficiency of 95%). For further the SDS.				
Use suitable eye protection. For further specification, refer to section 8 of the SDS.					
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.				
2.2.9	Cleaning & Maintenance (PROC 28)				
Product characteristics					
Physical form of product: Solid, high dustiness					
Frequency and duration of use	-				
Covers daily exposures up to 8 ho	purs.				

Technical conditions and measure	s to control dis	persion from so	urce towards the wor	ker	
Process is carried out at ambient pre-		-			
Covers use at ambient temperatures.	1				
Maintenance and repair work only at operation.	facilities which a	re not in operatio	n. Minor cleaning tasks	may be co	onducted under
Conditions and measures related t	o personal prot	ection, hygiene	and health evaluatior	ı	
Wear respiratory protection providing specification, refer to section 8 of the		gned protection f	actor of 10 (a minimum	efficiency	of 90%). For further
Use suitable eye protection. For furth	er specification,	refer to section 8	of the SDS.		
Wear suitable gloves tested to EN374	4. For further spe	ecification, refer to	section 8 of the SDS.		
Wear protective suit conforming to El	N 13982 in cases	s where direct cor	ntact with the substanc	e cannot be	e avoided.
SECTION 3:	7.3 Exposure	estimation			
3.1 Environment	I				
Release estimation method: Estimate	ed release factor				
			Release rate		
	Wa	ater	Air		Soil
Production and industrial use of cobalt containing alloys, steels and tools ES 1 STP Discharge	0.056 kg/day		0.942 kg/da	y	0 kg/day
Production and industrial use of cobalt containing alloys, steels and tools ES 2 Direct Discharge	0.056 kg/day		0.942 kg/da	ý	0 kg/day
Production and industrial use of cobalt containing alloys, steels and tools ES 3 Marine Discharge	0.056 kg/day		0.942 kg/da	ý	0 kg/day
Production and industrial use of coba	It containing allo	ys, steels and too	ls ES 1 STP Discharg	э	
Protection target		(PEC, Pred	concentration licted Exposure entration)	Risk ch	aracterisation ratio (RCR)
Fresh water		2.05E-4 mg/l (EUSES 2.1.2)		0.194	
Sedimentation (Fresh water)		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 (Systemic effects)		2.41E-4 mg/m ³ (EUSES 2.1.2)		0.03	
Man via Environment - Inhalation (Local effects)		2.41E-4 mg/m ³ (EUSES 2.1.2)		0.038	
Man via Environment - Oral			mg/kg bw/day sured data)	0.036	
Man via Environment - Combined rou	tes				0.066
Production and industrial use of coba	It containing allo	ys, steels and too	ols ES 2 Direct Dischar	ge	
Protection target			concentration icted Exposure	Risk ch	aracterisation ratio (RCR)

 Protection target
 Exposure concentration (PEC, Predicted Exposure Concentration)
 Risk characterisation ratio (RCR)

 Fresh water
 2.17E-4 mg/l
 0.205

	(EUSES 2.1.2)	
Sedimentation (Fresh water)	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 (Systemic effects)	2.41E-4 mg/m³ (EUSES 2.1.2)	0.03
Man via Environment - Inhalation (Local effects)	2.41E-4 mg/m³ (EUSES 2.1.2)	0.038
Man via Environment - Oral	3.24E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.066
Production and industrial use of cobalt containing allo	ys, steels and tools ES 3 Marine Discha	irge
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	0.135 µg/l (Clocal calculation with Kp susp. matter marine)	0.057
Sedimentation (Marine water)	23.47 mg/kg dw (PEC sediment calculation method for metals)	0.336
Agricultural soil	0.244 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	2.41E-4 mg/m³ (EUSES 2.1.2)	0.03
Man via Environment - Inhalation (Local effects)	2.41E-4 mg/m ³ (EUSES 2.1.2)	0.038
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.065
3.2 Worker		
Handling of massive materials (PROC 21)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term	8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term	62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.168
Sintering, melting and casting (PROC 23, PROC 22)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	1.4 µg/m³	0.026
Inhalation, Local effects, Long Term	1.4 μg/m³	0.035
Dermal, Systemic effects, Long Term	1.3 µg/kg bw/day	< 0.01

Combined routes, Systemic effects, Long Term		0.026
		0.020
Finishing of massive objects (PROC 25, PROC 14, P	- -	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	23.6 µg/m³	0.436
Inhalation, Local effects, Long Term	23.6 µg/m³	0.59
Dermal, Systemic effects, Long Term	106.9 µg/kg bw/day	0.015
Combined routes, Systemic effects, Long Term		0.451
Handling of powders (PROC 26)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	27.3 µg/m³	0.505
Inhalation, Local effects, Long Term	27.3 µg/m³	0.682
Dermal, Systemic effects, Long Term	92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term		0.517
Powder production (PROC 27a, PROC 27b, PROC 1)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10 µg/m3 (MEASE, PROC 1) *	0.185
Inhalation, Local effects, Long Term	10 µg/m3 (MEASE, PROC 1) *	0.25
Dermal, Systemic effects, Long Term	0.4 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.185
*Due to the containment of the process, PROC 1 was	s used in MEASE for the exposure ass	essment.
Further processing (PROC 24, PROC 1)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10 µg/m3 (MEASE, PROC 1) *	0.185
Inhalation, Local effects, Long Term	10 µg/m3 (MEASE, PROC 1) *	0.25
Dermal, Systemic effects, Long Term	0.4 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.185
*Due to the containment of the process, PROC 1 was	s used in MEASE for the exposure ass	essment.
Thermal spraying – fully automated (PROC 1, PROC	; 7)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10 µg/m3 (MEASE, PROC 1) *	0.185

Inhalation, Local effects, Long Term		10 µg/m³ (MEASE, PROC 1) *	0.25
Dermal, Systemic effects, Long Term		0.4 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.185
*Due to the containment of the proces	s, PROC 1 was u	used in MEASE for the exposure assess	sment.
Thermal spraying – NOT fully automa	ted (PROC 7)		
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	19.5 µg/m³	0.36
Inhalation, Local effects, Long Term		19.5 µg/m³	0.487
Dermal, Systemic effects, Long Term		1.3 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			0.361
Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		10.9 µg/m³	0.201
Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, L	ong Term		0.214
SECTION 4:	7.4 Guidance t the ES	o DU to evaluate whether he works ir	nside the boundaries set by
Health/ Environment			
met or the downstream user can dem measures are adequate. For human h below the DNEL (given that the proce If measured data are not available, th (www.ebrc.de/mease.html) to estimat they limit the PEC below the PNEC for	onstrate on his or lealth, this has to sses and activitie e DU may make e the associated r the respective e ng tool such as th	ither the proposed risk management me wn that his operational conditions and ir be done by showing that they limit the i es in question are covered by the PROC use of an appropriate scaling tool such exposure. For the environment, this has environmental compartment. If measure he DU-Scaling tool (http://www.arche-co	nplemented risk management nhalation exposure to a level s listed above) as given below. as MEASE s to be done by showing that d data are not available, the DU

8. Exposure Scenario 8: Use at industrial sites; Industrial use of cobalt in the production of diamond tools

SECTION 1:	8.1 Title of exposure scenario				
	Use at industrial sites; Industrial use of cobalt in the production of diamond tools				
Chemical product category [PC]					
Base metals and alloys		PC 7			
Metal surface treatment products PC 14					
Sectors of use [SU]					
Manufacture of fabricated metal p	roducts, except machinery and equipment	SU 15			
Contributing scenario controllin	g environmental exposure				
Industrial use of cobalt in the prod	uction of diamond tools ES 1 STP Discharge	ERC 5			
Industrial use of cobalt in the prod	uction of diamond tools ES 2 Direct Discharge	ERC 5			
Industrial use of cobalt in the prod Discharge	uction of diamond tools ES 3 Marine	ERC 5			
Contributing scenario controllin	ng worker exposure	I			
Raw material handling		PROC 26, PROC 9, PROC 8b			
Wet process	PROC 5, PROC 4				
Hot (metallurgical) processes		PROC 25, PROC 14, PROC 22			
Mechanical finishing processes					
Packaging PROC 21					
Cleaning & Maintenance PROC 28					
Subsequent service life exposu	re scenario(s)				
Service life (Professional worker); professional settings	Service life of cobalt-containing tools in	ES13			
Service life (Consumers); Service containing tools other than hard m	life of diamond tools and other cobalt- etal used by consumers	ES16			
SECTION 2:	8.2 Operational conditions and risk manage	ement measures			
2.1	Contributing scenario controlling environm	ental exposure			
2.1.1	Industrial use of cobalt in the production of diamond tools ES 1 STP Discharge (ERC 5)				
Frequency and duration of use					
Daily amount per site <= 0.216 tor	nnes/day				
Annual amount per site <= 51 tonr	nes/year				
Emission days >= 236 days/year					
Technical onsite conditions and	I measures to reduce or limit discharges, air	emissions and releases to soil			
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag	ilter or ceramic/metal mesh filter or wet			
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange.					
	d to municipal sewage treatment plant				
Municipal sewage treatment plant					
Assumed domestic sewage treatment plant flow >= 2E3 m ³ /day					
Conditions and measures relate	d to external treatment of waste for disposal				
Dispose of waste product or used containers according to local regulations.					
Other given operational conditions affecting environmental exposure					
No discharge to marine water asse	umed.				

Local freshwater dilution factor 100).
2.1.2	Industrial use of cobalt in the production of diamond tools ES 2 Direct Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 0.216 ton	ines/day
Annual amount per site <= 51 tonr	ies/year
Emission days >= 236 days/year	
	measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sediment	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow fr	om site >= 2E3 m³/day
No discharge to marine water assu	umed.
Local freshwater dilution factor 200).
2.1.3	Industrial use of cobalt in the production of diamond tools ES 3 Marine Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 0.216 ton	ines/day
Annual amount per site <= 51 tonr	ies/year
Emission days >= 236 days/year	
Technical onsite conditions and	measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sediment	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow fr	om site >= 2E3 m³/day
No discharge to freshwater assum	ed.
Local marine water dilution factor	100.
2.2	Contributing scenario controlling worker exposure
2.2.1	Raw material handling (PROC 26, PROC 9, PROC 8b)
Product characteristics	
Physical form of product: Solid, me	edium dustiness
Additional physical form of product	t: Solid, Granulate
Covers percentage substance in th	ne product up to 100 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and measu	ures to control dispersion from source towards the worker
Covers use at ambient temperatur	 es.
Semi-automated task.	
Use of an integrated local exhaust	ventilation is required. Inhalation - minimum efficiency of 90 %
Conditions and measures relate	d to personal protection, hygiene and health evaluation

specification, refer to section 8 of the SDS.					
Use suitable eye protection. For further specification, refer to section 8 of the SDS.					
	374. For further specification, refer to section 8 of the SDS.				
_	EN 13982 in cases where direct contact with the substance cannot be avoided.				
2.2.2	Wet process (PROC 5, PROC 4)				
Product characteristics					
Physical form of product: Aqueous	solution				
Maximum emission potential: Very					
Covers percentage substance in the					
Frequency and duration of use					
Covers daily exposures up to 8 ho	urs.				
Technical conditions and measu	ures to control dispersion from source towards the worker				
Covers use at ambient temperatur	es.				
local exhaust ventilation. Inhalation	n - minimum efficiency of 78 %				
Conditions and measures relate	d to personal protection, hygiene and health evaluation				
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.				
Use suitable eye protection. For fu	Irther specification, refer to section 8 of the SDS.				
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.				
2.2.3	Hot (metallurgical) processes (PROC 25, PROC 14, PROC 22)				
Product characteristics					
Physical form of product: Massive	object				
Maximum emission potential: Low					
Covers percentage substance in the product up to 100 %.					
Frequency and duration of use					
Covers daily exposures up to 8 ho	urs.				
Technical conditions and measu	ures to control dispersion from source towards the worker				
Limit the process temperature to 1	.2E3 °C.				
Limit the process pressure to 1.5E					
Use of an integrated local exhaust	ventilation is required. Inhalation - minimum efficiency of 90 %				
Use in closed process.					
Conditions and measures relate	d to personal protection, hygiene and health evaluation				
Wear respiratory protection provid specification, refer to section 8 of t	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.				
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.					
2.2.4	Mechanical finishing processes (PROC 24, PROC 21)				
Product characteristics					
Physical form of product: Bound in	article.				
Maximum emission potential: Med	ium (abrasion based)				
Covers percentage substance in the product up to 100 %.					
Frequency and duration of use					
Covers daily exposures up to 8 hours.					
Technical conditions and measures to control dispersion from source towards the worker					
Covers use at ambient temperatures.					

Conditions and measures related			
Near respiratory protection providin nhalation exposure to the substance			
Use suitable eye protection. For furt	her specification, refer to section 8	of the SDS.	
Wear suitable gloves tested to EN37	74. For further specification, refer to	section 8 of the SDS.	
2.2.5 F	Packaging (PROC 21)		
Product characteristics			
Physical form of product: Bound in a	rticle.		
Maximum emission potential: Very lo	w		
Covers percentage substance in the	product up to 100 %.		
Frequency and duration of use			
Covers daily exposures up to 8 hour	S.		
Technical conditions and measur	es to control dispersion from sou	Irce towards the worker	
Covers use at ambient temperatures	S.		
Conditions and measures related	to personal protection, hygiene a	and health evaluation	
Wear respiratory protection providin inhalation exposure to the substance			
Use suitable eye protection. For furt	her specification, refer to section 8	of the SDS.	
Wear suitable gloves tested to EN37	4. For further specification, refer to	section 8 of the SDS.	
2.2.6	Cleaning & Maintenance (PROC 28))	
Product characteristics			
Physical form of product: Solid, high	dustiness		
Frequency and duration of use			
Covers daily exposures up to 8 hour	S.		
Technical conditions and measur	es to control dispersion from sou	Irce towards the worker	
Process is carried out at ambient pre	essure.		
Covers use at ambient temperatures	S.		
Maintenance and repair work only a operation.	t facilities which are not in operation	n. Minor cleaning tasks may be o	conducted under
Conditions and measures related	to personal protection, hygiene a	and health evaluation	
Wear respiratory protection providin specification, refer to section 8 of the		actor of 10 (a minimum efficiency	/ of 90%). For further
Use suitable eye protection. For furt	her specification, refer to section 8	of the SDS.	
Wear suitable gloves tested to EN37	4. For further specification, refer to	section 8 of the SDS.	
Wear protective suit conforming to E	N 13982 in cases where direct con	tact with the substance cannot b	be avoided.
SECTION 3:	8.3 Exposure estimation		
3.1 Environment			
Release estimation method: Estimat	ed release factor		
		Poloaso rato	
		Release rate	
	Water	Air	Soil
Industrial use of cobalt in the production of diamond tools ES 1 STP Discharge	0.043 kg/day	6.48E-3 kg/day	0 kg/day
Industrial use of cobalt in the production of diamond tools ES 2 Direct Discharge	0.043 kg/day	6.48E-3 kg/day	0 kg/day

dustrial use of cobalt in the 0.043 k oduction of diamond tools ES 3 arine Discharge		kg/day 6.48E-3 kg/day		у	0 kg/day
Industrial use of cobalt in the production	n of diamond to	ools ES 1 STP Dis	scharge		
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk characte (RC	
Fresh water			2E-4 mg/l 3ES 2.1.2)	0.1	72
Sedimentation (Fresh water)		(PEC sediment	mg/kg dw t calculation method metals)	0.1	38
Sewage Treatment Plant			113 mg/l SES 2.1.2)	0.0	35
Agricultural soil			mg/kg dw SES 2.1.2)	0.0	55
Man via Environment - Inhalation (Systematics)	emic effects)		E-6 mg/m³ SES 2.1.2)	< 0	.01
Man via Environment - Inhalation (Loca	l effects)		E-6 mg/m³ SES 2.1.2)	< 0	.01
Man via Environment - Oral			mg/kg bw/day sured data)	0.0	36
Man via Environment - Combined route	s			0.0	36
Industrial use of cobalt in the production	n of diamond to	ools ES 2 Direct D	Discharge		
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk characte (RC	
Fresh water			3E-4 mg/l 3ES 2.1.2)	0.1	59
Sedimentation (Fresh water)		6.88 mg/kg dw (PEC sediment calculation method for metals)		0.1	28
Agricultural soil		0.239 mg/kg dw (EUSES 2.1.2)		0.0	22
Man via Environment - Inhalation (Syste	emic effects)		E-6 mg/m³ SES 2.1.2)	< 0	.01
Man via Environment - Inhalation (Loca	l effects)		E-6 mg/m³ SES 2.1.2)	< 0	.01
Man via Environment - Oral			mg/kg bw/day sured data)	0.0	36
Man via Environment - Combined route	S			0.0	36
Industrial use of cobalt in the production	n of diamond to	ools ES 3 Marine	Discharge		
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk characte (RC	
Marine water		(Clocal calculation)	l09 μg/l ation with Kp susp. er marine)	0.0	946
Sedimentation (Marine water)		(PEC sediment	mg/kg dw calculation method metals)	0.3	803
Agricultural soil			mg/kg dw SES 2.1.2)	0.0	022

Man via Environment - Inhalation (Systemic effects)	1.32E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	1.32E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.065
3.2 Worker		
Raw material handling (PROC 26, PROC 9, PROC 8b))	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	23.5 μg/m³	0.434
Inhalation, Local effects, Long Term	23.5 µg/m³	0.588
Dermal, Systemic effects, Long Term	3.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.435
Wet process (PROC 5, PROC 4)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	11 µg/m³ (MEASE, PROC 5)	0.203
Inhalation, Local effects, Long Term	11 µg/m ³ (MEASE, PROC 5)	0.275
Dermal, Systemic effects, Long Term	1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.203
Hot (metallurgical) processes (PROC 25, PROC 14, F	PROC 22)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18.1 µg/m³	0.335
Inhalation, Local effects, Long Term	18.1 µg/m³	0.453
Dermal, Systemic effects, Long Term	1.3 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.335
Mechanical finishing processes (PROC 24, PROC 21))	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	23.6 µg/m³	0.436
Inhalation, Local effects, Long Term	23.6 µg/m³	0.59
Dermal, Systemic effects, Long Term	106.9 µg/kg bw/day	0.015
Combined routes, Systemic effects, Long Term		0.451

Packaging (PROC 21)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	erm	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term		8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term	I	62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, I	ong Term		0.168
Cleaning & Maintenance (PROC 28)			•
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		10.9 µg/m³	0.201
Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, I	ong Term		0.214
SECTION 4:	ECTION 4: 8.4 Guidance to DU to evaluate whether he works inside the boundaries set b the ES		
Health/ Environment			
met or the downstream user can dem measures are adequate. For human below the DNEL (given that the proce If measured data are not available, th (www.ebrc.de/mease.html) to estima they limit the PEC below the PNEC for	nonstrate on his o health, this has to esses and activitie he DU may make the the associated or the respective of ing tool such as t	ither the proposed risk management me wn that his operational conditions and in be done by showing that they limit the i as in question are covered by the PROC use of an appropriate scaling tool such a exposure. For the environment, this has environmental compartment. If measured he DU-Scaling tool (http://www.arche-co	nplemented risk management nhalation exposure to a level s listed above) as given below. as MEASE to be done by showing that d data are not available, the DU

SECTION 1:	9.1 Title of exposure scenario			
	Use at industrial sites; Industrial use of cobalt metal in additive manufacturing (3D-printin			
Chemical product category [PC]				
Base metals and alloys PC 7				
Sectors of use [SU]				
Manufacture of basic metals, including alloys SU 14				
Contributing scenario controlling environmental exposure				
Industrial use of cobalt metal in additive manufacturing (3D-printing)		ERC 5		
Contributing scenario controlling worker exposure				
Handling of dusty raw materials		PROC 26		

9. Exposure Scenario 9: Use at industrial sites; Industrial use of cobalt metal in additive manufacturing (3D-printing)

3D-printing in closed process		PROC 2		
Handling and sieving of powder fo	PROC 26			
Maintenance work	PROC 28			
Cleaning & Maintenance		PROC 28		
Subsequent service life exposu	e scenario(s)			
Service life (worker at industrial sit steels and tools in industrial setting	e); Service life of cobalt containing alloys, gs	ES10		
SECTION 2:	9.2 Operational conditions and risk manag	jement measures		
2.1	Contributing scenario controlling environment	nental exposure		
2.1.1	Industrial use of cobalt metal in additive man	ufacturing (3D-printing) (ERC 5)		
Frequency and duration of use				
Daily amount per site <= 0.1 tonne	s/day			
Annual amount per site <= 1 tonne				
•	measures to reduce or limit discharges, air	emissions and releases to soil		
The substance should not be relea				
The substance should not be relea	used to water.			
	d to municipal sewage treatment plant			
Municipal sewage treatment plant				
Assumed domestic sewage treatment plant				
	d to external treatment of waste for disposa	4		
	· · · · ·	0		
· · ·	containers according to local regulations.			
2.2	Contributing scenario controlling worker exposure			
2.2.1	Handling of dusty raw materials (PROC 26)	Handling of dusty raw materials (PROC 26)		
Product characteristics				
Physical form of product: Solid, me	edium dustiness			
Covers percentage substance in the	ne product up to 100 %.			
Frequency and duration of use				
Covers daily exposures up to 8 ho	urs.			
Technical conditions and measu	ires to control dispersion from source towa	rds the worker		
local exhaust ventilation				
Semi-closed system.				
	d to personal protection, hygiene and healt	h evaluation		
	ing a minimum assigned protection factor of 10			
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS	5.		
	374. For further specification, refer to section 8			
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.				
2.2.2	3D-printing in closed process (PROC 2)			
Product characteristics				
Physical form of product: Solid, Pc	wder / Dust			
Maximum emission potential: Low	(temperature based)			
Covers percentage substance in the	ne product up to 100 %.			
Technical conditions and measures to control dispersion from source towards the worker				
Only very limited manual invention very limited duration of time.	shall be required to run the process. Contact v	vith the substance shall only be possible for a		

Closed process with occasional op	pening.				
Elevated temperature. Covers use	Elevated temperature. Covers use at temperatures below melting point.				
Use of an integrated local exhaust	ventilation is required.				
Conditions and measures relate	d to personal protection, hygiene and health evaluation				
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ce can be excluded. For further specification, refer to section 8 of the SDS.				
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.				
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.				
2.2.3	Handling and sieving of powder for reuse (PROC 26)				
Product characteristics					
Physical form of product: Solid, me	edium dustiness				
Covers percentage substance in the	ne product up to 100 %.				
Frequency and duration of use					
Covers daily exposures up to 8 ho	urs.				
Technical conditions and measu	ires to control dispersion from source towards the worker				
local exhaust ventilation					
Semi-closed system.					
Conditions and measures relate	d to personal protection, hygiene and health evaluation				
Wear respiratory protection provid specification, refer to section 8 of t	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS.				
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.				
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.				
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.				
2.2.4	Maintenance work (PROC 28)				
Product characteristics					
Physical form of product: Residual dust.					
,					
Frequency and duration of use					
Frequency and duration of use Covers daily exposures up to 8 ho					
Frequency and duration of use Covers daily exposures up to 8 ho	urs. Ires to control dispersion from source towards the worker				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b	urs. Ires to control dispersion from source towards the worker				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b Conditions and measures relate	urs. Ires to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measures Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t	urs. Ires to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu	urs. Ires to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS.				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measures Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN	urs. Ires to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS.				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measures Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN	urs. Irres to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS. 374. For further specification, refer to section 8 of the SDS.				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN Wear protective suit conforming to	urs. Ires to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation Ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS. 374. For further specification, refer to section 8 of the SDS. EN 13982 in cases where direct contact with the substance cannot be avoided.				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN Wear protective suit conforming to 2.2.5	urs. Irres to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS. 374. For further specification, refer to section 8 of the SDS. EN 13982 in cases where direct contact with the substance cannot be avoided. Cleaning & Maintenance (PROC 28)				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measures Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN Wear protective suit conforming to 2.2.5 Product characteristics	urs. Irres to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS. 374. For further specification, refer to section 8 of the SDS. EN 13982 in cases where direct contact with the substance cannot be avoided. Cleaning & Maintenance (PROC 28)				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN Wear protective suit conforming to 2.2.5 Product characteristics Physical form of product: Residual	urs. Ires to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation Ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS. 374. For further specification, refer to section 8 of the SDS. EN 13982 in cases where direct contact with the substance cannot be avoided. Cleaning & Maintenance (PROC 28) dust.				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN Wear protective suit conforming to 2.2.5 Product characteristics Physical form of product: Residual Frequency and duration of use Covers daily exposures up to 8 ho	urs. Ires to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation Ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS. 374. For further specification, refer to section 8 of the SDS. EN 13982 in cases where direct contact with the substance cannot be avoided. Cleaning & Maintenance (PROC 28) dust.				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN Wear protective suit conforming to 2.2.5 Product characteristics Physical form of product: Residual Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu	urs. Ires to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS. 374. For further specification, refer to section 8 of the SDS. EN 13982 in cases where direct contact with the substance cannot be avoided. Cleaning & Maintenance (PROC 28) dust. urs.				
Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Machinery to be maintained is to b Conditions and measures relate Wear respiratory protection provid specification, refer to section 8 of t Use suitable eye protection. For fu Wear suitable gloves tested to EN Wear protective suit conforming to 2.2.5 Product characteristics Physical form of product: Residual Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Cleaning is conducted using clean	urs. ures to control dispersion from source towards the worker e turned off during work. d to personal protection, hygiene and health evaluation ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further he SDS. rther specification, refer to section 8 of the SDS. 374. For further specification, refer to section 8 of the SDS. EN 13982 in cases where direct contact with the substance cannot be avoided. Cleaning & Maintenance (PROC 28) dust. urs. urs.				

Use suitable eye protection. For furth	Use suitable eye protection. For further specification, refer to section 8 of the SDS.					
Wear suitable gloves tested to EN37	4. For further spec	cification, refer to	section 8 of the SDS			
Wear protective suit conforming to E	N 13982 in cases	where direct con	tact with the substan	ce cannot b	e avoided.	
SECTION 3:	9.3 Exposure e	estimation				
3.1 Environment						
Release estimation method: Estimate	ed release factor					
			Release rate			
	Wa	ter	Air		Soil	
Industrial use of cobalt metal in additive manufacturing (3D- printing)	0 kg/	/day	0 kg/day		0 kg/day	
3.2 Worker						
Handling of dusty raw materials (PRC	DC 26)					
Exposure route		Exposure esti	mation	Risk c (RCR)	haracterisation ratio	
Inhalation, Systemic effects, Long Te	erm	12 µg/m³		0.222		
Inhalation, Local effects, Long Term		12 µg/m³		0.3		
Dermal, Systemic effects, Long Term	1	3.2 µg/kg bw/da	ау	< 0.01	< 0.01	
Combined routes, Systemic effects, Long Term		0.222				
3D-printing in closed process (PROC	: 2)			·		
Exposure route		Exposure estimation Risk characterisa (RCR)		haracterisation ratio		
Inhalation, Systemic effects, Long Term		15 µg/m³		0.277		
Inhalation, Local effects, Long Term		15 µg/m³		0.375		
Dermal, Systemic effects, Long Term	1	0.4 µg/kg bw/da	У	< 0.01		
Combined routes, Systemic effects, I	_ong Term	0.277				
Handling and sieving of powder for re	euse (PROC 26)					
Exposure route		Exposure esti	mation	Risk c (RCR)	haracterisation ratio	
Inhalation, Systemic effects, Long Te	erm	12 µg/m³		0.222		
Inhalation, Local effects, Long Term		12 µg/m³		0.3	0.3	
Dermal, Systemic effects, Long Term		3.2 µg/kg bw/day		< 0.01	< 0.01	
Combined routes, Systemic effects, I	_ong Term			0.222		
Maintenance work (PROC 28)						
Exposure route Exposure estimation Risk characterisation ratio (RCR)					haracterisation ratio	
Inhalation, Systemic effects, Long Te	erm	5 µg/m³		0.092		
Inhalation, Local effects, Long Term	5 µg/m³		0.125			

Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term			0.105
Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	16.9 µg/m³	0.312
Inhalation, Local effects, Long Term		16.9 µg/m³	0.422
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, L	ong Term		0.325
SECTION 4: 9.4 Guidance to the ES		o DU to evaluate whether he works in	side the boundaries set by
Health/ Environment			
met or the downstream user can dem measures are adequate. For human h below the DNEL (given that the proce measured data are not available, the (www.ebrc.de/mease.html) to estimate they limit the PEC below the PNEC for	onstrate on his or nealth, this has to sses and activitie DU may make us e the associated r the respective e ng tool such as th	ther the proposed risk management mea wn that his operational conditions and im be done by showing that they limit the ir is in question are covered by the PROCs e of an appropriate scaling tool such as exposure. For the environment, this has environmental compartment. If measured he DU-Scaling tool (http://www.arche-com	plemented risk management halation exposure to a level s listed above) as given below. If MEASE to be done by showing that I data are not available, the DU

10. Exposure Scenario 10: Service life (worker at industrial site); Service life of cobalt containing alloys, steels and tools in industrial settings

SECTION 1:	10.1 Title of exposure scenario		
	Service life (worker at industrial site); Service life of cobalt containing alloys, steels and tools in industrial settings		
Article Categories [AC]			
Vehicles		AC1	
Machinery, mechanical appliances	s, electrical/electronic articles	AC2	
Metal articles		AC7	
Contributing scenario controlling environmental exposure			
Service life of cobalt containing all	oys, steels and tools in industrial settings	ERC 12a	
Contributing scenario controllin	g worker exposure		
Handling and mechanical treatment of metal or hard coated tools, metals and/or alloys - low kinetic energy		PROC 21	
Use and mechanical treatment of metal or hard coated tools, metals and/or alloys - high kinetic energy		PROC 24	
Use of cobalt alloy in laser surface	treatment	PROC 25	

Exposure scenario of the uses I	eading to the inclusion of the substance into	the article		
Use at industrial sites; Production steels and tools	and industrial use of cobalt containing alloys,	ES7		
Use at industrial sites; Industrial use of cobalt metal in additive manufacturing ES9 (3D-printing)				
SECTION 2:	10.2 Operational conditions and risk manage	jement measures		
2.1	Contributing scenario controlling environm	ental exposure		
2.1.1	Service life of cobalt containing alloys, steels a	nd tools in industrial settings (ERC 12a)		
Frequency and duration of use				
Daily amount per site <= 50 tonne	s/dav			
Annual amount per site <= 5E-3 to	-			
	d to municipal sewage treatment plant			
Municipal sewage treatment plant				
Assumed domestic sewage treatm				
	ed to external treatment of waste for disposal			
	containers according to local regulations.			
· ·	J			
2.2	Contributing scenario controlling worker ex	(posure		
2.2.1	Handling and mechanical treatment of metal of low kinetic energy (PROC 21)	r hard coated tools, metals and/or alloys -		
Product characteristics				
Physical form of product: Massive	object			
Maximum emission potential: Low	(abrasion based)			
Covers percentage substance in the	ne product up to 100 %.			
Frequency and duration of use				
Covers daily exposures up to 8 ho	urs.			
Technical conditions and measure	ures to control dispersion from source toward	ds the worker		
Covers use at ambient temperatur	es.			
Conditions and measures relate	d to personal protection, hygiene and health	evaluation		
Wear respiratory protection provid	ing a minimum assigned protection factor of 10 (ince can be excluded. For further specification, re	a minimum efficiency of 90%) unless		
	inther specification, refer to section 8 of the SDS.			
	374. For further specification, refer to section 8 c			
2.2.2	Use and mechanical treatment of metal or hard			
	kinetic energy (PROC 24)			
Product characteristics				
Physical form of product: Massive	object			
Maximum emission potential: High	(abrasion based)			
Covers percentage substance in the	he product up to 100 %.			
Frequency and duration of use				
Covers daily exposures up to 8 ho	urs.			
Technical conditions and measured	ures to control dispersion from source toward	ds the worker		
Covers use at ambient temperatur	res.			
Conditions and measures relate	d to personal protection, hygiene and health	evaluation		
Wear respiratory protection provid specification, refer to section 8 of	ing a minimum assigned protection factor of 10 (the SDS.	a minimum efficiency of 90%). For further		
Use suitable eye protection. For fu	irther specification, refer to section 8 of the SDS.			

2.2.3	Use of cobalt alloy	Jse of cobalt alloy in laser surface treatment (PROC 25)				
Product characteristics						
Physical form of product: Massive of	object					
Technical conditions and measu	res to control disp	ersion from so	urce towards the worke	er		
Use in closed process.						
Conditions and measures related						
Wear respiratory protection providin specification, refer to section 8 of th		ned protection fa	actor of 10 (a minimum e	fficiency	of 90%). For further	
Use suitable eye protection. For fur	ther specification, re	efer to section 8	of the SDS.			
Wear suitable gloves tested to EN3	74. For further spec	cification, refer to	section 8 of the SDS.			
SECTION 3:	10.3 Exposure	estimation				
3.1 Environment	•					
Release estimation method: Estima	ated release factor					
			Release rate			
	Wat	ter	Air		Soil	
Service life of cobalt containing alloys, steels and tools in industrial settings	0 kg/	day	0 kg/day		0 kg/day	
3.2 Worker						
Handling and mechanical treatmen	t of metal or hard co	pated tools, meta	Ils and/or alloys - low kin	etic energ	gy (PROC 21)	
Exposure route				Risk cl (RCR)	Risk characterisation ratio	
Inhalation, Systemic effects, Long	Term	10 µg/m³	10 µg/m³ 0.185			
Inhalation, Local effects, Long Terr	n	10 µg/m³	0.25			
Dermal, Systemic effects, Long Ter	m	62.2 μg/kg bw/day		< 0.01		
Combined routes, Systemic effects	, Long Term			0.193		
Use and mechanical treatment of n	netal or hard coated	tools, metals ar	d/or alloys - high kinetic	energy (I	PROC 24)	
Exposure route		Exposure est	imation	Risk cl (RCR)	naracterisation ratio	
Inhalation, Systemic effects, Long	Term	11 µg/m³		0.203		
Inhalation, Local effects, Long Terr	n	11 µg/m³		0.275		
Dermal, Systemic effects, Long Ter	m	92.8 µg/kg bw/day		0.013		
Combined routes, Systemic effects	, Long Term			0.216		
Use of cobalt alloy in laser surface	treatment (PROC 2	5)				
Exposure route		Exposure est	mation	Risk cł (RCR)	naracterisation ratio	
Inhalation, Systemic effects, Long	Term	1 µg/m³ (MEASE, PROC 3) *		0.018		
Inhalation, Local effects, Long Terr	n	1 µg/m³ (MEAS	E, PROC 3) *	0.025		
Dermal, Systemic effects, Long Ter	m	0.4 µg/kg bw/da	ay	< 0.01		

Combined routes, Systemic effects, Long Term			0.019	
*Because of the enclosure of the process, PROC 3 was used for the assessment.				
SECTION 4: 10.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES			side the boundaries set by	
Health/ Environment				
met or the downstream user can dem measures are adequate. For human h below the DNEL (given that the proce measured data are not available, the (www.ebrc.de/mease.html) to estimate they limit the PEC below the PNEC for	onstrate on his or lealth, this has to sses and activitie DU may make us e the associated r the respective e ng tool such as th	ither the proposed risk management mea wn that his operational conditions and imp be done by showing that they limit the in as in question are covered by the PROCs se of an appropriate scaling tool such as M exposure. For the environment, this has t environmental compartment. If measured he DU-Scaling tool (http://www.arche-con	plemented risk management halation exposure to a level listed above) as given below. If MEASE to be done by showing that data are not available, the DU	

SECTION 1:	11.1 Title of exposure scenario				
	Service life (worker at industrial site); Welding in industrial settings				
Article Categories [AC]					
Metal articles		AC7			
Contributing scenario controllin	g environmental exposure				
Welding in industrial settings		ERC 12a			
Contributing scenario controllin	ng worker exposure				
Welding in industrial settings		PROC 25			
Furnace brazing		PROC 25			
Exposure scenario of the uses I	eading to the inclusion of the substance into	the article			
Use at industrial sites; Production steels and tools	and industrial use of cobalt containing alloys,	ES7			
SECTION 2:	11.2 Operational conditions and risk managed	gement measures			
2.1	Contributing scenario controlling environmental exposure				
2.1.1	Welding in industrial settings (ERC 12a)				
Frequency and duration of use					
Daily amount per site <= 50 tonne	s/day				
Annual amount per site <= 5E-3 to	onnes/year				
Conditions and measures related to municipal sewage treatment plant					
Municipal sewage treatment plant	is assumed.				
Assumed domestic sewage treatm	nent plant flow >= 2E3 m³/day				
Conditions and measures relate	d to external treatment of waste for disposal				
Dispose of waste product or used	containers according to local regulations.				

11. Exposure Scenario 11: Service life (worker at industrial site); Welding in industrial settings

2.2	Contributing scer	nario controlling	g worker exposure		
2.2.1	Welding in industri	al settings (PRO	C 25)		
Product characteristics					
Physical form of product: Molten					
Additional physical form of product:	Gaseous				
Maximum emission potential: High (temperature based	l)			
Covers percentage substance in the	e product up to 25 9	%.			
Frequency and duration of use					
Covers daily exposures up to 8 hour	rs.				
Conditions and measures related	to personal prote	ction, hygiene	and health evaluation		
Wear respiratory protection providin specification, refer to section 8 of th		ned protection fa	actor of 40 (a minimum e	fficiency	of 97.5%). For further
Specific RPE may be required depered legel regulations has to be assured. Pleas statements_july_2010.pdf.					
Use suitable eye protection. For furt	her specification, re	efer to section 8	of the SDS.		
Wear suitable gloves tested to EN3	74. For further spec	cification, refer to	section 8 of the SDS.		
2.2.2	Furnace brazing (F	PROC 25)			
Product characteristics					
Physical form of product: Molten					
Additional physical form of product:	Gaseous				
Maximum emission potential: Low (temperature based)			
Covers percentage substance in the	e product up to 100	%.			
Frequency and duration of use					
Covers daily exposures up to 8 hou	rs.				
Technical conditions and measur	es to control disp	ersion from so	urce towards the worke	er	
Assumes process temperature up to	o 900 °C.				
Automated task.					
local exhaust ventilation. Inhalation	- minimum efficiend	cy of 78 %			
Use in closed process.					
Conditions and measures related	to personal prote	ction, hygiene	and health evaluation		
Use suitable eye protection. For furt	her specification, r	efer to section 8	of the SDS.		
Wear suitable gloves tested to EN3	74. For further spec	cification, refer to	section 8 of the SDS.		
SECTION 3:	11.3 Exposure	estimation			
3.1 Environment					
Release estimation method: Estima	ted release factor				
			Release rate		
	Wa	Water Air Soil			
Welding in industrial settings	0 kg/day 0 kg/day 0 kg/day				
3.2 Worker					
Welding in industrial settings (PROC 25)					
Exposure route					
Inhalation, Systemic effects, Long	cts, Long Term 30 μg/m³ (MEASE) 0.555				

Inhalation, Local effects, Long Term		30 µg/m³ (MEASE)	0.75
Dermal, Systemic effects, Long Term		0.3 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			0.555
Furnace brazing (PROC 25)		I	
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	1.4 µg/m³	0.026
Inhalation, Local effects, Long Term		1.4 µg/m³	0.035
Dermal, Systemic effects, Long Term		1.3 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.026
Use of cobalt alloy in laser surface tre	eatment (PROC 2	5)	-
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	1 μg/m³ (MEASE, PROC 3) *	0.018
Inhalation, Local effects, Long Term		1 μg/m³ (MEASE, PROC 3) *	0.025
Dermal, Systemic effects, Long Term		0.4 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.019
*Because of the enclosure of the proc	ess, PROC 3 wa	s used for the assessment.	
SECTION 4:	11.4 Guidance the ES	to DU to evaluate whether he works	inside the boundaries set by
Health/ Environment			
met or the downstream user can dem measures are adequate. For human h below the DNEL (given that the proce measured data are not available, the (www.ebrc.de/mease.html) to estimat they limit the PEC below the PNEC for	onstrate on his or health, this has to isses and activitie DU may make us e the associated or the respective e ing tool such as th	ther the proposed risk management me wn that his operational conditions and ir be done by showing that they limit the i as in question are covered by the PROC ee of an appropriate scaling tool such as exposure. For the environment, this has environmental compartment. If measure the DU-Scaling tool (http://www.arche-co	nplemented risk management nhalation exposure to a level s listed above) as given below. I MEASE s to be done by showing that d data are not available, the DU

12. Exposure Scenario 12: Service life (Professional worker); Welding in professional settings

SECTION 1:	12.1 Title of exposure scenario			
	Service life (Professional worker); Welding in professional settings			
Article Categories [AC]	1			
Metal articles	AC7			
Contributing scenario controlli	ng environmental exposure	·		
Welding in professional settings		ERC 10a, ERC 11a		
Contributing scenario controlli	ng worker exposure			
Welding in professional settings	PROC 25			
Exposure scenario of the uses	leading to the inclusion of the substance into	the article		
Use at industrial sites; Production and industrial use of cobalt containing alloys, steels and tools		ES7		
SECTION 2:	12.2 Operational conditions and risk management measures			
2.1	Contributing scenario controlling environmental exposure			
2.1.1	Welding in professional settings (ERC 10a, ERC 11a)			
Conditions and measures relat	ed to municipal sewage treatment plant			
Municipal sewage treatment plan	t is assumed.			
Conditions and measures relat	ed to external treatment of waste for disposa	I		
Dispose of waste product or used	containers according to local regulations.			
2.2	Contributing scenario controlling worker exposure			
2.2.1	Welding in professional settings (PROC 25)			
Product characteristics				
Physical form of product: Molten				
Additional physical form of product: Gaseous				
Maximum emission potential: High (temperature based)				
Covers percentage substance in the product up to 25 %.				
Frequency and duration of use				
Avoid carrying out activities involving exposure for more than 4 hours per day.				
Conditions and measures relat	ed to personal protection, hygiene and health	evaluation		
Wear respiratory protection provid specification, refer to section 8 of	ding a minimum assigned protection factor of 40 the SDS.	(a minimum efficiency of 97.5%). For further		
	pending on the type of the conducted welding pr ease refer to e.g. http://european-welding.org/wp			
Use suitable eye protection. For further specification, refer to section 8 of the SDS.				
Use suitable eye protection. For i				

SECTION 3:	12.3 Exposure	12.3 Exposure estimation				
3.1 Environment						
Release estimation method: Estimat	ed release factor					
	Release rate					
	Wa	ter	Air		Soil	
Welding in professional settings	0 kg/day		0 kg/day		0 kg/day	
3.2 Worker						
Welding in professional settings (PR	OC 25)					
Exposure route		Exposure estimation		Risk characterisation ratio (RCR)		
Inhalation, Systemic effects, Long Term		36 μg/m³ (MEASE)		0.655		
Inhalation, Local effects, Long Term		36 µg/m³ (MEASE)		0.9		
Dermal, Systemic effects, Long Term		0.2 μg/kg bw/day		< 0.01		
Combined routes, Systemic effects, Long Term				0.665		
SECTION 4:	12.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES					
Health/ Environment						
The DU works inside the boundaries met or the downstream user can der measures are adequate. For human below the DNEL (given that the proo measured data are not available, the (www.ebrc.de/mease.html) to estimat they limit the PEC below the PNEC f may make use of an appropriate sca toolbox/duscaling-tool) to estimate P	nonstrate on his or health, this has to esses and activitie DU may make us the the associated or the respective e ling tool such as th	wn that his opera be done by show as in question are ae of an appropria exposure. For the environmental co	tional conditions and im ving that they limit the in covered by the PROCs ate scaling tool such as l e environment, this has mpartment. If measured	plemented halation e listed abo MEASE to be done data are r	d risk management exposure to a level ove) as given below. If e by showing that not available, the DU	

13. Exposure Scenario 13: Service life (Professional worker); Service life of cobalt-containing tools in professional settings

SECTION 1:	13.1 Title of exposure scenario				
	Service life (Professional worker); Service life of cobalt-containing tools in professional settings				
Article Categories [AC]					
Machinery, mechanical appliances, electrical/electronic articles		AC2			
Metal articles		AC7			
Contributing scenario controlling environmental exposure					
Service life of cobalt-containing tools in professional settings		ERC 10a, ERC 11a			
Contributing scenario controlling worker exposure					
Automated use of cobalt-containing tools with confined and/or extracted machines		PROC 21			

Manual tasks using cobalt-containi	ing tools	PROC 24	
Exposure scenario of the uses leading to the inclusion of the substance into the article			
Use at industrial sites; Production and industrial use of cobalt containing alloys, ES7 steels and tools			
Use at industrial sites; Industrial us	se of cobalt in the production of diamond tools	ES8	
SECTION 2:	13.2 Operational conditions and risk manage	jement measures	
2.1	Contributing scenario controlling environm	ental exposure	
2.1.1	Service life of cobalt-containing tools in profess	sional settings (ERC 10a, ERC 11a)	
Conditions and measures relate	d to municipal sewage treatment plant		
Municipal sewage treatment plant	is assumed.		
Conditions and measures relate	d to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
2.2	Contributing scenario controlling worker ex	cposure	
2.2.1	Automated use of cobalt-containing tools with 21)	confined and/or extracted machines (PROC	
Product characteristics			
Physical form of product: Bound in	article.		
Maximum emission potential: Med	ium (abrasion based)		
Covers percentage substance in th	ne product up to 25 %.		
Frequency and duration of use			
Covers daily exposures up to 8 ho	urs.		
Technical conditions and measu	ares to control dispersion from source toward	ds the worker	
Automated task.			
local exhaust ventilation. Inhalation	n - minimum efficiency of 72 %		
Conditions and measures relate	d to personal protection, hygiene and health	evaluation	
Wear respiratory protection provide specification, refer to section 8 of t	ing a minimum assigned protection factor of 10 (he SDS.	a minimum efficiency of 90%). For further	
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS		
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of	of the SDS.	
2.2.2	Manual tasks using cobalt-containing tools (PF	ROC 24)	
Product characteristics			
Physical form of product: Bound in	article.		
Maximum emission potential: High	(abrasion based)		
Covers percentage substance in th	ne product up to 100 %.		
Frequency and duration of use			
Covers daily exposures up to 8 ho			
Conditions and measures relate	d to personal protection, hygiene and health	evaluation	
	ing a minimum assigned protection factor of 10 (he SDS.	a minimum efficiency of 90%). For further	
Wear respiratory protection providi specification, refer to section 8 of t		· · ·	

SECTION 3:	13.3 Exposure estimation				
3.1 Environment	<u> </u>				
Release estimation method: Estimate	ed release factor				
			Release rate		
	Wat	er	Air		Soil
Service life of cobalt-containing tools in professional settings	0 kg/	day	0 kg/day		0 kg/day
3.2 Worker					
Automated use of cobalt-containing t	ools with confined	and/or extracte	d machines (PROC 21)		
Exposure route		Exposure est	mation	Risk cl (RCR)	haracterisation ratio
Inhalation, Systemic effects, Long T	erm	17 µg/m³ (MEA	\SE) *	0.314	
Inhalation, Local effects, Long Term		17 µg/m³ (MEA	\SE) *	0.425	
Dermal, Systemic effects, Long Tern	1	0.2 µg/kg bw/d	ау	< 0.01	
Combined routes, Systemic effects,	_ong Term			0.314	
service life ES. However, PROC 3 w individual interpretation of PROCs) a Manual tasks using cobalt-containing	s this is considere				
Exposure route		Exposure est	mation	Risk cl (RCR)	haracterisation ratio
Inhalation, Systemic effects, Long T	erm	11 µg/m³		0.203	
Inhalation, Local effects, Long Term		11 µg/m³		0.275	
Dermal, Systemic effects, Long Tern	1	92.8 µg/kg bw/o	day	0.013	
Combined routes, Systemic effects,	_ong Term			0.216	
SECTION 4: 13.4 Guidance the ES		to DU to evalua	te whether he works in	side the	boundaries set by
Health/ Environment					
The DU works inside the boundaries			d risk management mea ational conditions and im		

they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

14. Exposure Scenario 14: Service life (Professional worker); Service life of dental alloys containing cobalt in professional settings

SECTION 1:	14.1 Title of exposure scenario		
	Service life (Professional worker); Service life of dental alloys containing cobalt in professional settings		
Article Categories [AC]			
Metal articles		AC7	
Contributing scenario controllin	g environmental exposure		
Service life of dental alloys contair	ing cobalt in professional settings	ERC 11a	
Contributing scenario controllin	g worker exposure		
Handling of ingots		PROC 21	
Melting and casting		PROC 23, PROC 22	
Hand fettling		PROC 24	
Exposure scenario of the uses l	eading to the inclusion of the substance into	the article	
Use at industrial sites; Production steels and tools	and industrial use of cobalt containing alloys,	ES7	
SECTION 2:	14.2 Operational conditions and risk mana	gement measures	
2.1	Contributing scenario controlling environn	nental exposure	
2.1.1	Service life of dental alloys containing cobalt in	n professional settings (ERC 11a)	
Conditions and measures relate	d to municipal sewage treatment plant		
Municipal sewage treatment plant	is assumed.		
Conditions and measures relate	d to external treatment of waste for disposa		
Dispose of waste product or used	containers according to local regulations.		
2.2	Contributing scenario controlling worker exposure		
2.2.1	Handling of ingots (PROC 21)		
Product characteristics			
Physical form of product: Massive	object		
Maximum emission potential: Very	low		
Covers percentage substance in the product up to 100 %.			
Frequency and duration of use			
Covers daily exposures up to 8 ho	urs.		
Technical conditions and measu	ires to control dispersion from source towar	ds the worker	
Covers use at ambient temperatur	es.		
Conditions and measures relate	d to personal protection, hygiene and health	evaluation	
	ing a minimum assigned protection factor of 10 ce can be excluded. For further specification, re	· · · · · · · · · · · · · · · · · · ·	
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS		
Wear suitable gloves tested to EN	374. For further specification, refer to section 8	of the SDS.	
2.2.3	Hand fettling (PROC 24)		
Product characteristics			
Physical form of product: Massive	object		
Maximum emission potential: Med	ium (abrasion based)		
Covers percentage substance in the	ne product up to 100 %.		

Frequency and duration of use					
Covers daily exposures up to 8 hours		analan frans s			
Technical conditions and measure Covers use at ambient temperatures.		ersion from sou	urce towards the worke	er	
Use of an integrated tool / machine e		d Inhalation - n	ninimum efficiency of 80	%	
Conditions and measures related t	-			70	
Wear respiratory protection providing				fficiency	of 90%) unless
inhalation exposure to the substance	-	•	•	•	,
Use suitable eye protection. For furth	er specification, re	efer to section 8	of the SDS.		
Wear suitable gloves tested to EN374	4. For further spec	ification, refer to	section 8 of the SDS.		
SECTION 3:	14.3 Exposure	estimation			
3.1 Environment					
Release estimation method: Estimate	ed release factor				
			Release rate		
	Wat	er	Air		Soil
Service life of dental alloys		-			
containing cobalt in professional settings	0 kg/	uay	0 kg/day		0 kg/day
3.2 Worker					
Handling of ingots (PROC 21)					
Exposure route		Exposure esti	mation	Risk ch (RCR)	naracterisation ratio
Inhalation, Systemic effects, Long Te	erm	25 μg/m³		0.462	
Inhalation, Local effects, Long Term		25 μg/m³		0.625	
Dermal, Systemic effects, Long Term	1	62.2 µg/kg bw/	day	< 0.01	
Combined routes, Systemic effects, Long Term				0.471	
Melting and casting (PROC 23, PRO	C 22)				
Exposure route		Exposure esti	mation	Risk ch	naracterisation ratio
				(RCR)	
Inhalation, Systemic effects, Long Te	erm	25 μg/m³		0.462	
Inhalation, Local effects, Long Term		25 μg/m³		0.625	
Dermal, Systemic effects, Long Term	1	1.3 μg/kg bw/day		< 0.01	
Combined routes, Systemic effects, Long Term				0.462	
Hand fettling (PROC 24)					
Exposure route		Exposure esti	mation	Risk ch (RCR)	naracterisation ratio
Inhalation, Systemic effects, Long Te	erm	25 µg/m³		0.462	
Inhalation, Local effects, Long Term		25 µg/m³		0.625	
Dermal, Systemic effects, Long Term	1	106.9 µg/kg bw	/day	0.015	
Combined routes, Systemic effects, I	₋ong Term			0.477	

SECTION 4:	14.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES
Health/ Environment	
met or the downstream user can dem measures are adequate. For human h below the DNEL (given that the proce measured data are not available, the (www.ebrc.de/mease.html) to estimate they limit the PEC below the PNEC for	set by the ES if either the proposed risk management measures as described above are constrate on his own that his operational conditions and implemented risk management health, this has to be done by showing that they limit the inhalation exposure to a level asses and activities in question are covered by the PROCs listed above) as given below. If DU may make use of an appropriate scaling tool such as MEASE are the associated exposure. For the environment, this has to be done by showing that or the respective environmental compartment. If measured data are not available, the DU ing tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA- EC values.

15. Exposure Scenario 15: Service life (Consumers); Service life of dental alloys

SECTION 1:	15.1 Title of exposure scenario		
	Service life (Consumers); Service life of dental alloys		
Article Categories [AC]			
Metal articles		AC7	
Contributing scenario controllin	g environmental exposure		
Service life of dental alloys		ERC 10a, ERC 11a	
Contributing scenario controllin	g consumer exposure		
Service life of dental alloys after in	stallation	AC7	
Exposure scenario of the uses l	eading to the inclusion of the substance into	the article	
Use at industrial sites; Production and industrial use of cobalt containing alloys, ES steels and tools		ES7	
SECTION 2:	15.2 Operational conditions and risk management measures		
2.1	Contributing scenario controlling environmental exposure		
2.1.1	Service life of dental alloys (ERC 10a, ERC 11a)		
Conditions and measures relate	d to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
Municipal sewage treatment plant	is assumed.		
2.2	Contributing scenario controlling consumer exposure		
2.2.1	Service life of dental alloys after installation (AC 7)		
Product characteristics			
Physical form of product: Massive object			
Covers a release rate in artificial p	laque solution acc. to ISO 10271:2001 of up to 2	2 μg Co/cm²/7 days.	
Inhalation exposure is considered	to be not relevant.		
Dermal exposure assumed to be negligible.			

Frequency and duration of use					
Duration of contact: 24 hour(s).					
Frequency of use: 365 events/year					
Other given operational conditions	affecting consu	mers exposure			
Covers adult use.					
Covers a surface area of a dental app	pliance of up to 20) cm².			
SECTION 3:	15.3 Exposure	estimation			
3.1 Environment					
Release estimation method: Estimate	ed release factor				
			Release rate		
	Wat	ter	Air		Soil
Service life of dental alloys	0 kg/	day	0 kg/day		0 kg/day
3.2 Consumer	L				
Service life of dental alloys after insta	allation (AC 7)				
Exposure route		Exposure esti	mation	Risk cl (RCR)	naracterisation ratio
Inhalation, Systemic effects, Long Term		0 mg/m³ (Quali	tative assessment)	< 0.01	
Inhalation, Local effects, Long Term		0 mg/m³ (Quali	tative assessment)	< 0.01	
Dermal, Systemic effects, Long Term		0 mg/kg bw/da (Quantitative as	•	< 0.01	
Oral, Systemic effects, Long Term		0.097 μg/kg bw/day (Quantitative assessment)		0.011	
Combined routes, Systemic effects, L	₋ong Term			0.011	
SECTION 4: 15.4 Guidance to DU to evaluate whether he works inside the boundaries set to the ES		boundaries set by			
Health/ Environment					
The DU works inside the boundaries met or the downstream user can dem measures are adequate. For human I below the DNEL (given that the proce measured data are not available, the (www.ebrc.de/mease.html) to estimat	honstrate on his on health, this has to esses and activitie DU may make us	wn that his opera be done by show s in question are e of an appropria	tional conditions and im ving that they limit the ir covered by the PROCs ate scaling tool such as	plemente halation listed ab MEASE	d risk management exposure to a level ove) as given below. If

(www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

16. Exposure Scenario 16: Service life (Consumers); Service life of diamond tools and other cobalt-containing tools other than hard metal used by consumers

SECTION 1:	16.1 Title of exposure scenario		
	Service life (Consumers); Service life of diamond tools and other cobalt-containing tools other than hard metal used by consumers		
Article Categories [AC]			
Machinery, mechanical appliances	s, electrical/electronic articles	AC2	
Metal articles		AC7	
Contributing scenario controllin	ng environmental exposure		
Service life of diamond tools and o metal used by consumers	other cobalt-containing tools other than hard	ERC 10a, ERC 11a	
Contributing scenario controllin	ng consumer exposure		
Use of cutting tools		AC2	
Use of cutting tools		AC7	
Exposure scenario of the uses I	eading to the inclusion of the substance into	the article	
Use at industrial sites; Production steels and tools	and industrial use of cobalt containing alloys,	ES7	
Use at industrial sites; Industrial us	se of cobalt in the production of diamond tools	ES8	
SECTION 2:	16.2 Operational conditions and risk managed	gement measures	
2.1	Contributing scenario controlling environm	nental exposure	
2.1.1	Service life of diamond tools and other cobalt-containing tools other than hard metal used by consumers (ERC 10a, ERC 11a)		
Conditions and measures relate	ed to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
Municipal sewage treatment plant	is assumed.		
2.2	Contributing scenario controlling consumer exposure		
2.2.1	Use of cutting tools (AC 2)		
Product characteristics			
Physical form of product: Bound in	n article.		
Inhalation exposure is considered	to be not relevant.		
Dermal exposure assumed to be r	negligible.		
Oral exposure is considered to be not relevant.			
Conditions and measures relate	d to information and behavioural advice to c	onsumers	
Do follow the manufacturers recon	nmended specification for material being cut, dri	lled or sawed.	
2.2.2	Use of cutting tools (AC 7)		
Product characteristics			
Physical form of product: Bound in	article.		
Table Information and the second damaged	to be not relevant.		
Inhalation exposure is considered			
Dermal exposure assumed to be r	negligible.		
	•••		
Dermal exposure assumed to be r Oral exposure is considered to be	•••	onsumers	

SECTION 3:	16.3 Exposure estimation				
3.1 Environment					
Release estimation method: Estimate	d release factor				
			Release rate		
	Wat	ter	Air		Soil
Service life of diamond tools and other cobalt-containing tools other than hard metal used by consumers	0 kg/day 0 kg/day			0 kg/day	
3.2 Consumer					
Use of cutting tools (AC 2)					
Exposure route		Exposure est	mation	Risk ch (RCR)	naracterisation ratio
Inhalation, Systemic effects, Long Te	erm	0 µg/m³ (Qualit	ative assessment)	< 0.01	
Inhalation, Local effects, Long Term		0 µg/m³ (Qualit	ative assessment)	< 0.01	
Dermal, Systemic effects, Long Term		0 mg/kg bw/da (Qualitative ass		< 0.01	
Oral, Systemic effects, Long Term		0.097 µg/kg bw (Qualitative ass		< 0.01	
Combined routes, Systemic effects, L	.ong Term		< 0.01		
Use of cutting tools (AC 7)					
Exposure route		Exposure est	mation	Risk cł (RCR)	naracterisation ratio
Inhalation, Systemic effects, Long Te	erm	0 µg/m³ (Qualit	ative assessment)	< 0.01	
Inhalation, Local effects, Long Term		0 µg/m³ (Qualit	ative assessment)	< 0.01	
Dermal, Systemic effects, Long Term		0 mg/kg bw/day (Qualitative assessment)		< 0.01	
Oral, Systemic effects, Long Term		0.097 µg/kg bw/day (Qualitative assessment)		< 0.01	
Combined routes, Systemic effects, L	ong Term			< 0.01	
SECTION 4:	16.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES		boundaries set by		
Health/ Environment	·				
The DU works inside the boundaries met or the downstream user can dem measures are adequate. For human below the DNEL (given that the proce measured data are not available, the (www.ebrc.de/mease.html) to estimat they limit the PEC below the PNEC for may make use of an appropriate scal toolbox/duscaling-tool) to estimate PE	onstrate on his or health, this has to esses and activitie DU may make us the associated or the respective e ing tool such as th	wn that his opera be done by sho is in question are e of an appropri- exposure. For the environmental co	ational conditions and im wing that they limit the in a covered by the PROCs ate scaling tool such as e environment, this has mpartment. If measured	nplemente nhalation s listed ab MEASE to be don d data are	d risk management exposure to a level ove) as given below. If e by showing that not available, the DU

17. Exposure Scenario 17: Use at industrial sites; Industrial use of cobalt in passivation processes in surface treatment

SECTION 1:	17.1 Title of exposure scenario	
	Use at industrial sites; Industrial use of cobalt in passivation processes in surface treatment	
Chemical product category [PC]	I	
Metal surface treatment products		PC 14
Contributing scenario controllin	g environmental exposure	
Industrial use of cobalt in passivat Discharge	ion processes in surface treatment ES 1 STP	ERC5
Industrial use of cobalt in passivat Discharge	ion processes in surface treatment ES 2 Direct	ERC5
Industrial use of cobalt in passivat Marine Discharge	ion processes in surface treatment ES 3	ERC5
Contributing scenario controllin	g worker exposure	
Raw material handling		PROC 21
Wet processes		PROC 2, PROC 1
Passivation		PROC 13
Packaging and handling of passiva	ated articles	PROC 21
Cleaning & Maintenance		PROC 28
Subsequent service life exposu	re scenario(s)	
Service life (worker at industrial sit articles (passivated/plated/sprayed	e); Industrial handling of surface treated ধ)	ES21
Service life (Professional worker); articles (passivated/plated/sprayed	Professional handling of surface treated	ES22
Service life (Consumer); Handling	of heat and wear resistant vehicle parts	ES23
SECTION 2:	17.2 Operational conditions and risk managed	gement measures
2.1	Contributing scenario controlling environm	ental exposure
2.1.1	Industrial use of cobalt in passivation processes in surface treatment ES 1 STP Discharge (ERC 5)	
Frequency and duration of use		
Daily amount per site <= 0.025 tor	ines/day	
Annual amount per site <= 4 tonne	es/year	
Emission days >= 160 days/year		
Technical onsite conditions and	measures to reduce or limit discharges, air	emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag f	ilter or ceramic/metal mesh filter or wet
	tation or filtration or electrolysis or reverse osmo	sis or ion exchange.
	d to municipal sewage treatment plant	
Municipal sewage treatment plant		
Assumed domestic sewage treatm	d to external treatment of waste for disposal	
	containers according to local regulations.	
· · ·	ons affecting environmental exposure	
No discharge to marine water assu		

Local freshwater dilution factor 20	0.
2.1.2	Industrial use of cobalt in passivation processes in surface treatment ES 2 Direct Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 0.025 tor	nnes/day
Annual amount per site <= 4 tonne	es/year
Emission days >= 160 days/year	
	I measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow f	rom site >= 2E3 m3/day
Local freshwater dilution factor 30	0.
2.1.3	Industrial use of cobalt in passivation processes in surface treatment ES 3 Marine Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 0.025 tor	ines/day
Annual amount per site <= 4 tonne	es/year
Emission days >= 160 days/year	
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow f	rom site >= 2E3 m3/day
No discharge to freshwater assum	ed.
Local marine water dilution factor	100
2.2	Contributing scenario controlling worker exposure
2.2.1	Raw material handling (PROC 21)
Product characteristics	
Physical form of product: Massive	object
Maximum emission potential: Very	-
Covers percentage substance in the	ne product up to 100 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and measured	ures to control dispersion from source towards the worker
Covers use at ambient temperatur	es.
Conditions and measures relate	d to personal protection, hygiene and health evaluation
Wear respiratory protection provid	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ace can be excluded. For further specification, refer to section 8 of the SDS.
	In the specification, refer to section 8 of the SDS.

Wear suitable gloves tested to E	N374. For further specification, refer to section 8 of the SDS.
2.2.2	Wet processes (PROC 2, PROC 1)
Product characteristics	
Physical form of product: Aqueou	us solution
Maximum emission potential: Ve	ry low
Covers percentage substance in	the product up to 100 %.
Frequency and duration of use	
Covers daily exposures up to 8 h	iours.
Technical conditions and measured	sures to control dispersion from source towards the worker
Covers use at ambient temperate	ures.
Semi-automated task.	
Use in closed process.	
Vapour extraction units in the tar 90 %	k: Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of
Conditions and measures related	ted to personal protection, hygiene and health evaluation
Wear respiratory protection provi specification, refer to section 8 of	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further f the SDS.
Use suitable eye protection. For	further specification, refer to section 8 of the SDS.
Wear suitable gloves tested to E	N374. For further specification, refer to section 8 of the SDS.
2.2.3	Passivation (PROC 13)
Product characteristics	
Physical form of product: Aqueou	us solution
Maximum emission potential: Ve	ry low
Covers percentage substance in	the product up to 5 %.
Frequency and duration of use	
Covers daily exposures up to 8 h	ours.
Conditions and measures related	ted to personal protection, hygiene and health evaluation
	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ance can be excluded. 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 suitable gloves tested to E	N374. For further specification, refer to section 8 of the SDS.
2.2.4	Packaging and handling of passivated articles (PROC 21)
Product characteristics	
Physical form of product: Massiv	e object
Maximum emission potential: Ve	
Covers percentage substance in	the product up to 100 %.
Frequency and duration of use)
Covers daily exposures up to 8 h	iours.
Technical conditions and measure	sures to control dispersion from source towards the worker
Covers use at ambient temperate	Jres.
Conditions and measures related	ted to personal protection, hygiene and health evaluation
	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ance can be excluded. For further specification, refer to section 8 of the SDS.
Use suitable eye protection. For	further specification, refer to section 8 of the SDS.

2.2.5	Cleaning & Mainte	enance (PROC 28	3)		
Product characteristics					
Physical form of product: Dried spla	ashes/overspill.				
Maximum emission potential: Medi	um				
Frequency and duration of use					
Covers daily exposures up to 8 hou	Irs.				
Technical conditions and measu	res to control dis	persion from so	urce towards the wor	ker	
Process is carried out at ambient p	ressure.				
Covers use at ambient temperature	es.				
Maintenance and repair work only a operation.	at facilities which a	re not in operation	n. Minor cleaning tasks	s may be co	onducted under
Conditions and measures related	l to personal prot	ection, hygiene	and health evaluatior	ı	
Wear respiratory protection providin specification, refer to section 8 of th		gned protection fa	actor of 10 (a minimum	efficiency	of 90%). For further
Use suitable eye protection. For fu	ther specification,	refer to section 8	of the SDS.		
Wear suitable gloves tested to EN3	74. For further spe	ecification, refer to	section 8 of the SDS.		
SECTION 3:	17.3 Exposure	e estimation			
3.1 Environment	_				
Release estimation method: Estimation	ated release factor				
			Release rate		
	Wa	ater	Air		Soil
Industrial use of cobalt in passivation processes in surface treatment ES 1 STP Discharge	0.125	0.125 kg/day		0.05 kg/day	
Industrial use of cobalt in passivation processes in surface treatment ES 2 Direct Discharge	0.125	kg/day	0.05 kg/day	,	0 kg/day
Industrial use of cobalt in passivation processes in surface treatment ES 3 Marine Discharge	0.125	kg/day	0.05 kg/day		0 kg/day
Industrial use of cobalt in passivation	on processes in su	rface treatment E	S 1 STP Discharge		
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk ch	aracterisation ratio (RCR)
Fresh water			3E-4 mg/l SES 2.1.2)		0.206
Sedimentation (Fresh water)		8.81 mg/kg dw (PEC sediment calculation method for metals)		0.164	
Sewage Treatment Plant		0.037 mg/l (EUSES 2.1.2)			0.101
Agricultural soil		1.292 mg/kg dw (EUSES 2.1.2)			0.119
Man via Environment - Inhalation (S	systemic effects)		E-6 mg/m³ SES 2.1.2)		< 0.01
Man via Environment - Inhalation (L	ocal effects)		E-6 mg/m³ SES 2.1.2)		< 0.01
Man via Environment - Oral			ng/kg bw/day sured data)		0.036

Man via Environment - Combined routes		0.037
Industrial use of cobalt in passivation processes in su	rface treatment ES 2 Direct Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Fresh water	2.32E-4 mg/l (EUSES 2.1.2)	0.218
Sedimentation (Fresh water)	9.32 mg/kg dw (PEC sediment calculation method for metals)	0.173
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.24E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.037
Industrial use of cobalt in passivation processes in su	rface treatment ES 3 Marine Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	0.286 µg/l (Clocal calculation with Kp susp. matter marine)	0.121
Sedimentation (Marine water)	36.42 mg/kg dw (PEC sediment calculation method for metals)	0.522
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	6.24E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.036
3.2 Worker		
Raw material handling (PROC 21)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term	8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term	62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.168

Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	2.1 µg/m³	0.039
Inhalation, Local effects, Long Term	2.1 µg/m³	0.053
Dermal, Systemic effects, Long Term	0.4 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long	Term	0.039
Passivation (PROC 13)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	2 µg/m³ (MEASE)	0.037
Inhalation, Local effects, Long Term	2 µg/m³ (MEASE)	0.05
Dermal, Systemic effects, Long Term	0.1 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long	Term	0.037
Packaging and handling of passivated arti	cles (PROC 21)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term	8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term	62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long	Term	0.168
Cleaning & Maintenance (PROC 28)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10.9 µg/m³	0.201
Inhalation, Local effects, Long Term	10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term	74.7 μg/kg bw/day	0.01
Combined routes, Systemic effects, Long	Term	0.212
	4 Guidance to DU to evaluate whether he v ∋ ES	vorks inside the boundaries set by
Health/ Environment		

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

18. Exposure Scenario 18: Use at industrial sites; Passivation processes in surface treatment at large industrial sites with continuous processes

Metal surface treatment products PC 14 Sectors of use [SU] SU 15 Contributing scenario controlling environmental exposure SU 15 Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes in surface treatment at large industrial sites with continuous processes in surface treatment at large industrial sites with continuous processes in surface treatment at large industrial sites with continuous processes in surface treatment at large industrial sites with continuous processes ES 3 Marine Discharge ERC5 Contributing scenario controlling worker exposure Raw material handling (exclusively very low dusty forms as input materials) PROC 21 Passivation PROC 2, PROC 13 Passivation Packaging and handling of passivated articles PROC 21 Subsequent service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 Sectron 2: 18.2 Operational conditions and risk management measures ES22 2.1 Contributing scenario controlling norifoces insurface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) ES22 Sectros 1: Passivation processes in surface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) ES22 <th>SECTION 1:</th> <th>18.1 Title of exposure scenario</th> <th></th>	SECTION 1:	18.1 Title of exposure scenario	
Vectal surface treatment products PC 14 Sectors of use [SU] Surface treatment products, except machinery and equipment SU 15 Contributing scenario controlling environmental exposure Passivation processes is S1 STP Discharge ERC5 Passivation processes ES S1 Det Collocharge ERC5 ERC5 Passivation processes ES S1 Marine Discharge ERC5 Passivation processes ES S1 StrP Discharge ERC5 Passivation processes ES S1 Marine Discharge ERC5 Passivation processes ES S1 Marine Discharge ERC5 Contributing scenario controlling worker exposure Raw material handling (exclusively very low dusty forms as input materials) PROC 21 Passivation PROC 2, PROC 13 Packaging and handling of passivated articles PROC 21 Subsequent service life exposure scenario(s) Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 ES22 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 ES22 Service life (professional worker); Professional handling of surface treated articles on pasivation processes ES 1 STP Discharge (ERC 5) ES22 Prof 14 Contributing scenari			s in surface treatment at large industrial
Sectors of use [SU] SU 15 Wanufacture of fabricated metal products, except machinery and equipment SU 15 Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge ERC5 Passivation processes is surface treatment at large industrial sites with continuous processes ES 21 STP Discharge ERC5 Passivation processes ES 21 STP Discharge ERC5 Passivation processes ES 21 StrIP Discharge ERC5 Passivation processes ES 21 Marine Discharge ERC5 Passivation processes ES 21 Marine Discharge ERC5 Passivation processes ES 21 Marine Discharge ERC5 Contributing scenario controlling worker exposure Raw material handling (exclusively very low dusty forms as input materials) PROC 21 Passivation PROC 21 Passivation PROC 21 Subsequent service life exposure scenario(S) Esc1 Esc1 Esc2 Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES22 Esc2 Service life (Professional worker); Professional handling of surface treated articles (passivated plated/sprayed) ES22 Esc2 Service life (Professional worker); Professional handling of surface treated articles	Chemical product category [PC]		
Wanufacture of fabricated metal products, except machinery and equipment SU 15 Contributing scenario controlling environmental exposure ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes ES 2 Direct Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes ES 3 Marine Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes ES 3 Marine Discharge PROC 21 Passivation processes IS surface treatment at large industrial sites with continuous processes ES 1 GTP Discharge PROC 21 Passivation PROC 2, PROC 13 Passivation PROC 2, PROC 13 Passivation PROC 21 Subsequent service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 Service life (worker at industrial site); Industrial handling of surface treatment at large industrial sites with continuou processes IS S1 STP Discharge (ERC 6) ES22 EECTION 2: 18.2 Operational conditions and risk management measures EA 2.1 Contributing scenario controlling environmental exposure Envice (ERC 6)	Metal surface treatment products		PC 14
Contributing scenario controlling environmental exposure Passivation processes in surface treatment at large industrial sites with continuous processes IS 1 STP Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes IS 2 Direct Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes IS 3 Marine Discharge ERC5 Contributing scenario controlling worker exposure ERC5 Raw material handling (exclusively very low dusty forms as input materials) PROC 21 Passivation PROC 2, PROC 13 Passivation PROC 21 Subsequent service life exposure scenario(S) ES21 Service life (vorker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES22 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure Pasivation processes IS STPT Discharge (ERC 5) Erequency and duration of use Service life exposure scenario(s) Erectostatic precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange.	Sectors of use [SU]		
Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes E2 Direct Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes E3 3 Marine Discharge ERC5 Contributing scenario controlling worker exposure ERC5 Raw material handling (exclusively very low dusty forms as input materials) PROC 21 Passivation PROC 2, PROC 13 Passivation PROC 21 Subsequent service life exposure scenario(s) ES21 Service life (worker at industrial site): Industrial handling of surface treated articles (passivated/plated/sprayed) ES22 Service life (Professional worker): Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1.1 Passivation processes in surface treated articles of advs/year Ensistion days >= 160 days/year Escharge Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or ceramic/	Manufacture of fabricated metal pr	oducts, except machinery and equipment	SU 15
continuous processes ES 1 STP Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes ES 2 Direct Discharge ERC5 Passivation processes in surface treatment at large industrial sites with continuous processes ES 3 Marine Discharge ERC5 Contributing scenario controlling worker exposure ERC5 Raw material handling (exclusively very low dusty forms as input materials) PROC 21 Passivation PROC 2, PROC 13 Passivation PROC 21 Subsequent service life exposure scenario(s) ES21 Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES22 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1 Passivation processes IS 1STP Discharge (ERC 5) Frequency and duration of use Esclassion and measures to reduce or limit discharges, air emissions and releases to soil Cally amount per site <= 0.025 tonnes/day	Contributing scenario controllin	g environmental exposure	
continuous processes ES 2 Direct Discharge ERC5 Passivation processes IS 3 Marine Discharge ERC5 Contributing scenario controlling worker exposure PROC 21 Passivation PROC 2, PROC 13 Passivation PROC 21 Passivation PROC 21 Passivation PROC 21 Subsequent service life exposure scenario(s) PROC 21 Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 Service life (worker at worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1 Passivation processes in surface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Passivation processes in surface treatment at large industrial sites with continuou processes is or inductorable precipitator or wet electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or scrubber. Chemical precipitation or sedimentation or filtration or electrolysis or			ERC5
contributing scenario controlling worker exposure Raw material handling (exclusively very low dusty forms as input materials) PROC 21 Passivation PROC 2, PROC 13 Packaging and handling of passivated articles PROC 21 Subsequent service life exposure scenario(s) ES21 Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1.1 Passivation processes in surface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) Frequency and duration of use			ERC5
Raw material handling (exclusively very low dusty forms as input materials) PROC 21 Passivation PROC 2, PROC 13 Packaging and handling of passivated articles PROC 21 Subsequent service life exposure scenario(s) ES21 Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1.1 Passivation processes in surface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 4 tonnes/year			ERC5
Passivation PROC 2, PROC 13 Packaging and handling of passivated articles PROC 21 Subsequent service life exposure scenario(s) ES21 Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1.1 Passivation processes in surface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 4 tonnes/year	Contributing scenario controllin	g worker exposure	
Packaging and handling of passivated articles PROC 21 Subsequent service life exposure scenario(s) Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1. Passivation processes in surface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 0.025 tonnes/day Annual amount per site <= 4 tonnes/year Emission days >= 160 days/year Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or scrubber. Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange. Conditions and measures related to municipal sewage treatment plant is assumed. Assumed domestic sewage treatment plant flow >= 2E3 m ³ /day Conditions and measures according to local regulations. Dther given operational conditions affecting environmental exposure	Raw material handling (exclusively	very low dusty forms as input materials)	PROC 21
Subsequent service life exposure scenario(s) Subsequent service life exposure scenario(s) Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1.1 Passivation processes in surface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 0.025 tonnes/day	Passivation		PROC 2, PROC 13
Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed) ES21 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 0.025 tonnes/day	Packaging and handling of passiva	ated articles	PROC 21
articles (passivated/plated/sprayed) ES22 Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed) ES22 SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1 Passivation processes in surface treatment at large industrial sites with continuou processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 0.025 tonnes/day	Subsequent service life exposur	re scenario(s)	
articles (passivated/plated/sprayed) SECTION 2: 18.2 Operational conditions and risk management measures 2.1 Contributing scenario controlling environmental exposure 2.1.1 Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 0.025 tonnes/day			ES21
2.1 Contributing scenario controlling environmental exposure 2.1.1 Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 0.025 tonnes/day			ES22
2.1.1 Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 0.025 tonnes/day	SECTION 2:	18.2 Operational conditions and risk man	agement measures
processes ES 1 STP Discharge (ERC 5) Frequency and duration of use Daily amount per site <= 0.025 tonnes/day	2.1	Contributing scenario controlling enviror	nmental exposure
Daily amount per site <= 0.025 tonnes/day Annual amount per site <= 4 tonnes/year Emission days >= 160 days/year Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or scrubber. Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange. Conditions and measures related to municipal sewage treatment plant Municipal sewage treatment plant is assumed. Assumed domestic sewage treatment plant flow >= 2E3 m ³ /day Conditions and measures related to external treatment of waste for disposal Dispose of waste product or used containers according to local regulations. Other given operational conditions affecting environmental exposure	2.1.1		at large industrial sites with continuous
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Other given operational conditions affecting environmental exposure	Conditions and measures relate	d to external treatment of waste for dispos	al
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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. Use suitable eye protection. For further specification, refer to section 8 of the SDS.	Automated task.	
inhalation exposure to the substance can be excluded. For further specification, refer to section 8 of the SDS. Use suitable eye protection. For further specification, refer to section 8 of the SDS.	Conditions and measures relate	d 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 fu	rther specification, refer to section 8 of the SDS.
	Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.

2.2.2	Passivation (PROC 2, PROC 13)		
Product characteristics			
Physical form of product: Aqueous	solution		
Maximum emission potential: Very	low		
Covers percentage substance in the	e product up to 5 %.		
Frequency and duration of use			
Covers daily exposures up to 8 hou	rs.		
Technical conditions and measu	res to control dispersion from so	urce towards the worker	
Automated task.			
Use of an integrated local exhaust	ventilation is required. Inhalation - m	ninimum efficiency of 90 %	
Use in closed process.			
Conditions and measures related	to personal protection, hygiene	and health evaluation	
	ng a minimum assigned protection face are can be excluded. For further spec		
Use suitable eye protection. For fur	ther specification, refer to section 8	of the SDS.	
	74. For further specification, refer to		
2.2.3	Packaging and handling of passiva	ted articles (PROC 21)	
Product characteristics			
Physical form of product: Massive of	biect		
Maximum emission potential: Very			
Covers percentage substance in the			
Frequency and duration of use			
Covers daily exposures up to 8 hou	rs.		
	res to control dispersion from so	urce towards the worker	
Covers use at ambient temperature			
Automated task.	-		
	l to personal protection, hygiene	and health evaluation	
Wear respiratory protection providir	ng a minimum assigned protection face e can be excluded. For further spec	actor of 10 (a minimum efficienc	
Use suitable eye protection. For fur			
Wear suitable gloves tested to EN3			
SECTION 3:	18.3 Exposure estimation		
3.1 Environment			
	tod roloooo footor		
Release estimation method: Estima			
		Release rate	-
	Water	Air	Soil
Passivation processes in surface treatment at large industrial sites with continuous processes ES 1 STP Discharge	0.125 kg/day	0.05 kg/day	0 kg/day
Passivation processes in surface treatment at large industrial sites with continuous processes ES 2 Direct Discharge	0.125 kg/day	0.05 kg/day	0 kg/day
Passivation processes in surface treatment at large industrial sites with continuous processes ES 3	0.125 kg/day	0.05 kg/day	0 kg/day

Passivation processes in surface treatment at large in	dustrial sites with continuous processes	ES 1 STP Discharge
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Fresh water	2.18E-4 mg/l (EUSES 2.1.2)	0.206
Sedimentation (Fresh water)	8.81 mg/kg dw (PEC sediment calculation method for metals)	0.164
Sewage Treatment Plant	0.037 mg/l (EUSES 2.1.2)	0.101
Agricultural soil	1.292 mg/kg dw (EUSES 2.1.2)	0.119
Man via Environment - Inhalation (Systemic effects)	6.24E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.2E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.037
Passivation processes in surface treatment at large in	dustrial sites with continuous processes	ES 2 Direct Discharge
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Fresh water	2.32E-4 mg/l (EUSES 2.1.2)	0.218
Sedimentation (Fresh water)	9.32 mg/kg dw (PEC sediment calculation method for metals)	0.173
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	6.24E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.24E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.037
Passivation processes in surface treatment at large in	dustrial sites with continuous processes	ES 3 Marine Discharge
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	0.286 µg/l (Clocal calculation with Kp susp. matter marine)	0.121
Sedimentation (Marine water)	36.42 mg/kg dw (PEC sediment calculation method for metals)	0.522
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	6.24E-6 mg/m ³	< 0.01

		(EUSES 2.1.2)	
Man via Environment - Inhalation (Loo	al effects)	6.24E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral		3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes			0.036
3.2 Worker			
Raw material handling (exclusively ve	ery low dusty form	ns as input materials) (PROC 21)	
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		8.6 µg/m³	0.159
Inhalation, Local effects, Long Term		8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term		0.8 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			0.159
Passivation (PROC 2, PROC 13)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	erm	1 μg/m³ (MEASE, PROC 2)	0.018
Inhalation, Local effects, Long Term		1 µg/m³ (MEASE, PROC 2)	0.025
Dermal, Systemic effects, Long Term		0.024 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, I	ong Term		0.018
Packaging and handling of passivate	d articles (PROC	21)	
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	erm	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term		8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term		62.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, I	ong Term		0.168
SECTION 4:	18.4 Guidance the ES	to DU to evaluate whether he works	s inside the boundaries set I
Health/ Environment			
are met or the downstream user can management measures are adequate exposure to a level below the DNEL above) as given below. If measured of MEASE (www.ebrc.de/mease.html) to	demonstrate on h e. For human hea given that the pro lata are not avail o estimate the as	ither the proposed risk management m his own that his operational conditions a lith, this has to be done by showing that pocesses and activities in question are of able, the DU may make use of an appro- sociated exposure. For the environmer he respective environmental compartme	and implemented risk it they limit the inhalation covered by the PROCs listed opriate scaling tool such as it, this has to be done by

available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.archeconsulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

19. Exposure Scenario 19: Use at industrial sites; Industrial use of cobalt in plating processes in surface treatment

Chemical product category [PC]	Use at industrial sites; Industrial use of coba	It in plating processes in surface treatment	
Chemical product category [PC	Use at industrial sites; Industrial use of cobalt in plating processes in surface treatment		
]		
Metal surface treatment products		PC 14	
Contributing scenario controllir	ng environmental exposure		
Industrial use of cobalt in plating p Discharge	processes in surface treatment ES 1 STP	ERC5	
Industrial use of cobalt in plating p Discharge	processes in surface treatment ES 2 Direct	ERC5	
Industrial use of cobalt in plating processes in surface treatment ES 3 Marine ERC5 Discharge			
Contributing scenario controllir	ng worker exposure	•	
Raw material handling		PROC 21	
Wet processes	Vet processes PROC 2, PROC 1		
Plating		PROC 13	
Handling of coated/plated articles		PROC 21	
Cleaning & Maintenance		PROC 28	
Subsequent service life exposu	re scenario(s)		
	te); Industrial handling of surface treated	ES21	
articles (passivated/plated/sprayed			
Service life (Professional worker); articles (passivated/plated/sprayed	Professional handling of surface treated d)	ES22	
Service life (Consumer); Handling	of heat and wear resistant vehicle parts	ES23	
SECTION 2:	19.2 Operational conditions and risk man	agement measures	
2.1	Contributing scenario controlling environ	mental exposure	
2.1.1	Industrial use of cobalt in plating processes i (ERC 5)	n surface treatment ES 1 STP Discharge	
Frequency and duration of use			
Daily amount per site <= 0.025 tor	nnes/day		
Annual amount per site <= 4 tonne	es/year		
Emission days >= 160 days/year			
Technical onsite conditions and	d measures to reduce or limit discharges, ai	r emissions and releases to soil	
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bac	g filter or ceramic/metal mesh filter or wet	
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osn	nosis or ion exchange.	
Conditions and measures relate	ed to municipal sewage treatment plant		
Municipal sewage treatment plant	is assumed.		
Assumed domestic sewage treatment	nent plant flow >= 2E3 m³/day		
Conditions and measures relate	ed to external treatment of waste for dispos	al	
Dispose of waste product or used	containers according to local regulations.		
Other given operational conditional	ons affecting environmental exposure		
No discharge to marine water ass	umed.		
. te alconargo to manno water abb			

2.1.2	Industrial use of cobalt in plating processes in surface treatment ES 2 Direct Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 0.025 tor	ines/day
Annual amount per site <= 4 tonne	year
Emission days >= 160 days/year	
Technical onsite conditions and	measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sediment	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow fi	rom site >= 2E3 m3/day
Local freshwater dilution factor 300).
2.1.3	Industrial use of cobalt in plating processes in surface treatment ES 3 Marine Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 0.025 tor	ines/day
Annual amount per site <= 4 tonne	es/year
Emission days >= 160 days/year	
Technical onsite conditions and	measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sediment	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow fi	rom site >= 2E3 m3/day
No discharge to freshwater assum	ed.
Local marine water dilution factor	100.
2.2	Contributing scenario controlling worker exposure
2.2.1	Raw material handling (PROC 21)
Product characteristics	
Physical form of product: Massive	object
Maximum emission potential: Very	' low
Covers percentage substance in th	ne product up to 100 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and measu	ires to control dispersion from source towards the worker
Covers use at ambient temperatur	es.
Conditions and measures relate	d to personal protection, hygiene and health evaluation
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ace can be excluded. For further specification, refer to section 8 of the SDS.
Use suitable eye protection. For fu	In the specification, refer to section 8 of the SDS.
	374. For further specification, refer to section 8 of the SDS.

2.2.2	Wet processes (PROC 2, PROC 1)
Product characteristics	
Physical form of product: Aqueous	s solution
Maximum emission potential: Very	/ low
Covers percentage substance in t	he product up to 100 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and measure	ures to control dispersion from source towards the worker
Covers use at ambient temperature	es.
Semi-automated task.	
Vapour extraction units in the tank of 90 %	:: Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency
Use in closed process.	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation
Wear respiratory protection provid specification, refer to section 8 of	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.
Use suitable eye protection. For fu	In the specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.
2.2.3	Plating (PROC 13)
Product characteristics	
Physical form of product: Aqueous	solution
Maximum emission potential: Very	/ low
Covers percentage substance in t	he product up to 100 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and meas	ures to control dispersion from source towards the worker
Covers use at ambient temperature	es.
Semi-automated task.	
Vapour extraction units in the tank of 90 %	:: Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency
Use in closed process.	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation
Wear respiratory protection provid specification, refer to section 8 of	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.
2.2.4	Handling of coated/plated articles (PROC 21)
Product characteristics	
Physical form of product: Massive	object
Maximum emission potential: Very	/ low
Covers percentage substance in t	he product up to 100 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and meas	ures to control dispersion from source towards the worker
Covers use at ambient temperature	res.

Conditions and measures related t	o personal prot	ection, hygiene	and health evaluation	1
Wear respiratory protection providing inhalation exposure to the substance		• •	(, , , , , , , , , , , , , , , , , , ,
Use suitable eye protection. For furth	er specification,	refer to section 8	of the SDS.	
Wear suitable gloves tested to EN374	4. For further spe	cification, refer to	section 8 of the SDS.	
2.2.5	Cleaning & Mainte	enance (PROC 2	3)	
Product characteristics				
Physical form of product: Dried splas	hes/overspill.			
Maximum emission potential: Mediun	n			
Frequency and duration of use				
Covers daily exposures up to 8 hours	S.			
Technical conditions and measure	s to control dis	persion from so	urce towards the wor	ker
Process is carried out at ambient pre	ssure.			
Covers use at ambient temperatures				
Maintenance and repair work only at operation.	facilities which a	re not in operatio	n. Minor cleaning tasks	may be conducted under
Conditions and measures related t	o personal prot	ection, hygiene	and health evaluation	1
Wear respiratory protection providing specification, refer to section 8 of the		gned protection f	actor of 10 (a minimum	efficiency of 90%). For furthe
Use suitable eye protection. For furth	er specification,	refer to section 8	of the SDS.	
Wear suitable gloves tested to EN374	4. For further spe	ecification, refer to	section 8 of the SDS.	
SECTION 3:	19.3 Exposure	estimation		
3.1 Environment				
Release estimation method: Estimate	ed release factor			
			Release rate	
	Wa	ater	Air	Soil
Industrial use of cobalt in plating processes in surface treatment ES 1 STP Discharge	0.125	kg/day	0.05 kg/day	0 kg/day
Industrial use of cobalt in plating processes in surface treatment ES 2 Direct Discharge	0.125	kg/day	0.05 kg/day	0 kg/day
Industrial use of cobalt in plating processes in surface treatment ES	0.125 kg/day		0.05 kg/day	0 kg/day
3 Marine Discharge				
_	cesses in surface	treatment ES 1	STP Discharge	
3 Marine Discharge Industrial use of cobalt in plating proc Protection target	cesses in surface	Exposure (PEC, Pred	STP Discharge concentration icted Exposure entration)	Risk characterisation rati (RCR)
Industrial use of cobalt in plating proc	cesses in surface	Exposure (PEC, Pred Conc 2.1	concentration licted Exposure	Risk characterisation rati (RCR) 0.206
Industrial use of cobalt in plating proc Protection target	cesses in surface	Exposure (PEC, Pred Conc 2.14 (EUS 8.81 (PEC sedimen	concentration licted Exposure entration) BE-4 mg/l	(RCR)
Industrial use of cobalt in plating proc Protection target Fresh water	cesses in surface	Exposure (PEC, Pred Conc 2.11 (EUS 8.81 (PEC sedimen for 0.0	concentration icted Exposure entration) BE-4 mg/l BES 2.1.2) mg/kg dw t calculation method	(RCR) 0.206

Man via Environment - Inhalation (Systemic effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.2E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.037
Industrial use of cobalt in plating processes in surface	treatment ES 2 Direct Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Fresh water	2.32E-4 mg/l (EUSES 2.1.2)	0.218
Sedimentation (Fresh water)	9.32 mg/kg dw (PEC sediment calculation method for metals)	0.173
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	6.24E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.24E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.037
Industrial use of cobalt in plating processes in surface	treatment ES 3 Marine Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	0.286 μg/l (Clocal calculation with Kp susp. matter marine)	0.121
Sedimentation (Marine water)	36.42 mg/kg dw (PEC sediment calculation method for metals)	0.522
· · ·	(PEC sediment calculation method	0.522
Agricultural soil	(PEC sediment calculation method for metals) 0.239 mg/kg dw	
Agricultural soil Man via Environment - Inhalation (Systemic effects)	(PEC sediment calculation method for metals) 0.239 mg/kg dw (EUSES 2.1.2) 6.24E-6 mg/m ³	0.022
Sedimentation (Marine water) Agricultural soil Man via Environment - Inhalation (Systemic effects) Man via Environment - Inhalation (Local effects) Man via Environment - Oral	(PEC sediment calculation method for metals) 0.239 mg/kg dw (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 6.24E-6 mg/m ³	0.022
Agricultural soil Man via Environment - Inhalation (Systemic effects) Man via Environment - Inhalation (Local effects) Man via Environment - Oral	(PEC sediment calculation method for metals) 0.239 mg/kg dw (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 3.17E-4 mg/kg bw/day	0.022 < 0.01 < 0.01
Agricultural soil Man via Environment - Inhalation (Systemic effects) Man via Environment - Inhalation (Local effects) Man via Environment - Oral Man via Environment - Combined routes	(PEC sediment calculation method for metals) 0.239 mg/kg dw (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 3.17E-4 mg/kg bw/day	0.022 < 0.01 < 0.01 0.036
Agricultural soil Man via Environment - Inhalation (Systemic effects) Man via Environment - Inhalation (Local effects) Man via Environment - Oral Man via Environment - Combined routes 3.2 Worker	(PEC sediment calculation method for metals) 0.239 mg/kg dw (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 3.17E-4 mg/kg bw/day	0.022 < 0.01 < 0.01 0.036
Agricultural soil Man via Environment - Inhalation (Systemic effects) Man via Environment - Inhalation (Local effects)	(PEC sediment calculation method for metals) 0.239 mg/kg dw (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 3.17E-4 mg/kg bw/day	0.022 < 0.01 < 0.01 0.036
Agricultural soil Man via Environment - Inhalation (Systemic effects) Man via Environment - Inhalation (Local effects) Man via Environment - Oral Man via Environment - Combined routes 3.2 Worker Raw material handling (PROC 21)	(PEC sediment calculation method for metals) 0.239 mg/kg dw (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 6.24E-6 mg/m ³ (EUSES 2.1.2) 3.17E-4 mg/kg bw/day (Measured data)	0.022 < 0.01 < 0.01 0.036 0.036 Risk characterisation

		62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.168
Wet processes (PROC 2, PROC 1)		·	·
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	2.1 µg/m³	0.039
Inhalation, Local effects, Long Term		2.1 µg/m³	0.053
Dermal, Systemic effects, Long Term		0.4 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.039
Plating (PROC 13)		<u></u>	
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	2.1 µg/m³	0.039
Inhalation, Local effects, Long Term		2.1 µg/m³	0.053
Dermal, Systemic effects, Long Term		1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.039
Handling of coated/plated articles (PR	ROC 21)		
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term		8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term		62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.168
Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	rm	10.9 µg/m³	0.201
Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		74.7 µg/kg bw/day	0.01
Combined routes, Systemic effects, L	ong Term		0.212
SECTION 4:	19.4 Guidance the ES	to DU to evaluate whether he	works inside the boundaries set b

above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by

showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

20. Exposure Scenario 20: Use at industrial sites; Industrial use of cobalt in thermal spraying in surface treatment

SECTION 1:	20.1 Title of exposure scenario		
	Use at industrial sites; Industrial use of coba	It in thermal spraying in surface treatment	
Chemical product category [PC]			
Metal surface treatment products		PC 14	
Contributing scenario controllin	g environmental exposure		
Industrial use of cobalt in thermal	spraying in surface treatment ES 1 STP	ERC5	
Industrial use of cobalt in thermal Discharge	spraying in surface treatment ES 2 Direct	ERC5	
Industrial use of cobalt in thermal	e of cobalt in thermal spraying in surface treatment ES 3 Marine ERC5		
Contributing scenario controllin	g worker exposure		
Preparation of massive spraying n	naterials (e.g. wires)	PROC 21	
Preparation of dusty spraying mate	erials	PROC 26	
Thermal spraying– fully automated	1	PROC 1, PROC 7	
Finishing of massive objects		PROC 24	
Handling and packaging of finishe	d massive	PROC 21	
Cleaning & Maintenance		PROC 28	
Subsequent service life exposu	re scenario(s)		
Service life (worker at industrial sit articles (passivated/plated/sprayed	e); Industrial handling of surface treated	ES21	
Service life (Professional worker); articles (passivated/plated/sprayed	Professional handling of surface treated	ES22	
Service life (Consumer); Handling	of heat and wear resistant vehicle parts	ES23	
SECTION 2:	20.2 Operational conditions and risk man	agement measures	
2.1	Contributing scenario controlling environ	mental exposure	
2.1.1	Industrial use of cobalt in thermal spraying ir (ERC 5)	surface treatment ES 1 STP Discharge	
Frequency and duration of use			
Daily amount per site <= 0.025 tor	nes/day		
Annual amount per site <= 4 tonne	es/year		
Emission days >= 160 days/year			
Technical onsite conditions and	measures to reduce or limit discharges, a	r emissions and releases to soil	
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag	g filter or ceramic/metal mesh filter or wet	
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osn	nosis or ion exchange.	

Conditions and mossures relate	d to municipal sowage treatment plant
Municipal sewage treatment plant	d to municipal sewage treatment plant
Assumed domestic sewage treatment	
	d to external treatment of waste for disposal
	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
No discharge to marine water assu	
Local freshwater dilution factor 20	
2.1.2	Industrial use of cobalt in thermal spraying in surface treatment ES 2 Direct Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 0.025 tor	nes/day
Annual amount per site <= 4 tonne	
Emission days >= 160 days/year	
	measures to reduce or limit discharges, air emissions and releases to soil
	ctrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow f	rom site >= 2E3 m3/day
Local freshwater dilution factor 30).
2.1.3	Industrial use of cobalt in thermal spraying in surface treatment ES 3 Marine Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 0.025 tor	nes/day
Annual amount per site <= 4 tonne	es/year
Emission days >= 160 days/year	
Technical onsite conditions and	measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ctrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow f	rom site >= 2E3 m3/day
No discharge to freshwater assum	ed.
Local marine water dilution factor	100.
2.2	Contributing scenario controlling worker exposure
2.2.1	Preparation of massive spraying materials (e.g. wires) (PROC 21)
Product characteristics	
Physical form of product: Massive	object
Maximum emission potential: Very	low
Covers percentage substance in the	ne product up to 100 %.

Frequency and duration of use					
Covers daily exposures up to 8 hours.					
Technical conditions and measu	ures to control dispersion from source towards the worker				
Covers use at ambient temperatur	es.				
Conditions and measures relate	ed to personal protection, hygiene and health evaluation				
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.				
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.				
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.				
2.2.2	Preparation of dusty spraying materials (PROC 26)				
Product characteristics					
Physical form of product: Solid, me	edium dustiness				
Covers percentage substance in the	he product up to 100 %.				
Frequency and duration of use					
Covers daily exposures up to 8 ho	urs.				
Technical conditions and measu	ures to control dispersion from source towards the worker				
Covers use at ambient temperatur	es.				
Use of an integrated local exhaust	ventilation is required. Inhalation - minimum efficiency of 90 %				
Conditions and measures relate	ed to personal protection, hygiene and health evaluation				
Wear respiratory protection provid specification, refer to section 8 of 1	ing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). For further the SDS.				
Use suitable eye protection. For fu	Irther specification, refer to section 8 of the SDS.				
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.				
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.				
2.2.3	Thermal spraying – fully automated (PROC 1, PROC 7)				
Product characteristics					
Physical form of product: Solid, Po	owder / Dust				
Maximum emission potential: High	n (temperature based)				
Covers percentage substance in the	he product up to 100 %.				
Frequency and duration of use					
Covers daily exposures up to 8 ho	urs.				
Technical conditions and measu	ures to control dispersion from source towards the worker				
Limit the process temperature dur	ing flame spraying to 3.1E3 °C.				
Limit the process temperature dur	ing plasma spraying to 3E4 °C.				
High pressure applied during plass	High pressure applied during plasma and high-velocity flame spraying.				
Automated task.					
Ensure complete segregation.					
Use in closed process.					
Conditions and measures relate	ed to personal protection, hygiene and health evaluation				
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.				
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.				

Wear suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.

2.2.4	Finishing of massive objects (PROC 24)
Product characteristics	
Physical form of product:	ssive object
Maximum emission poten	: Low (abrasion based)
Covers percentage substa	e in the product up to 90 %.
Frequency and duration	use
Covers daily exposures up	9 8 hours.
Technical conditions an	neasures to control dispersion from source towards the worker
Covers use at ambient ter	eratures.
Conditions and measure	related to personal protection, hygiene and health evaluation
	providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ubstance can be excluded. 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 suitable gloves teste	to EN374. For further specification, refer to section 8 of the SDS.
2.2.5	Handling and packaging of finished massive (PROC 21)
Product characteristics	
Physical form of product:	ssive object
Maximum emission poten	: Very low
Covers percentage substa	e in the product up to 100 %.
Frequency and duration	use
Covers daily exposures up) 8 hours.
Technical conditions an	neasures to control dispersion from source towards the worker
Process is carried out at a	pient pressure.
Covers use at ambient ter	eratures.
Conditions and measure	related to personal protection, hygiene and health evaluation
	providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ubstance can be excluded. 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 suitable gloves teste	to EN374. For further specification, refer to section 8 of the SDS.
2.2.6	Cleaning & Maintenance (PROC 28)
Product characteristics	
Physical form of product:	id, high dustiness
Frequency and duration	-
Covers daily exposures up) 8 hours.
Technical conditions an	neasures to control dispersion from source towards the worker
Process is carried out at a	
Covers use at ambient ter	eratures.
Maintenance and repair w operation.	conly at facilities which are not in operation. Minor cleaning tasks may be conducted under
Conditions and measure	related to personal protection, hygiene and health evaluation
Wear respiratory protection specification, refer to sect	providing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). For further 8 of the SDS.
Use suitable eye protection	For further specification, refer to section 8 of the SDS.
Wear suitable gloves teste	to EN374. For further specification, refer to section 8 of the SDS.

SECTION 3:	20.3 Exposure	estimation				
3.1 Environment						
Release estimation method: Estimate	ed release factor					
			Release rate			
	Wa	ater	Air		Soil	
Industrial use of cobalt in thermal spraying in surface treatment ES 1 STP Discharge	0.125	kg/day	0.05 kg/day	0 kg/day		
Industrial use of cobalt in thermal spraying in surface treatment ES 2 Direct Discharge	0.125	kg/day	0.05 kg/day	/	0 kg/day	
Industrial use of cobalt in thermal spraying in surface treatment ES 3 Marine Discharge	0.125	i kg/day 0.05 kg/day		/	0 kg/day	
Industrial use of cobalt in thermal spr	aying in surface	treatment ES 1 S	TP Discharge			
Protection target		(PEC, Pred	concentration licted Exposure entration)	Risk cha	racterisation ratio (RCR)	
Fresh water			8E-4 mg/l SES 2.1.2)		0.206	
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method · metals)		0.164	
Sewage Treatment Plant			037 mg/l SES 2.1.2)		0.101	
Agricultural soil			2 mg/kg dw SES 2.1.2)		0.119	
Man via Environment - Inhalation (System)	stemic effects)		E-6 mg/m³ SES 2.1.2)		< 0.01	
Man via Environment - Inhalation (Loo	cal effects)		E-6 mg/m³ SES 2.1.2)		< 0.01	
Man via Environment - Oral			mg/kg bw/day sured data)		0.036	
Man via Environment - Combined rou	tes				0.037	
Industrial use of cobalt in thermal spr	aying in surface	treatment ES 2 D	irect Discharge			
Protection target		(PEC, Pred	concentration licted Exposure centration)	Risk cha	racterisation ratio (RCR)	
Fresh water			2E-4 mg/l SES 2.1.2)		0.218	
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method ⁻ metals)		0.173	
Agricultural soil			9 mg/kg dw SES 2.1.2)		0.022	
Man via Environment - Inhalation (Sy	stemic effects)		E-6 mg/m³ SES 2.1.2)		< 0.01	
Man via Environment - Inhalation (Loo	cal effects)		E-6 mg/m³ SES 2.1.2)		< 0.01	
Man via Environment - Oral			mg/kg bw/day sured data)		0.036	

Man via Environment - Combined routes		0.037
Industrial use of cobalt in thermal spraying in surface	treatment ES 3 Marine Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	0.286 µg/l (Clocal calculation with Kp susp. matter marine)	0.121
Sedimentation (Marine water)	36.42 mg/kg dw (PEC sediment calculation method for metals)	0.522
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	6.24E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	6.24E-6 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.036
3.2 Worker		
Preparation of massive spraying materials (e.g. wires)) (PROC 21)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term	8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term	62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.168
Preparation of dusty spraying materials (PROC 26)		·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	23.5 μg/m³	0.434
Inhalation, Local effects, Long Term	23.5 µg/m³	0.588
Dermal, Systemic effects, Long Term	92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term		0.447
Thermal spraying – fully automated (PROC 1, PROC	7)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10 μg/m³ (MEASE, PROC 1)	0.185
Inhalation, Local effects, Long Term	10 µg/m ³ (MEASE, PROC 1)	0.25
Dermal, Systemic effects, Long Term	0.4 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.185

Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	23.6 µg/m³	0.436
Inhalation, Local effects, Long Term	23.6 µg/m³	0.59
Dermal, Systemic effects, Long Term	106.9 µg/kg bw/day	0.015
Combined routes, Systemic effects, Long Term		0.451
Handling and packaging of finished massive (PR	DC 21)	I
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term	8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term	62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.168
Cleaning & Maintenance (PROC 28)		I
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10.9 µg/m³	0.201
Inhalation, Local effects, Long Term	10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term	92.8 μg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term		0.214
SECTION 4: 20.4 Guid the ES	ance to DU to evaluate whether he	works inside the boundaries set
Health/ Environment		

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

21. Exposure Scenario 21: Service life (worker at industrial site); Industrial handling of surface treated articles (passivated/plated/sprayed)

SECTION 1:	21.1 Title of exposure scenario		
	Service life (worker at industrial site); Industr (passivated/plated/sprayed)	ial handling of surface treated articles	
Article Categories [AC]			
Machinery, mechanical appliances	s, electrical/electronic articles	AC2	
Metal articles		AC7	
Contributing scenario controllin	g environmental exposure		
Handling of surface treated articles	s (passivated/plated/sprayed)	ERC 12a	
Contributing scenario controllin	ng worker exposure		
Handling of articles	PROC 21		
Subsequent service life exposu	re scenario(s)		
Use at industrial sites; Industrial us surface treatment	se of cobalt in passivation processes in	ES17	
Use at industrial sites; Passivation industrial sites with continuous pro	processes in surface treatment at large ocesses	ES18	
Use at industrial sites; Industrial us treatment	se of cobalt in plating processes in surface	ES19	
Use at industrial sites; Industrial us treatment	se of cobalt in thermal spraying in surface	ES20	
SECTION 2:	21.2 Operational conditions and risk man	agement measures	
2.1	Contributing scenario controlling environ	mental exposure	
2.1.1	Handling of surface treated articles (passivat	ed/plated/sprayed) (ERC 12a)	
Frequency and duration of use			
Daily amount per site <= 6E-3 tonr	nes/day		
Annual amount per site <= 2.007 t	onnes/year		
Conditions and measures relate	d to municipal sewage treatment plant		
Municipal sewage treatment plant	is assumed.		
Assumed domestic sewage treatm	nent plant flow >= 2E3 m³/day		
Conditions and measures relate	d to external treatment of waste for dispose	al	
Dispose of waste product or used	containers according to local regulations.		
2.2	Contributing scenario controlling worker	exposure	
2.2.1	Handling of articles (PROC 21)		
Product characteristics			
Product characteristics Physical form of product: Massive	object		
	•		
Physical form of product: Massive	/ low		
Physical form of product: Massive Maximum emission potential: Very	/ low		
Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th	ne product up to 100 %.		
Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho	ne product up to 100 %.	ards the worker	
Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho	r low ne product up to 100 %. urs. ures to control dispersion from source towa	ards the worker	
Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu	r low ne product up to 100 %. urs. u res to control dispersion from source towa	ards the worker	

Conditions and measures related to personal protection, hygiene and health evaluation					
. , , , , , , , , , , , , , , , , , , ,	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.				
Use suitable eye protection. For further specification, refer to section 8 of the SDS.					
Wear suitable gloves tested to EN374	4. For further spec	ification, refer to	section 8 of the SDS.		
SECTION 3:	21.3 Exposure estimation				
3.1 Environment					
Release estimation method: Estimate	ed release factor				
			Release rate		
	Wat	er	Air		Soil
Handling of surface treated articles (passivated/plated/sprayed)	0 kg/	day	0 kg/day		0 kg/day
3.2 Worker					
Handling of articles (PROC 21)					
Exposure route		Exposure est	imation	Risk cl ratio (F	haracterisation RCR)
Inhalation, Systemic effects, Long Te	erm	8.6 µg/m³		0.159	
Inhalation, Local effects, Long Term		8.6 µg/m³		0.215	
Dermal, Systemic effects, Long Term		62.2 µg/kg bw	/day	< 0.01	
Combined routes, Systemic effects, L	ong Term			0.168	
SECTION 4:	21.4 Guidance to DU to evaluate whether he works inside the boundaries set the ES			boundaries set by	
Health/ Environment	Health/ Environment				
Health/ Environment The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche- consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.					

22. Exposure Scenario 22: Service life (Professional worker); Professional handling of surface treated articles (passivated/plated/sprayed)

SECTION 1:	22.1 Title of exposure scenario	
	Service life (Professional worker); Profession (passivated/plated/sprayed)	al handling of surface treated articles
Article Categories [AC]		
Machinery, mechanical appliances	s, electrical/electronic articles	AC2
Metal articles		AC7
Contributing scenario controllin	g environmental exposure	
Handling of surface treated articles	s (passivated/plated/sprayed)	ERC 10a, ERC 11a
Contributing scenario controllin	g worker exposure	
Handling of articles		PROC 21
Subsequent service life exposu	re scenario(s)	
Use at industrial sites; Industrial us surface treatment	se of cobalt in passivation processes in	ES17
Use at industrial sites; Passivation industrial sites with continuous pro	processes in surface treatment at large cesses	ES18
Use at industrial sites; Industrial us treatment	se of cobalt in plating processes in surface	ES19
Use at industrial sites; Industrial us treatment	se of cobalt in thermal spraying in surface	ES20
SECTION 2:	22.2 Operational conditions and risk mana	agement measures
2.1	Contributing scenario controlling environ	mental exposure
2.1.1	Handling of surface treated articles (passivat	ed/plated/sprayed) (ERC 10a, ERC 11a)
Conditions and measures relate	d to municipal sewage treatment plant	
Municipal sewage treatment plant	is assumed.	
Conditions and measures relate	d to external treatment of waste for disposa	al
Dispose of waste product or used	containers according to local regulations.	
2.2	Contributing scenario controlling worker	exposure
	Handling of articles (PROC 21)	
2.2.1		
Product characteristics		
Product characteristics Physical form of product: Massive	object	
Product characteristics Physical form of product: Massive Maximum emission potential: Very	object / low	
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th	object / low	
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use	object / low ne product up to 100 %.	
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho	object / low ne product up to 100 %.	Inds the worker
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu	object low ne product up to 100 %. urs. ures to control dispersion from source towa	ards the worker
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu	object r low ne product up to 100 %. urs. urs. ures to control dispersion from source towa	Irds the worker
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Covers use at ambient temperatur	object r low ne product up to 100 %. urs. urs. ures to control dispersion from source towa	Irds the worker
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in the Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Covers use at ambient temperatur Use in room with a volume of minin Indoor use.	object r low ne product up to 100 %. urs. urs. ures to control dispersion from source towa	
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Covers use at ambient temperatur Use in room with a volume of minin Indoor use. Conditions and measures relate Wear respiratory protection provide	object low ne product up to 100 %. urs. ures to control dispersion from source towa es. mum 1E3 m ³ .	h evaluation) (a minimum efficiency of 90%) unless
Product characteristics Physical form of product: Massive Maximum emission potential: Very Covers percentage substance in th Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and measu Covers use at ambient temperatur Use in room with a volume of minin Indoor use. Conditions and measures relate Wear respiratory protection providi inhalation exposure to the substan	object low he product up to 100 %. urs. urs. ures to control dispersion from source towa es. mum 1E3 m ³ . d to personal protection, hygiene and healt ing a minimum assigned protection factor of 10	h evaluation) (a minimum efficiency of 90%) unless refer to section 8 of the SDS.

SECTION 3:	22.3 Exposure	estimation				
3.1 Environment						
Release estimation method: Estimate	ed release factor					
	Release rate					
	Wat	ter	Air		Soil	
Handling of surface treated articles (passivated/plated/sprayed)	0 kg/day		0 kg/day		0 kg/day	
3.2 Worker	•					
Handling of articles (PROC 21)						
Exposure route		Exposure estimation		Risk characterisation ratio (RCR)		
Inhalation, Systemic effects, Long Term		8.6 µg/m³		0.159		
Inhalation, Local effects, Long Term		8.6 μg/m³		0.215		
Dermal, Systemic effects, Long Term		62.2 μg/kg bw/day		< 0.01		
Combined routes, Systemic effects, Long Term				0.168		
SECTION 4:	22.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES					
Health/ Environment						
The DU works inside the boundaries are met or the downstream user can management measures are adequate exposure to a level below the DNEL above) as given below. If measured of MEASE (www.ebrc.de/mease.html) t showing that they limit the PEC below available, the DU may make use of a consulting.be/Metal-CSA-toolbox/dus	demonstrate on h e. For human heal (given that the pro data are not availa o estimate the ass v the PNEC for the n appropriate scal	is own that his c th, this has to b cesses and acti- ble, the DU may sociated exposu e respective env- ling tool such as	perational conditions and e done by showing that the vities in question are cov y make use of an approprie. For the environment, vironmental compartment the DU-Scaling tool (http: the	d implem hey limit rered by t riate scal this has t If meas	ented risk the inhalation the PROCs listed ling tool such as to be done by ured data are not	

SECTION 1:	23.1 Title of exposure scenario				
	Service life (Consumer); Handling of heat and wear resistant vehicle parts				
Article Categories [AC]					
Vehicles		AC1			
Metal articles		AC7			
Contributing scenario controlling environmental exposure					
Handling of heat and wear resistant vehicle parts		ERC 10a, ERC 11a			
Contributing scenario controlling consumer exposure					
Handling/ exchange of heat and wear resistant vehicle parts		AC1			
Handling/ exchange of heat and w	AC 7				

23. Exposure Scenario 23: Service life (Consumer); Handling of heat and wear resistant vehicle parts

Subsequent service life exposure	scenario(s)					
Use at industrial sites; Industrial use surface treatment	ation processes	in	ES17			
Use at industrial sites; Industrial use treatment	processes in su	urface	ES19			
Use at industrial sites; Industrial use of cobalt in thermal spraying in surface ES20 treatment						
SECTION 2:	23.2 Operational of	conditions and	risk manag	ement meas	sures	
2.1	Contributing scer	ario controlling	g environm	ental expos	ure	
2.1.1	Handling of heat ar	nd wear resistan	t vehicle pa	rts (ERC 10a	, ERC 11	a)
Conditions and measures related	to external treatm	ent of waste fo	r disposal	``		,
Dispose of waste product or used co			•			
Other given operational condition	-	_				
Municipal sewage treatment plant is						
· - ·		orio controlling				
	Contributing scen					
2.2.1	Handling/ exchange	e of heat and we	ar resistant	vehicle parts	s (AC1)	
Product characteristics						
Physical form of product: Massive o	bject					
Inhalation exposure is considered to	be not relevant.					
Dermal exposure assumed to be ne	gligible.					
Oral exposure is considered to be n	ot relevant.					
2.2.2	Handling/ exchange	e of heat and we	ar resistant	vehicle parts	s (AC7)	
Product characteristics						
Physical form of product: Massive o	bject					
Inhalation exposure is considered to	be not relevant.					
Dermal exposure assumed to be ne	gligible.					
Oral exposure is considered to be n	ot relevant.					
SECTION 3:	23.3 Exposure	estimation				
3.1 Environment						
Release estimation method: Estima	ted release factor					
			Releas	e rate		
	Wat	er		Air		Soil
Handling of heat and wear resistant				0 kg/day		0 kg/day
vehicle parts						
3.2 Consumer						
Handling/ exchange of heat and we	ar resistant vehicle	parts (AC1)				
Exposure route		Exposure esti			Risk cł ratio (F	naracterisation RCR)
Inhalation, Local effects, Long Term		0 μg/m³ (Qualitative assessment)		sment)	< 0.01	
Dermal, Systemic effects, Long Term		0 mg/kg bw/day (Qualitative assessment)		< 0.01		
Oral, Systemic effects, Long Term	0 μg/kg bw/day (Qualitative < 0.01 assessment)					

SECTION 4: 23.4 Guidance to DU to evaluate whether he works inside the bounda the ES	
Health/ Environment	
are met or the downstream user can management measures are adequate exposure to a level below the DNEL (above) as given below. If measured of MEASE (www.ebrc.de/mease.html) to showing that they limit the PEC below	set by the ES if either the proposed risk management measures as described above demonstrate on his own that his operational conditions and implemented risk e. For human health, this has to be done by showing that they limit the inhalation given that the processes and activities in question are covered by the PROCs listed data are not available, the DU may make use of an appropriate scaling tool such as to estimate the associated exposure. For the environment, this has to be done by the PNEC for the respective environmental compartment. If measured data are not appropriate scaling tool such as the DU-Scaling tool (http://www.arche-caling-tool) to estimate PEC values.

SECTION 1:	24.1 Title of exposure scenario				
	Use at industrial sites; Production of cobalt-containing batteries				
Sectors of use [SU]					
Manufacture of computer, electron	ic and optical products, electrical equipment	SU 16			
Contributing scenario controllin	g environmental exposure				
Production of cobalt-containing ba	tteries ES 1 Direct Discharge	ERC5			
Production of cobalt-containing ba	tteries ES 2 Marine Discharge	ERC5			
Contributing scenario controllin	g worker exposure				
Raw material handling		PROC 26, PROC 4, PROC 3, PROC 8b			
Mix preparation		PROC 5, PROC 3			
Further processing	PROC 13, PROC 9, PROC 4, PROC 5, PROC 6, PROC 3				
Final processing and handling		PROC 14, PROC 21			
Cleaning & Maintenance		PROC 28			
Subsequent service life exposur	re scenario(s)				
Service life (worker at industrial sit industrial settings	e); Service life of cobalt-containing batteries in	ES25			
Service life (Professional worker); professional settings	Service life of cobalt-containing batteries in	ES26			
SECTION 2:	24.2 Operational conditions and risk manage	jement measures			
2.1	Contributing scenario controlling environmental exposure				
2.1.1	Production of cobalt-containing batteries ES 1	Direct Discharge (ERC 5)			
Frequency and duration of use					
Daily amount per site <= 0.088 ton	nes/day				
Annual amount per site <= 28 tonnes/year					
Emission days >= 319 days/year					
Technical onsite conditions and	measures to reduce or limit discharges, air	emissions and releases to soil			
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet					

24. Exposure Scenario 24: Use at industrial sites; Production of cobalt-containing batteries

scrubber.					
Chemical precipitation or sediment	tation or filtration or electrolysis or reverse osmosis or ion exchange.				
Conditions and measures relate	d to external treatment of waste for disposal				
Dispose of waste product or used	containers according to local regulations.				
Other given operational condition	ons affecting environmental exposure				
Assumed effluent discharge flow fr	rom site >= 513 m³/day				
No discharge to marine water assu	umed.				
Local freshwater dilution factor 100	D.				
2.1.2	Production of cobalt-containing batteries ES 2 Marine Discharge (ERC 5)				
Frequency and duration of use					
Daily amount per site <= 0.088 ton	ines/day				
Annual amount per site <= 28 tonr	nes/year				
Emission days >= 319 days/year					
Technical onsite conditions and	measures to reduce or limit discharges, air emissions and releases to soil				
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet				
Chemical precipitation or sediment	tation or filtration or electrolysis or reverse osmosis or ion exchange.				
Conditions and measures relate	d to external treatment of waste for disposal				
Dispose of waste product or used	containers according to local regulations.				
Other given operational condition	ons affecting environmental exposure				
Assumed effluent discharge flow fr	rom site >= 513 m³/day				
No discharge to freshwater assum	ed.				
Local marine water dilution factor	100.				
2.2	Contributing scenario controlling worker exposure				
2.2.1	Raw material handling (PROC 26, PROC 4, PROC 3, PROC 8b)				
Product characteristics					
Physical form of product: Solid, me	edium dustiness				
Covers percentage substance in the	ne product up to 100 %.				
Frequency and duration of use					
Covers daily exposures up to 8 ho	urs.				
Technical conditions and measu	ires to control dispersion from source towards the worker				
Covers use at ambient temperatur	es.				
Conditions and measures relate	d to personal protection, hygiene and health evaluation				
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.					
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.					
2.2.2	Mix preparation (PROC 5, PROC 3)				
Product characteristics					
Physical form of product: Aqueous solution					
Covers percentage substance in the product up to 100 %.					

Frequency and duration of use						
	Frequency and duration of use					
Covers daily exposures up to 8 ho						
	ures to control dispersion from source towards the worker					
Covers use at ambient temperatu	res.					
Semi-automated task.						
Vapour extraction units in the tank 90 %)	(Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of					
Ensure enclosure of reaction vess						
Conditions and measures relate	ed to personal protection, hygiene and health evaluation					
Wear respiratory protection provic specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.					
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.					
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.					
2.2.3	Further processing (PROC 13, PROC 9, PROC 4, PROC 5, PROC 6, PROC 3)					
Product characteristics						
Physical form of product: Solid, lo	w dustiness					
Covers percentage substance in t	he product up to 100 %.					
Frequency and duration of use						
Covers daily exposures up to 8 ho	burs.					
Technical conditions and meas	ures to control dispersion from source towards the worker					
Covers use at ambient temperatu	res.					
Conditions and measures relate	ed to personal protection, hygiene and health evaluation					
Wear respiratory protection provic specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.					
Use suitable eye protection. For fi	urther specification, refer to section 8 of the SDS.					
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.					
2.2.4						
Product characteristics						
	lin alagad container					
Physical form of product: Included						
Maximum emission potential: Ver						
Covers percentage substance in t Frequency and duration of use						
Covers daily exposures up to 8 ho						
	ures to control dispersion from source towards the worker					
Process is carried out at ambient pressure.						
Covers use at ambient temperatures.						
2.2.5 Cleaning & Maintenance (PROC 28)						
Product characteristics						
Physical form of product: Solid, high dustiness						
Frequency and duration of use						
Covers daily exposures up to 8 hours.						
Technical conditions and measures to control dispersion from source towards the worker						
Process is carried out at ambient pressure.						
Covers use at ambient temperatures.						
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 respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN37	4. For further spe	ecification, refer to	section 8 of the SDS.				
Wear protective suit conforming to E	N 13982 in cases	s where direct cor	ntact with the substanc	e cannot be	e avoided.		
SECTION 3:	24.3 Exposure	estimation					
3.1 Environment	J						
Release estimation method: Estimate	ed release factor						
			Release rate				
	Wa	ater	Air		Soil		
Production of cobalt-containing batteries ES 1 Direct Discharge	9.57E-3	3 kg/day	1.03E-3 kg/d	ay	0 kg/day		
Production of cobalt-containing batteries ES 2 Marine Discharge	9.57E-3	3 kg/day	1.03E-3 kg/d	ay	0 kg/day		
Production of cobalt-containing batte	ries ES 1 Direct	Discharge					
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk ch	characterisation ratio (RCR)		
Fresh water			3E-4 mg/l SES 2.1.2)	0.205			
Sedimentation (Fresh water)		8.78 mg/kg dw (PEC sediment calculation method for metals)		0.163			
Agricultural soil		0.239 mg/kg dw (EUSES 2.1.2)		0.022			
Man via Environment - Inhalation (Sy	stemic effects)		-7 mg/m³ SES 2.1.2)	< 0.01			
Man via Environment - Inhalation (Lo	cal effects)	4E-7 mg/m³ (EUSES 2.1.2)			< 0.01		
Man via Environment - Oral			mg/kg bw/day sured data)		0.036		
Man via Environment - Combined rou	ites				0.036		
Production of cobalt-containing batte	ries ES 2 Marine	Discharge					
Protection target	(PEC, Pred	concentration icted Exposure entration)	Risk ch	aracterisation ratio (RCR)			
Marine water		0.095 μg/l (Clocal calculation with Kp susp. matter marine)			0.04		
Sedimentation (Marine water)		20.05 mg/kg dw (PEC sediment calculation method for metals)			0.287		
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)			0.022			
Man via Environment - Inhalation (Systemic effects)		4E-7 mg/m³ (EUSES 2.1.2)			< 0.01		
Man via Environment - Inhalation (Lo	cal effects)		-7 mg/m³ SES 2.1.2)		< 0.01		
Man via Environment - Oral		3.17E-4	mg/kg bw/day		0.036		

Inhalation, Systemic effects, Long Term	10.9 µg/m³	0.201
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Cleaning & Maintenance (PROC 28)		
Combined routes, Systemic effects, Long Term		< 0.01
Dermal, Systemic effects, Long Term	1E-3 μg/kg bw/day (Qualitative assessment)	< 0.01
Inhalation, Local effects, Long Term	1E-3 μg/m³ (Qualitative assessment)	< 0.01
Inhalation, Systemic effects, Long Term	1E-3 μg/m³ (Qualitative assessment)	< 0.01
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Final processing and handling (PROC 14, PROC 21		
Combined routes, Systemic effects, Long Term		0.055
Dermal, Systemic effects, Long Term	74.7 μg/kg bw/day	0.01
Inhalation, Local effects, Long Term	2.4 µg/m³	0.06
Inhalation, Systemic effects, Long Term	2.4 µg/m³	0.044
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Further processing (PROC 13, PROC 9, PROC 4, P	ROC 5, PROC 6, PROC 3)	
Combined routes, Systemic effects, Long Term		0.039
Dermal, Systemic effects, Long Term	1 μg/kg bw/day	< 0.01
Inhalation, Local effects, Long Term	2.1 µg/m³	0.053
Inhalation, Systemic effects, Long Term	2.1 µg/m³	0.039
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Mix preparation (PROC 5, PROC 3)		
Combined routes, Systemic effects, Long Term		0.331
Dermal, Systemic effects, Long Term	92.8 µg/kg bw/day	0.013
Inhalation, Local effects, Long Term	17.2 μg/m³	0.43
Inhalation, Systemic effects, Long Term	17.2 μg/m³	0.318
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Raw material handling (PROC 26, PROC 4, PROC	3, PROC 8b)	
3.2 Worker		
Man via Environment - Combined routes		0.036

Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, L	Combined routes, Systemic effects, Long Term		0.214
SECTION 4: 24.4 Guidance to DU to evaluate whether he works inside the boundaries set the ES			nside the boundaries set by
Health/ Environment			
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.			

25. Exposure Scenario 25: Service life (worker at industrial site); Service life of cobalt-containing batteries in industrial settings

SECTION 1:	25.1 Title of exposure scenario				
	Service life (worker at industrial site); Service life of cobalt-containing batteries in industrial settings				
Article Categories [AC]					
Electrical batteries and accumulat	tors	AC3			
Contributing scenario controllin	ng environmental exposure				
Service life of cobalt-containing ba	atteries in industrial settings	ERC 12a			
Contributing scenario controlling	ng worker exposure	•			
Handling of sealed containers		PROC 21			
Exposure scenario of the uses	leading to the inclusion of the substance int	o the article			
Use at industrial sites; Production	of cobalt-containing batteries	ES24			
SECTION 2:	25.2 Operational conditions and risk mana	gement measures			
2.1	Contributing scenario controlling environ	nental exposure			
2.1.1	Service life of cobalt-containing batteries in in	dustrial settings (ERC 12a)			
Frequency and duration of use	1				
Daily amount per site <= 6E-3 ton	nes/day				
Annual amount per site <= 2.007	tonnes/year				
Conditions and measures related to municipal 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 for disposal					
Dispose of waste product or used	containers according to local regulations.				

2.2	Contributing scenario controlling worker exposure				
2.2.1	Handling of sealed containers (PROC 21)				
Product characteristics					
Physical form of product: Included	n closed container				
Maximum emission potential: Very	ow				
Covers percentage substance in th	e product up to 100	%.			
Frequency and duration of use					
Covers daily exposures up to 8 hou	rs.				
Technical conditions and measu	es to control disp	ersion from so	urce towards the worke	er	
Process is carried out at ambient p	essure.				
Covers use at ambient temperature	s.				
SECTION 3:	25.3 Exposure	estimation			
3.1 Environment					
Release estimation method: Estimation	ted release factor				
	Release rate				
	Wa	Water Air Soil			
Service life of cobalt-containing batteries in industrial settings	0 kg/	′day	0 kg/day		0 kg/day
3.2 Worker	_		L		1
Handling of sealed containers (PR	DC 21)				
Exposure route		Exposure est	imation	Risk cl ratio (F	haracterisation RCR)
Inhalation, Systemic effects, Long	Гerm	1E-3 µg/m³ (Q	ualitative assessment)	< 0.01	
Inhalation, Local effects, Long Ten	n	1E-3 µg/m³ (Q	ualitative assessment)	< 0.01	
Dermal, Systemic effects, Long Te	m	1E-3 µg/kg bw assessment)	/day (Qualitative	< 0.01	
Combined routes, Systemic effects	Long Term			< 0.01	
SECTION 4:	25.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES				
Health/ Environment					
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-					

available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.archeconsulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values. 26. Exposure Scenario 26: Service life (Professional worker); Service life of cobalt-containing batteries in professional settings

SECTION 1:	26.1 Title of expo	26.1 Title of exposure scenario				
	Service life (Professional worker); Service life of cobalt-containing batteries in professional settings					
Article Categories [AC]						
Electrical batteries and accumulators AC3						
Contributing scenario controlli	ng environmental ex	xposure				
Service life of cobalt-containing b	atteries in profession	al settings	ERC	10a, ERC 11a		
Contributing scenario controlli	ng worker exposure	•				
Handling of sealed containers	<u> </u>		PRO	C 21		
Exposure scenario of the uses	leading to the inclu	sion of the subs	_	-		
-	-					
Use at industrial sites; Production	-		ES24			
SECTION 2:	26.2 Operational	conditions and	risk management	t measures		
2.1	Contributing scer	nario controlling	g environmental e	exposure		
2.1.1	Service life of coba	alt-containing bat	teries in profession	nal settings (EF	RC 10a, ERC 11a)	
Conditions and measures relat	ed to municipal sew	age treatment p	olant			
Municipal sewage treatment plan	t is assumed.					
Conditions and measures relat	ed to external treatn	nent of waste fo	or disposal			
Dispose of waste product or used	l containers according	g to local regulati	ons.			
2.2	Contributing scer	Contributing scenario controlling worker exposure				
2.2.1	Handling of sealed	Handling of sealed containers (PROC 21)				
Product characteristics						
Physical form of product: Include	d in closed container					
Maximum emission potential: Ver	y low					
Covers percentage substance in	the product up to 100)%.				
Frequency and duration of use						
Covers daily exposures up to 8 h	ours.					
Technical conditions and meas	•	persion from so	urce towards the	worker		
Process is carried out at ambient	pressure.					
Covers use at ambient temperatu						
SECTION 3:	26.3 Exposure	estimation				
3.1 Environment						
Release estimation method: Estir	nated release factor					
			Release rate			
	Wa	Water Air		Soil		
Service life of cobalt-containing batteries in professional settings	0 kg/	0 kg/day 0 kg/day 0		0 kg/day		
3.2 Worker						
	200.21					
Handling of sealed containers (PI	XUU 21)	1_				
Exposure route		Exposure estimation Risk charact ratio (RCR)		haracterisation RCR)		
Inhalation, Systemic effects, Lon	a Term	Term 1E-3 μg/m ³ (Qualitative assessment) < 0.01				

Inhalation, Local effects, Long Term		1E-3 µg/m³ (Qualitative assessment)	< 0.01	
Dermal, Systemic effects, Long Term		1E-3 μg/kg bw/day (Qualitative assessment)	< 0.01	
Combined routes, Systemic effects, L	ong Term		< 0.01	
SECTION 4:	SECTION 4: 26.4 Guidance to DU to evaluate whether he works in the ES		nside the boundaries set by	
Health/ Environment				
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.				

27. Exposure Scenario 27: Use at industrial sites; Industrial use of cobalt in the production of varistors and magnets (calcination/sintering processes)

SECTION 1:	27.1 Title of exposure scenario	27.1 Title of exposure scenario		
	Use at industrial sites; Industrial use of coba (calcination/sintering processes)	Use at industrial sites; Industrial use of cobalt in the production of varistors and magnets (calcination/sintering processes)		
Chemical product categ	ory [PC]			
Semiconductors		PC 33		
Sectors of use [SU]				
Manufacture of other non-	metallic mineral products, e.g. plasters, cement	SU 13		
Manufacture of fabricated	metal products, except machinery and equipment	SU 15		
Manufacture of computer,	electronic and optical products, electrical equipment	SU 16		
Contributing scenario co	ontrolling environmental exposure			
	the production of varistors and magnets esses) ES 1 STP Discharge	ERC 5		
Industrial use of cobalt in the production of varistors and magnets (calcination/sintering processes) ES 2 Direct Discharge		ERC 5		
Industrial use of cobalt in the production of varistors and magnets (calcination/sintering processes) ES 3 Marine Discharge		ERC 5		
Contributing scenario co	ontrolling worker exposure			
Raw material handling		PROC 26, PROC 21, PROC 8b		
Preparation of raw material		PROC 5, PROC 4, PROC 2, PROC 3, PROC 1		
Wet process		PROC 4, PROC 1		
Preparation of pre-sintered materials		PROC 26, PROC 14, PROC 5, PROC 3, PROC 8b		
Hot process/sintering		PROC 22, PROC 1		

Formulation and filling		PROC 9, PROC 3, PROC 8b		
Packaging of varistors		PROC 21		
Packaging of magnets		PROC 21		
Cleaning & Maintenance PROC 28				
Subsequent service life expos	ure scenario(s)			
Service life (worker at industrial and magnets in industrial setting	site); Service life of cobalt-containing varistors s	ES29		
Service life (Professional worker magnets in professional settings); Service life of cobalt-containing varistors and	ES30		
Service life (Consumer); Service encapsulated in the internal part	life of articles containing cobalt being of the product	ES31		
SECTION 2:				
2.1	Contributing scenario controlling environ	Contributing scenario controlling environmental exposure		
2.1.1	Industrial use of cobalt in the production of varistors and magnets (calcination/sintering processes) ES 1 STP Discharge (ERC 5)			
Frequency and duration of us	e			
Daily amount per site <= 4.1E-3	tonnes/day			
Annual amount per site <= 1.5 to	onnes/year			
Emission days >= 365 days/yea	r			
Technical onsite conditions a	nd measures to reduce or limit discharges, air	emissions and releases to soil		
Electrostatic precipitator or wet o scrubber.	electrostatic precipitator or cyclones or fabric/bag	filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedime	entation or filtration or electrolysis or reverse osmo	osis or ion exchange.		
Conditions and measures rela	ted to municipal sewage treatment plant			
Municipal sewage treatment pla	nt is assumed.			
Assumed domestic sewage trea	tment plant flow >= 2E3 m³/day			
Conditions and measures rela	ted to external treatment of waste for disposa	I		
Dispose of waste product or use	d containers according to local regulations.			
Other given operational condi	tions affecting environmental exposure			
No discharge to marine water as	sumed.			
Local freshwater dilution factor	00.			
2.1.2				
Frequency and duration of us				
Daily amount per site <= 4.1E-3				
Annual amount per site <= 1.5 to	•			
Emission days >= 365 days/yea	r			
	nd measures to reduce or limit discharges, air	emissions and releases to soil		
Electrostatic precipitator or wet o scrubber.	electrostatic precipitator or cyclones or fabric/bag	filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedime	entation or filtration or electrolysis or reverse osmo	osis or ion exchange.		
Conditions and measures rela	ted to external treatment of waste for disposa	l		
Dispose of waste product or use	d containers according to local regulations.			
	tions affecting environmental exposure			

Local freshwater dilution factor 10	0.
2.1.3	Industrial use of cobalt in the production of varistors and magnets (calcination/sintering processes) ES 3 Marine Discharge (ERC 5)
Frequency and duration of use	
Daily amount per site <= 4.1E-3 to	nnes/day
Annual amount per site <= 1.5 ton	nes/year
Emission days >= 365 days/year	
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil
scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	d to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow f	rom site >= 2E3 m³/day
No discharge to freshwater assum	ed
Local marine water dilution factor	100.
2.2	Contributing scenario controlling worker exposure
2.2.1	Raw material handling (PROC 26, PROC 21, PROC 8b)
Product characteristics	
Physical form of product: Solid, me	edium dustiness
Additional physical form of produc	
Additional physical form of produc	t: Aqueous solution
Covers percentage substance in the	he product up to 100 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and measu	ures to control dispersion from source towards the worker
Covers use at ambient temperatur	es.
Conditions and measures relate	d to personal protection, hygiene and health evaluation
Wear respiratory protection provid specification, refer to section 8 of 1	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.
Use suitable eye protection. For fu	Irther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.2	Preparation of raw material (PROC 5, PROC 4, PROC 2, PROC 3, PROC 1)
Product characteristics	
Physical form of product: Aqueous	solution
Covers percentage substance in the	ne product up to 100 %.
Maximum emission potential: Very	/ low
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and measu	ures to control dispersion from source towards the worker
Assumes process temperature up	to 95 °C.
Reactor equipped with local exhaum minimum efficiency of 90 %	ust ventilation (Use of an integrated local exhaust ventilation is required. Inhalation -
minimum emolency of 50 70	

Wear respiratory protection provid	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless	
inhalation exposure to the substar	nce can be excluded. For further specification, refer to section 8 of the SDS.	
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.	
2.2.3	Wet process (PROC 4, PROC 1)	
Product characteristics		
Physical form of product: Aqueous	s solution	
Covers percentage substance in t	he product up to 100 %.	
Maximum emission potential: Ver	/ low	
Frequency and duration of use		
Covers daily exposures up to 8 ho	burs.	
Technical conditions and meas	ures to control dispersion from source towards the worker	
Covers use at ambient temperature	res.	
Use in closed process.		
Semi-automated task.		
Vapour extraction units in the tank 90 %)	(Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation	
Wear respiratory protection provid specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.	
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.	
2.2.4	Preparation of pre-sintered materials (PROC 26, PROC 14, PROC 5, PROC 3, PROC 8b)	
Product characteristics		
Physical form of product: Solid, m	edium dustiness	
Covers percentage substance in t	he product up to 100 %.	
Frequency and duration of use		
Covers daily exposures up to 8 ho	purs.	
Technical conditions and meas	ures to control dispersion from source towards the worker	
Covers use at ambient temperatu	res.	
Local exhaust ventilation in powde	er handling areas. Inhalation - minimum efficiency of 78 %	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation	
Wear respiratory protection provic specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.	
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.	
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.	
2.2.5	Hot process/sintering (PROC 22, PROC 1)	
Product characteristics		
Physical form of product: Molten		
Additional physical form of produc	rt: Solid, Powder / Dust	
Additional physical form of produc	t: Massive object	
Maximum emission potential: Med	lium (temperature based)	

Frequency and duration of use		
Covers daily exposures up to 8 ho	DUIS.	
	ures to control dispersion from source towards the worker	
Assumes process temperature up		
Ensure that worker is in a separat		
Closed furnace or well-extracted		
	t ventilation is required. Inhalation - minimum efficiency of 90 %	
-	ed to personal protection, hygiene and health evaluation	
Wear respiratory protection provid specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.	
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	I374. For further specification, refer to section 8 of the SDS.	
2.2.6	Formulation and filling (PROC 9, PROC 3, PROC 8b)	
Product characteristics		
Physical form of product: Aqueou	s solution	
Maximum emission potential: Ver		
Covers percentage substance in t		
Frequency and duration of use		
Covers daily exposures up to 8 ho		
	ures to control dispersion from source towards the worker	
Covers use at ambient temperatu		
Conditions and measures relate	ed to personal protection, hygiene and health evaluation	
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nce can be excluded. For further specification, refer to section 8 of the SDS.	
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.	
2.2.7	Packaging of varistors (PROC 21)	
Product characteristics		
Physical form of product: Bound in	n article.	
Maximum emission potential: Ver	y low	
Covers percentage substance in t		
Frequency and duration of use		
Covers daily exposures up to 8 ho	DUIS.	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation	
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nce can be excluded. For further specification, refer to section 8 of the SDS.	
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.		
2.2.8	Packaging of magnets (PROC 21)	
Product characteristics		
Physical form of product: Massive	e object	
Maximum emission potential: Ver	y low	
Frequency and duration of use		
Covers daily exposures up to 8 ho	Durs.	
Technical conditions and meas	ures to control dispersion from source towards the worker	

Conditions and measures related to personal protection, hygiene and health evaluation					
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.					
Use suitable eye protection. For furth	ner specification,	refer to section 8	of the SDS.		
Wear suitable gloves tested to EN37	4. For further spe	ecification, refer to	o section 8 of the SDS.		
2.2.9 C	leaning & Mainte	nance (PROC 28	3)		
Product characteristics					
Physical form of product: Solid, medi	um dustiness				
Frequency and duration of use					
Covers daily exposures up to 8 hours	5.				
Technical conditions and measure	es to control dis	persion from so	urce towards the wor	ker	
Process is carried out at ambient pre	ssure				
Covers use at ambient temperatures					
Maintenance and repair work only at operation.	facilities which a	re not in operatio	n. Minor cleaning tasks	s may be co	onducted under
Conditions and measures related t	to personal prot	ection, hygiene	and health evaluation	า	
Wear respiratory protection providing specification, refer to section 8 of the		gned protection f	actor of 10 (a minimum	efficiency	of 90%). For further
Use suitable eye protection. For furth	ner specification,	refer to section 8	of the SDS.		
Wear suitable gloves tested to EN374	4. For further spe	ecification, refer to	section 8 of the SDS.		
Wear protective suit conforming to E	N 13982 in cases	where direct cor	ntact with the substanc	e cannot be	e avoided.
SECTION 3:	27.3 Exposure	estimation			
3.1 Environment					
Release estimation method: Estimate	ad ralaasa faatar				
			Release rate		ſ
	Wa	ater	Air		Soil
Industrial use of cobalt in the production of varistors and	0.012	kg/day	8.2E-3 kg/da	iy	0 kg/day
magnets (calcination/sintering					
processes) ES 1 STP Discharge					
Industrial use of cobalt in the production of varistors and	0.012	kg/day	8.2E-3 kg/da	у	0 kg/day
magnets (calcination/sintering					
processes) ES 2 Direct Discharge					
Industrial use of cobalt in the	0.012 kg/day		8.2E-3 kg/da	iy	0 kg/day
production of varistors and magnets (calcination/sintering					
processes) ES 3 Marine Discharge					
Industrial use of cobalt in the production of varistors and magnets (calcination/sintering processes) ES 1 STP Discharge					
Protection target	Protection target Exposure concentration Risk characterisation ratio				
(PEC			licted Exposure entration)		(RCR)
Fresh water		1.23E-4 mg/l (EUSES 2.1.2)		0.116	
Sedimentation (Fresh water)			mg/kg dw		0.096
		•	t calculation method		
for metals) Sewage Treatment Plant 3.69E-3 mg/l < 0.01					< 0.01
Sewage Treatment Plant			SES 2.1.2)		< 0.01

Agricultural soil	0.343 mg/kg dw (EUSES 2.1.2)	0.031
Man via Environment - Inhalation (Systemic effects)	2.43E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	2.43E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.21E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.036
Industrial use of cobalt in the production of varistors a	and magnets (calcination/sintering proces	sses) ES 2 Direct Discharge
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Fresh water	1.39E-4 mg/l (EUSES 2.1.2)	0.131
Sedimentation (Fresh water)	5.76 mg/kg dw (PEC sediment calculation method for metals)	0.107
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	2.43E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	2.43E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.21E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.037
Industrial use of cobalt in the production of varistors a	and magnets (calcination/sintering proces	sses) ES 3 Marine Discharge
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	0.045 μg/l (Clocal calculation with Kp susp. matter marine)	0.019
Sedimentation (Marine water)	15.4 mg/kg dw (PEC sediment calculation method for metals)	0.221
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	2.43E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	2.43E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
	3.17E-4 mg/kg bw/day	0.036
Man via Environment - Oral	(Measured data)	

3.2 Worker		
Raw material handling (PROC 26, PROC 21, PROC	8b)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	17.2 μg/m³	0.318
Inhalation, Local effects, Long Term	17.2 μg/m³	0.43
Dermal, Systemic effects, Long Term	92.8 μg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term		0.331
Preparation of raw material (PROC 5, PROC 4, PRC	DC 2, PROC 3, PROC 1)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	12 µg/m³	0.222
Inhalation, Local effects, Long Term	12 µg/m³	0.3
Dermal, Systemic effects, Long Term	1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.222
Wet process (PROC 4, PROC 1)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	2.1 µg/m³	0.039
Inhalation, Local effects, Long Term	2.1 µg/m³	0.053
Dermal, Systemic effects, Long Term	1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.039
Preparation of pre-sintered materials (PROC 26, PR	OC 14, PROC 5, PROC 3, PROC 8b))
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	11 µg/m³	0.203
Inhalation, Local effects, Long Term	11 µg/m³	0.275
Dermal, Systemic effects, Long Term	92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term		0.216
Hot process/sintering (PROC 22, PROC 1)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18.1 µg/m³	0.335
Inhalation, Local effects, Long Term	18.1 µg/m³	0.453
Dermal, Systemic effects, Long Term	1.3 μg/kg bw/day	< 0.01

Formulation and filling (PROC 9, PROC	3, PROC 8t)	
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Terr	n	10 µg/m³ (MEASE, PROC 9)	0.185
Inhalation, Local effects, Long Term		10 µg/m³ (MEASE, PROC 9)	0.25
Dermal, Systemic effects, Long Term		0.8 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Lor	ng Term		0.185
Packaging of varistors (PROC 21)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Terr	n	10 µg/m³	0.185
Inhalation, Local effects, Long Term		10 µg/m³	0.25
Dermal, Systemic effects, Long Term		3.1 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Lor	ng Term		0.185
Packaging of magnets (PROC 21)			
Exposure route		Exposure estimation	Risk characterisation ratio
Inhalation, Systemic effects, Long Terr	n	8.6 µg/m³	0.159
Inhalation, Local effects, Long Term		8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term		62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Lor	ng Term		0.168
Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ration (RCR)
Inhalation, Systemic effects, Long Term		10.9 µg/m³	0.201
Inhalation, Systemic effects, Long Terr			
Inhalation, Systemic effects, Long Tern Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
		10.9 µg/m³ 92.8 µg/kg bw/day	0.273
Inhalation, Local effects, Long Term	ng Term		
Inhalation, Local effects, Long Term Dermal, Systemic effects, Long Term Combined routes, Systemic effects, Lon SECTION 4:	-		0.013 0.214

below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that

they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU

may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

28. Exposure Scenario 28: Use at industrial sites; Industrial use of cobalt in the manufacture of inorganic pigments, frits, ceramic ware, glass

SECTION 1:	28.1 Title of exposure scenario			
	Use at industrial sites; Industrial use of cobalt in the manufacture of inorganic pigments, frits, ceramic ware, glass			
Chemical product category [PC]	1			
Semiconductors		PC 33		
Sectors of use [SU]				
Manufacture of bulk, large scale c	hemicals (including petroleum products)	SU 8		
Manufacture of fine chemicals		SU 9		
Contributing scenario controllin	ng environmental exposure			
Industrial use of cobalt in the man ware, glass ES 1 STP Discharge	ufacture of inorganic pigments, frits, ceramic	ERC 6a		
Industrial use of cobalt in the man ware, glass ES 2 Direct Discharge	ufacture of inorganic pigments, frits, ceramic	ERC 6a		
Industrial use of cobalt in the man ware, glass ES 3 Marine Discharg	ufacture of inorganic pigments, frits, ceramic e	ERC 6a		
Industrial use of cobalt in the man High volume with low emission fac	ufacture of inorganic pigments and frits ES4 ctor	ERC 6a		
Contributing scenario controllin	ng worker exposure			
Raw material handling		PROC 26, PROC 21, PROC 8b		
Preparation of raw material		PROC 5, PROC 4, PROC 2, PROC 3, PROC 1		
Wet process		PROC 4, PROC 1		
Hot process		PROC 23, PROC 1, PROC 22		
Formulation and filling		PROC 9, PROC 3, PROC 8b		
Packaging of massive objects		PROC 21		
Cleaning & Maintenance		PROC 28		
SECTION 2:	28.2 Operational conditions and risk management measures			
2.1	Contributing scenario controlling environmental exposure			
2.1.1	Industrial use of cobalt in the manufacture of inorganic pigments, frits, ceramic ware, glass ES 1 STP Discharge (ERC 6a)			
Frequency and duration of use				
Daily amount per site <= 0.198 tor	nnes/day			
Annual amount per site <= 65 ton	Annual amount per site <= 65 tonnes/year			
Emission days >= 328 days/year				
Technical onsite conditions and	I measures to reduce or limit discharges, air	emissions and releases to soil		
Electrostatic precipitator or wet ele	ectrostatic 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 municipal sewage treatment plant			
Municipal sewage treatment plant	is assumed.		
Assumed domestic sewage treatm	nent plant flow >= 2E3 m³/day		
Conditions and measures relate	d to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
No discharge to marine water assu	umed.		
Local freshwater dilution factor 200	0.		
2.1.2	Industrial use of cobalt in the manufacture of inorganic pigments, frits, ceramic ware, glass ES 2 Direct Discharge (ERC 6a)		
Frequency and duration of use			
Daily amount per site <= 0.198 tor	ines/day		
Annual amount per site <= 65 tonr	nes/year		
Emission days >= 328 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sediment	tation or filtration or electrolysis or reverse osmosis or ion exchange.		
Conditions and measures relate	d to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
Assumed effluent discharge flow fi	rom site >= 2E3 m³/day		
No discharge to marine water assu	umed.		
Local freshwater dilution factor 200	0.		
2.1.3	Industrial use of cobalt in the manufacture of inorganic pigments, frits, ceramic ware, glass ES 3 Marine Discharge (ERC 6a)		
Frequency and duration of use			
Daily amount per site <= 0.198 tor	nnes/day		
Annual amount per site <= 65 tonr	nes/year		
Emission days >= 328 days/year			
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange.			
Conditions and measures related to external treatment of waste for disposal			
Dispose of waste product or used containers according to local regulations.			
Other given operational conditions affecting environmental exposure			
Assumed effluent discharge flow from site >= 2E3 m³/day			
No discharge to freshwater assumed			
Local marine water dilution factor 100.			
2.1.4	Industrial use of cobalt in the manufacture of inorganic pigments and frits ES4 High volume with low emission factor (ERC 6a)		
Frequency and duration of use			
Daily amount per site <= 1.39 tonnes/day			

Annual amount per site <= 500 tonnes/year		
Emission days >= 360 days/year		
Technical onsite conditions and	I measures to reduce or limit discharges, air emissions and releases to soil	
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet	
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.	
Conditions and measures relate	ed to municipal sewage treatment plant	
Municipal sewage treatment plant	is assumed.	
Assumed domestic sewage treatm	nent plant flow >= 2E3 m³/day	
Conditions and measures relate	ed to external treatment of waste for disposal	
Dispose of waste product or used	containers according to local regulations.	
Other given operational condition	ons affecting environmental exposure	
No discharge to marine water ass	umed.	
Local freshwater dilution factor 10		
2.2	Contributing scenario controlling worker exposure	
2.2.1	Raw material handling (PROC 26, PROC 21, PROC 8b)	
Product characteristics		
Physical form of product: Solid, me	edium dustiness	
Additional physical form of produc	t: Massive object	
Additional physical form of produc	t: Aqueous solution	
Covers percentage substance in the	he product up to 100 %.	
Frequency and duration of use		
Covers daily exposures up to 8 ho	urs.	
Technical conditions and measured	ures to control dispersion from source towards the worker	
Covers use at ambient temperatur	es.	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation	
Wear respiratory protection provid specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.	
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.	
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.	
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.	
2.2.2	Preparation of raw material (PROC 5, PROC 4, PROC 2, PROC 3, PROC 1)	
Product characteristics		
Physical form of product: Aqueous	solution	
Covers percentage substance in the product up to 100 %.		
Maximum emission potential: Very low		
Frequency and duration of use		
Covers daily exposures up to 8 ho	urs.	
Technical conditions and measured	ures to control dispersion from source towards the worker	
Assumes process temperature up	to 95 °C.	
Reactor equipped with local exhaum minimum efficiency of 90 %)	ust ventilation (Use of an integrated local exhaust ventilation is required. Inhalation -	
Ensure enclosure of reaction vess	el.	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation	
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.		

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.						
2.2.3	.2.3 Wet process (PROC 4, PROC 1)					
Product characteristics						
Physical form of product: Aqueous	s solution					
Covers percentage substance in t	he product up to 100 %.					
Maximum emission potential: Ver	y low					
Frequency and duration of use						
Covers daily exposures up to 8 ho	burs.					
Technical conditions and meas	ures to control dispersion from source towards the worker					
Covers use at ambient temperatu	res.					
Use in closed process.						
Semi-automated task.						
Vapour extraction units in the tank 90 %	k: Use of an integrated local exhaust ventilation is required. Inhalation - minimum efficiency of					
Conditions and measures relate	ed to personal protection, hygiene and health evaluation					
Wear respiratory protection provid specification, refer to section 8 of	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.					
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.					
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.					
2.2.4	Hot process (PROC 23, PROC 1, PROC 22)					
Product characteristics						
Physical form of product: Molten						
Additional physical form of produc	Additional physical form of product: Solid, Powder / Dust					
Additional physical form of product: Solid						
Maximum emission potential: Medium (temperature based)						
Covers percentage substance in the product up to 100 %.						
Frequency and duration of use	Frequency and duration of use					
Covers daily exposures up to 8 ho	burs.					
Technical conditions and meas	ures to control dispersion from source towards the worker					
Assumes process temperature up	o to 1.6E3 °C.					
Closed furnace or well-extracted of	open induction furnace.					
Use of an integrated local exhaus	t ventilation is required. Inhalation - minimum efficiency of 90 %					
Conditions and measures relate	ed to personal protection, hygiene and health evaluation					
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.						
2.2.5	Formulation and filling (PROC 9, PROC 3, PROC 8b)					
Product characteristics						
Physical form of product: Aqueous	s solution					
Covers percentage substance in t	he product up to 100 %.					
Maximum emission potential: Ver	y low					
Frequency and duration of use						
Covers daily exposures up to 8 hours.						

Technical conditions and measur	es to control dispersion from so	urce towards the worker		
Covers use at ambient temperatures	6.			
Conditions and measures related	to personal protection, hygiene	and health evaluation		
Wear respiratory protection providing inhalation exposure to the substance	S S 1		,	
Use suitable eye protection. For furt	her specification, refer to section 8	of the SDS.		
Wear suitable gloves tested to EN37	74. For further specification, refer to	section 8 of the SDS.		
2.2.6 F	Packaging of massive objects (PRC	ackaging of massive objects (PROC 21)		
Product characteristics				
Physical form of product: Bound in a	article.			
Maximum emission potential: Very lo	OW			
Covers percentage substance in the	product up to 5 %.			
Frequency and duration of use	<u></u>			
Covers daily exposures up to 8 hour	S.			
Technical conditions and measur		urce towards the worker		
Covers use at ambient temperatures	·			
Conditions and measures related		and health evaluation		
Wear respiratory protection providin inhalation exposure to the substance	g a minimum assigned protection f	actor of 10 (a minimum efficiency	,	
Use suitable eye protection. For furt	her specification, refer to section 8	of the SDS.		
Wear suitable gloves tested to EN37				
2.2.7	Cleaning & Maintenance (PROC 28			
Product characteristics				
Physical form of product: Solid, med	lium dustiness			
Frequency and duration of use				
Covers daily exposures up to 8 hour	'S.			
Technical conditions and measur	es to control dispersion from so	urce towards the worker		
Process is carried out at ambient pro	essure			
Covers use at ambient temperatures	5.			
Maintenance and repair work only a operation.	t facilities which are not in operatio	n. Minor cleaning tasks may be co	onducted under	
Conditions and measures related	to personal protection, hygiene	and health evaluation		
Wear respiratory protection providin specification, refer to section 8 of the		actor of 10 (a minimum efficiency	of 90%). For further	
Use suitable eye protection. For furt	her specification, refer to section 8	of the SDS.		
Wear suitable gloves tested to EN37	74. For further specification, refer to	section 8 of the SDS.		
Wear protective suit conforming to E	N 13982 in cases where direct cor	ntact with the substance cannot be	e avoided.	
SECTION 3:	28.3 Exposure estimation			
3.1 Environment				
Release estimation method: Estimat	ted release factor			
		Release rate		
	Water	Air	Soil	
Industrial use of cobalt in the manufacture of inorganic pigments, frits, ceramic ware, glass ES 1 STP Discharge	0.079 kg/day	0.059 kg/day	0 kg/day	

Industrial use of cobalt in the manufacture of inorganic pigments, frits, ceramic ware, glass ES 2 Direct Discharge	0.079	kg/day	0.059 kg/da	ý	0 kg/day	
Industrial use of cobalt in the manufacture of inorganic pigments, frits, ceramic ware, glass ES 3 Marine Discharge	0.079	kg/day	0.059 kg/day		0 kg/day	
Industrial use of cobalt in the manufacture of inorganic pigments and frits ES4 High volume with low emission factor (ERC 6a)	0.032	kg/day	7.92E-3 kg/da	ау	0 kg/day	
Industrial use of cobalt in the manufact	cture of inorganio	c pigments, frits,	ceramic ware, glass ES	6 1 STP Dis	charge	
Protection target		(PEC, Pred	concentration licted Exposure entration)	Risk ch	aracterisation ratio (RCR)	
Fresh water			5E-4 mg/l SES 2.1.2)		0.165	
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method · metals)	0.133		
Sewage Treatment Plant		0.024 mg/l (EUSES 2.1.2)		0.064		
Agricultural soil		0.906 mg/kg dw (EUSES 2.1.2)		0.083		
Man via Environment - Inhalation (Systemic effects)		1.5E-5 mg/m ³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Inhalation (Local effects)			E-5 mg/m³ SES 2.1.2)		< 0.01	
Man via Environment - Oral			mg/kg bw/day sured data)	0.036		
Man via Environment - Combined rout	es				0.038	
Industrial use of cobalt in the manufact	cture of inorganio	c pigments, frits,	ceramic ware, glass ES	6 2 Direct D	ischarge	
Protection target		(PEC, Pred	concentration licted Exposure entration)	Risk ch	aracterisation ratio (RCR)	
Fresh water			5E-4 mg/l SES 2.1.2)		0.212	
Sedimentation (Fresh water)		9.07 mg/kg dw (PEC sediment calculation method for metals)		0.169		
Agricultural soil		0.239 mg/kg dw (EUSES 2.1.2)		0.022		
Man via Environment - Inhalation (Sys	temic effects)		5E-5 mg/m ³ < 0.0 USES 2.1.2)		< 0.01	
Man via Environment - Inhalation (Loc	al effects)		1.5E-5 mg/m³ (EUSES 2.1.2)		< 0.01	
Man via Environment - Oral			mg/kg bw/day sured data)		0.036	
Man via Environment - Combined rout	es				0.038	

Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	0.187 µg/l (Clocal calculation with Kp susp. matter marine)	0.079
Sedimentation (Marine water)	27.89 mg/kg dw (PEC sediment calculation method for metals)	0.4
Agricultural soil	0.239 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	1.5E-5 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	1.5E-5 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.037
Industrial use of cobalt in the manufacture of inorgani	c pigments and frits ES4 High volume w	ith low emission factor (ERC 6a
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Marine water	7.06E-4 mg/l (EUSES 2.1.2)	0.666
Sedimentation (Marine water)	27.56 mg/kg dw (PEC sediment calculation method for metals)	0.512
Sewage Treatment Plant	9.59E-3 mg/l (EUSES 2.1.2)	0.026
Agricultural soil	0.508 mg/kg dw (EUSES 2.1.2)	0.047
Man via Environment - Inhalation (Systemic effects)	2.32E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	2.32E-6 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3. 4E-4 mg/kg bw/day (Measured data)	0.038
Man via Environment - Combined routes		0.038
3.2 Worker		
Raw material handling (PROC 26, PROC 21, PROC 8	8b)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	17.2 µg/m³	0.318
Inhalation, Local effects, Long Term	17.2 µg/m³	0.43
Dermal, Systemic effects, Long Term	92.8 μg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term		0.331

Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	12 µg/m³	0.222
Inhalation, Local effects, Long Term	12 µg/m³	0.3
Dermal, Systemic effects, Long Term	1 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.222
Wet process (PROC 4, PROC 1)	·	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	2.1 µg/m³	0.039
Inhalation, Local effects, Long Term	2.1 µg/m³	0.053
Dermal, Systemic effects, Long Term	1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.039
Hot process (PROC 23, PROC 1, PROC 22)	·	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18.1 µg/m³	0.335
Inhalation, Local effects, Long Term	18.1 µg/m³	0.453
Dermal, Systemic effects, Long Term	1.3 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.335
Formulation and filling (PROC 9, PROC 3, PROC 8	b)	·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10 µg/m ³ (MEASE, PROC 9)	0.185
Inhalation, Local effects, Long Term	10 µg/m ³ (MEASE, PROC 9)	0.25
Dermal, Systemic effects, Long Term	0.8 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.185
Packaging of massive objects (PROC 21)	·	·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10 μg/m³ (MEASE)	0.185
Inhalation, Local effects, Long Term	10 µg/m³ (MEASE)	0.25
Dermal, Systemic effects, Long Term	3.1 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.185

Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Te	erm	10.9 µg/m³	0.201
Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, Long Term			0.214
SECTION 4:	28.4 Guidance to DU to evaluate whether he works inside the boundaries set the ES		inside the boundaries set by
Health/ Environment			
The DU works inside the boundaries		ither the proposed risk management me wn that his operational conditions and ir	

met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSAtoolbox/duscaling-tool) to estimate PEC values.

29. Exposure Scenario 29: Service life (worker at industrial site); Service life of cobalt-containing varistors and magnets in industrial settings

SECTION 1:	29.1 Title of exposure scenario	29.1 Title of exposure scenario		
	Service life (worker at industrial site); Service life of cobalt-containing varistors and magnets in industrial settings			
Article Categories [AC]				
Machinery, mechanical appliances	s, electrical/electronic articles	AC2		
Metal articles		AC7		
Contributing scenario controllin	ng environmental exposure			
Service life of cobalt-containing va	aristors and magnets in industrial settings ERC 12a			
Contributing scenario controllin	ng worker exposure			
Handling of varistors	PROC 21			
Handling of magnets	PROC 21			
Exposure scenario of the uses	leading to the inclusion of the substance into	o the article		
Use at industrial sites; Industrial u magnets (calcination/sintering pro	se of cobalt in the production of varistors and cesses)	ES27		
SECTION 2:	29.2 Operational conditions and risk mana	gement measures		
2.1	Contributing scenario controlling environmental exposure			
2.1.1	Service life of cobalt-containing varistors and magnets in industrial settings (ERC 12a)			
Frequency and duration of use				

Daily amount per site <= 0.5 tonnes/day					
Annual amount per site <= 10 tonnes/year					
Conditions and measures related to municipal sewage treatment plant					
Municipal sewage treatment plant is assumed.					
Assumed domestic sewage treatment plant flow >= 2E3 m3/day					
Conditions and measures related			r disposal		
Dispose of waste product or used of	ontainers according	to local regulati	ons.		
2.2	Contributing scen	ario controlling	worker exposure		
2.2.1	Handling of varisto	rs (PROC 21)	<u> </u>		
Product characteristics					
Physical form of product: Bound in	article.				
Maximum emission potential: Very	low				
Covers percentage substance in the	e product up to 5 %				
Frequency and duration of use					
Covers daily exposures up to 8 hou	Irs.				
Technical conditions and measu	res to control disp	ersion from so	urce towards the worke	er	
Wear respiratory protection providir inhalation exposure to the substance					
Use suitable eye protection. For fur					
Wear suitable gloves tested to EN3	74. For further spec	cification, refer to	section 8 of the SDS.		
2.2.2	Handling of magne	ts (PROC 21)			
Product characteristics					
Physical form of product: Massive of	object				
Maximum emission potential: Very	low				
Frequency and duration of use					
Covers daily exposures up to 8 hou	Irs.				
Technical conditions and measu	res to control disp	ersion from so	urce towards the worke	er	
Covers use at ambient temperature	es.				
Technical conditions and measu	res to control disp	ersion from so	urce towards the worke	er	
Technical conditions and measures to control dispersion from source towards the worker 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.					
Use suitable eye protection. For fur	ther specification, re	efer to section 8	of the SDS.		
Wear suitable gloves tested to EN3	74. For further spec	cification, refer to	section 8 of the SDS.		
SECTION 3:	29.3 Exposure	estimation			
3.1 Environment					
Release estimation method: Estima	ated release factor				
			Release rate		
	Wat	Water Air			Soil
Service life of cobalt-containing varistors and magnets in industrial settings	0 kg/day 0 kg/day 0 kg/da		0 kg/day		
3.2 Worker					
Handling of varistors (PROC 21)					
Exposure route		Exposure esti	mation	Risk ch ratio (F	naracterisation RCR)
Inhalation, Systemic effects, Long	Term	erm 10 μg/m³ (MEASE)		0.185	

nhalation, Local effects, Long Term		10 μg/m³ (MEASE)	0.25
Dermal, Systemic effects, Long Term		3.1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.185
Handling of magnets (PROC 21)			L
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		8.6 µg/m³	0.159
Inhalation, Local effects, Long Term		8.6 µg/m³	0.215
Dermal, Systemic effects, Long Term		62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			0.168
SECTION 4:	29.4 Guidance to DU to evaluate whether he works inside the boundaries set b the ES		nside the boundaries set by
Health/ Environment			
are met or the downstream user can of management measures are adequate exposure to a level below the DNEL (above) as given below. If measured d MEASE (www.ebrc.de/mease.html) to showing that they limit the PEC below	demonstrate on h e. For human heat given that the pro- lata are not availa o estimate the ass the PNEC for the n appropriate sca	ther the proposed risk management mea- is own that his operational conditions an ith, this has to be done by showing that t occesses and activities in question are cow able, the DU may make use of an approp sociated exposure. For the environment, e respective environmental compartment ling tool such as the DU-Scaling tool (htt imate PEC values.	d implemented risk hey limit the inhalation rered by the PROCs listed riate scaling tool such as this has to be done by t. If measured data are not

30. Exposure Scenario 30: Service life (Professional worker); Service life of cobalt-containing varistors and magnets in professional settings

SECTION 1:	30.1 Title of exposure scenario				
	Service life (Professional worker); Service life of cobalt-containing varistors and magnets in professional settings				
Article Categories [AC]					
Machinery, mechanical appliances, electrical/electronic articles AC2					
Metal articles	AC7				
Contributing scenario controlling environmental exposure					
Service life of cobalt-containing varistors and magnets in professional settings ERC 10a, ERC 11a					
Contributing scenario controllin	Contributing scenario controlling worker exposure				
Handling of varistors		PROC 21			
Handling of magnets		PROC 21			
Exposure scenario of the uses leading to the inclusion of the substance into the article					
Use at industrial sites; Industrial use of cobalt in the production of varistors and magnets (calcination/sintering processes)		ES27			

SECTION 2:	30.2 Operational conditions and risk management measures				
2.1	Contributing scenario controlling	ontributing scenario controlling environmental exposure			
2.1.1	ervice life of cobalt-containing varistors and magnets in professional settings (ERC 10a, RC 11a)				
Conditions and measures related to municipal sewage treatment plant					
Municipal sewage treatment plant is assumed.					
Conditions and measures related	to external treatment of waste for	or disposal			
Dispose of waste product or used c	ontainers according to local regulat	ions.			
2.2	ontributing scenario controlling worker exposure				
2.2.1	Handling of varistors (PROC 21)				
Product characteristics					
Physical form of product: Bound in	article.				
Maximum emission potential: Very	ow				
Covers percentage substance in the	e product up to 5 %.				
Frequency and duration of use					
Covers daily exposures up to 8 hou	rs.				
Conditions and measures related	to personal protection, hygiene	and health evaluation			
Wear respiratory protection providir inhalation exposure to the substance					
Use suitable eye protection. For fur	ther specification, refer to section 8	of the SDS.			
Wear suitable gloves tested to EN3	74. For further specification, refer to	section 8 of the SDS.			
2.2.2	Handling of magnets (PROC 21)				
Product characteristics					
Physical form of product: Massive object					
Maximum emission potential: Very low					
Frequency and duration of use					
Covers daily exposures up to 8 hours.					
Technical conditions and measured	res to control dispersion from so	urce towards the worker			
Covers use at ambient temperature	S.				
Conditions and measures related	to personal protection, hygiene	and health evaluation			
Wear respiratory protection providir inhalation exposure to the substance					
Use suitable eye protection. For fur	ther specification, refer to section 8	of the SDS.			
Wear suitable gloves tested to EN3	74. For further specification, refer to	section 8 of the SDS.			
SECTION 3:	30.3 Exposure estimation				
3.1 Environment					
Release estimation method: Estima	ted release factor				
		Release rate			
	Water	Air	Soil		
Service life of cobalt-containing varistors and magnets in professional settings	0 kg/day	0 kg/day	0 kg/day		

3.2 Worker				
Handling of varistors (PROC 21)				
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Te	erm	10 μg/m³ (MEASE)	0.185	
Inhalation, Local effects, Long Term		10 μg/m³ (MEASE)	0.25	
Dermal, Systemic effects, Long Term	I	3.1 μg/kg bw/day	< 0.01	
Combined routes, Systemic effects, L	ong Term		0.185	
Handling of magnets (PROC 21)		<u>I</u>		
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term		8.6 µg/m³	0.159	
Inhalation, Local effects, Long Term		8.6 µg/m³	0.215	
Dermal, Systemic effects, Long Term		62.2 μg/kg bw/day	< 0.01	
Combined routes, Systemic effects, L	ong Term		0.168	
SECTION 4:	30.4 Guidance the ES	to DU to evaluate whether he works i	nside the boundaries set by	
Health/ Environment				
are met or the downstream user can management measures are adequate exposure to a level below the DNEL above) as given below. If measured of MEASE (www.ebrc.de/mease.html) to showing that they limit the PEC below	demonstrate on h e. For human hea given that the pro- lata are not availa o estimate the ass v the PNEC for th n appropriate sca	ither the proposed risk management mea- is own that his operational conditions an lth, this has to be done by showing that to presses and activities in question are con- able, the DU may make use of an approp- sociated exposure. For the environment, e respective environmental compartmen ling tool such as the DU-Scaling tool (htt imate PEC values.	d implemented risk they limit the inhalation vered by the PROCs listed oriate scaling tool such as this has to be done by t. If measured data are not	

31. Exposure Scenario 31: Service life (Consumers); Service life of articles containing cobalt being encapsulated in the internal part of the product

SECTION 1:	31.1 Title of exposure scenario		
	Service life (Consumers); Service life of articles containing cobalt being encapsulated in the internal part of the product		
Article Categories [AC]			
Machinery, mechanical appliances, electrical/electronic articles		AC2	
Contributing scenario controlling environmental exposure			
Service life of articles containing cobalt being encapsulated in the internal part of the product		ERC 10a, ERC 11a	
Contributing scenario controlling consumer exposure			
Handling of electronic articles		AC2	

Exposure scenario of the uses lea Use at industrial sites; Industrial use magnets (calcination/sintering proce	of cobalt in the pro					
	31.2 Operational conditions and risk management measures					
2.1	Contributing scenario controlling environmental exposure					
	Service life of articles containing cobalt being encapsulated in the internal part of the product (ERC 10a, ERC 11a)					
Conditions and measures related	to external treatm	nent of waste fo	or disposal			
Dispose of waste product or used co	ontainers according	to local regulati	ions.			
Other given operational condition	s affecting enviro	nmental expos	ure			
Municipal sewage treatment plant is	assumed.					
2.2	Contributing scen	ario controlling	g consumer exposu	ire		
2.2.1	Handling of electro	nic articles (AC 2	2)			
Product characteristics						
Physical form of product: encapsula	ted in the internal p	art				
Inhalation exposure is considered to	be not relevant.					
Assumes no dermal contact.						
Oral exposure is considered to be n	ot relevant.					
SECTION 3:	31.3 Exposure estimation					
3.1 Environment						
Release estimation method: Estima	ed release factor					
			Release rate			
	Water Air			Soil		
Service life of articles containing	0 kg/			1		
cobalt being encapsulated in the internal part of the product	0 kg/day 0 kg/day		ý	0 kg/day		
3.2 Consumer	•					
Handling of electronic articles (AC 2)					
Exposure route		Exposure estimation			Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long T	erm	0 µg/m³ (Qualitative assessment)		< 0.01	< 0.01	
Inhalation, Local effects, Long Term	1	0 µg/m³ (Qualitative assessment)		< 0.01	< 0.01	
Dermal, Systemic effects, Long Term		0 mg/kg bw/day (Qualitative assessment)		< 0.01	< 0.01	
Oral, Systemic effects, Long Term		0 μg/kg bw/day (Qualitative assessment)		< 0.01	< 0.01	
Combined routes, Systemic effects, Long Term				< 0.01	< 0.01	
SECTION 4:	31.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES					
Health/ Environment						
The DU works inside the boundaries are met or the downstream user car management measures are adequa exposure to a level below the DNEL above) as given below. If measured	demonstrate on h te. For human heal (given that the pro	is own that his o th, this has to be cesses and activ	perational conditions e done by showing th vities in question are	and implem at they limit covered by t	ented risk he inhalation he PROCs listed	

showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

32. Exposure Scenario 32: Use at industrial sites; Production of hardmetal powder

SECTION 1:	32.1 Title of exposure scenario			
	Use at industrial sites; Production of hardmetal powder			
Chemical product category [PC]				
Base metals and alloys PC 7				
Contributing scenario controllin	g environmental exposure			
Production of hardmetal powder ES 1 STP Discharge ERC 6a				
Production of hardmetal powder ES 2 Marine Discharge ERC 6a				
Contributing scenario controllin	g worker exposure			
Weighing Powders & Filling the Mi	11	PROC 26		
Milling		PROC 3		
Emptying the mill		PROC 8b		
Drying	PROC 9, PROC 3			
Cleaning & Maintenance		PROC 28		
Subsequent service life exposu	re scenario(s)			
Service life (worker at industrial site); Service life of hardmetal articles in industrial settings				
SECTION 2:	32.2 Operational conditions and risk man	nagement measures		
2.1	Contributing scenario controlling environmental exposure			
2.1.1	Production of hardmetal powder ES 1 STP Discharge (ERC 6a)			
Frequency and duration of use				
Daily amount per site <= 0.654 tor	nnes/day			
Annual amount per site <= 170 tor	nnes/year			
Emission days >= 260 days/year				
Technical onsite conditions and	measures to reduce or limit discharges,	air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/ba	ag filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange.				
Conditions and measures related to municipal sewage treatment plant				
Municipal sewage treatment plant	is assumed.			
Assumed domestic sewage treatment plant flow >= 2E3 m ³ /day				
Conditions and measures related to external treatment of waste for disposal				
Dispose of waste product or used	containers according to local regulations.			
Other given operational conditions affecting environmental exposure				
	umed.			

Local freshwater dilution factor 10	0.		
2.1.2	Production of hardmetal powder ES 2 Marine Discharge (ERC 6a)		
Frequency and duration of use			
Daily amount per site <= 0.654 tor	nnes/day		
Annual amount per site <= 170 tor			
Emission days >= 260 days/year	,		
	I measures to reduce or limit discharges, air emissions and releases to soil		
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet		
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.		
Conditions and measures relate	d to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
Assumed effluent discharge flow f	rom site >= 2E3 m³/day		
Local marine water dilution factor	100.		
2.2	Contributing scenario controlling worker exposure		
2.2.1	Weighing Powders & Filling the Mill (PROC 26)		
Product characteristics			
Physical form of product: Solid, me	edium dustiness		
Covers percentage substance in the	ne product up to 25 %.		
Frequency and duration of use			
Covers daily exposures up to 8 ho	urs.		
Technical conditions and measured	ures to control dispersion from source towards the worker		
local exhaust ventilation. Inhalation	n - minimum efficiency of 78 %		
Conditions and measures relate	d to personal protection, hygiene and health evaluation		
Wear respiratory protection provid specification, refer to section 8 of 1	ing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). For further the SDS.		
Use suitable eye protection. For fu	Irther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.		
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.		
2.2.2	Milling (PROC 3)		
Product characteristics			
Physical form of product: Aqueous	solution		
Covers percentage substance in the	ne product up to 25 %.		
Maximum emission potential: Very	/ low		
Frequency and duration of use			
Covers daily exposures up to 8 ho	urs.		
Technical conditions and measu	ures to control dispersion from source towards the worker		
local exhaust ventilation. Inhalation	n - minimum efficiency of 78 %		
Use in closed process.			
Conditions and measures relate	d to personal protection, hygiene and health evaluation		
Wear respiratory protection provid specification, refer to section 8 of t	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.		
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 protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.3	Emptying the mill (PROC 8b)
Product characteristics	
Physical form of product: Aqueous	s solution
Covers percentage substance in t	he product up to 25 %.
Maximum emission potential: Ven	y low
Frequency and duration of use	
Covers daily exposures up to 8 ho	burs.
Technical conditions and meas	ures to control dispersion from source towards the worker
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %
Conditions and measures relate	ed to personal protection, hygiene and health evaluation
Wear respiratory protection provid specification, refer to section 8 of	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.
• •	1374. For further specification, refer to section 8 of the SDS.
5	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.4	Drying (PROC 9, PROC 3)
Product characteristics	
Physical form of product: Solid, m	
Covers percentage substance in t	he product up to 25 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	purs.
Technical conditions and meas	ures to control dispersion from source towards the worker
Elevated temperature. Covers use	e at temperatures below melting point.
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %
Use in closed process.	
Conditions and measures relate	ed to personal protection, hygiene and health evaluation
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.5	Cleaning & Maintenance (PROC 28)
Product characteristics	
Physical form of product: Solid, m	edium dustiness
Frequency and duration of use	
Covers daily exposures up to 8 ho	purs.
Technical conditions and meas	ures to control dispersion from source towards the worker
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %
	ed to personal protection, hygiene and health evaluation
Wear respiratory protection provid specification, refer to section 8 of	ling a minimum assigned protection factor of 20 (a minimum efficiency of 95%). For further the SDS.
	with an end of the state of the section of the ODO
Use suitable eye protection. For fu	urtner specification, refer to section 8 of the SDS.
	Jittner specification, refer to section 8 of the SDS.

SECTION 3:	32.3 Exposure estimation					
3.1 Environment						
Release estimation method: Estima	ed release factor					
		Release rate				
	Wa	ater	Air	Soil		
Production of hardmetal powder ES 1 STP Discharge	0.065	kg/day	0.196 kg/day		0 kg/day	
Production of hardmetal powder ES 2 Marine Discharge	0.065	kg/day	0.196 kg/day	/ 0 kg/day		
Production of hardmetal powder ES	1 STP Discharge	•				
Protection target		Exposure concentration (PEC, Predicted Exposure Concentration)		Risk characterisation ratio (RCR)		
Fresh water			4E-4 mg/l SES 2.1.2)	0.211		
Sedimentation (Fresh water)		9.08 mg/kg dw (PEC sediment calculation method for metals)		0.168		
Sewage Treatment Plant		0.02 mg/l (EUSES 2.1.2)		0.053		
Agricultural soil		0.791 mg/kg dw (EUSES 2.1.2)		0.073		
Man via Environment - Inhalation (Systemic effects)		3.9E-5 mg/m ³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Inhalation (Local effects)		3.9E-5 mg/m ³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Oral		3.24E-4 mg/kg bw/day (Measured data)		0.036		
Man via Environment - Combined ro	utes			0.041		
Production of hardmetal powder ES	2 Marine Dischar	rge				
Protection target		Exposure concentration (PEC, Predicted Exposure Concentration)		Risk characterisation ratio (RCR)		
Marine water		0.157 μg/l (Clocal calculation with Kp susp. matter marine)		0.067		
Sedimentation (Marine water)		25.3 mg/kg dw (PEC sediment calculation method for metals)		0.362		
Agricultural soil		0.24 mg/kg dw (EUSES 2.1.2)		0.022		
Man via Environment - Inhalation (Systemic effects)		3.9E-5 mg/m ³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Inhalation (Local effects)		3.9E-5 mg/m ³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Oral		3.17E-4 mg/kg bw/day (Measured data)		0.036		
Man via Environment - Combined ro	utes			0.04		

3.2 Worker		
Weighing Powders & Filling the Mill (PROC 26)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	27 μg/m³	0.499
Inhalation, Local effects, Long Term	27 μg/m³	0.675
Dermal, Systemic effects, Long Term	23.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.502
Milling (PROC 3)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	10 µg/m³	0.185
Inhalation, Local effects, Long Term	10 µg/m³	0.25
Dermal, Systemic effects, Long Term	0.1 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.185
Emptying the mill (PROC 8b)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	12 μg/m³	0.222
Inhalation, Local effects, Long Term	12 µg/m³	0.3
Dermal, Systemic effects, Long Term	0.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.222
Drying (PROC 9, PROC 3)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	16 μg/m³	0.296
Inhalation, Local effects, Long Term	16 μg/m³	0.4
Dermal, Systemic effects, Long Term	0.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.296
Cleaning & Maintenance (PROC 28)		· · ·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18.6 µg/m³	0.344
Inhalation, Local effects, Long Term	18.6 µg/m³	0.465
Dermal, Systemic effects, Long Term	62.6 µg/kg bw/day	< 0.01
		I

Combined routes, Systemic effects, Long Term			0.352
SECTION 4:	32.4 Guidance the ES	32.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES	
Health/ Environment			
met or the downstream use measures are adequate. For below the DNEL (given that measured data are not ava (www.ebrc.de/mease.html) they limit the PEC below th	er can demonstrate on his out or human health, this has to t the processes and activitie ilable, the DU may make us to estimate the associated e PNEC for the respective e priate scaling tool such as th	ther the proposed risk management mea wn that his operational conditions and im be done by showing that they limit the in es in question are covered by the PROCs ee of an appropriate scaling tool such as l exposure. For the environment, this has environmental compartment. If measured ne DU-Scaling tool (http://www.arche-cor	plemented risk management halation exposure to a level listed above) as given below. If MEASE to be done by showing that data are not available, the DU

SECTION 1:	33.1 Title of exposure scenario	
	Use at industrial sites; Production of sintered hardmetal articles	
Chemical product category [PC]	l	
Base metals and alloys		PC 7
Contributing scenario controllin	g environmental exposure	
Production of sintered hardmetal a	articles ES 1 STP Discharge	ERC 6a
Production of sintered hardmetal a	articles ES 2 Marine Discharge	ERC 6a
Contributing scenario controllin	g worker exposure	
Transfer to mixer		PROC 8b
Mixing		PROC 3
Press charging		PROC 8b
Pressing		PROC 14
Shaping		PROC 21
Sintering		PROC 22
Grinding and/or turning		PROC 24
Edge rounding		PROC 24
Coating		PROC 1
Brazing or welding		PROC 25
Marking		PROC 21
Packaging		PROC 21
Cleaning & Maintenance		PROC 28
Subsequent service life exposu	re scenario(s)	
Service life (worker at industrial sit industrial settings	te); Service life of hardmetal articles in	ES35

33. Exposure Scenario 33: Use at industrial sites; Production of sintered hardmetal articles

Service life (Consumers): Servic	e life of hard metal articles used by consumers	ES37
SECTION 2:	33.2 Operational conditions and risk manag	
2.1	Contributing scenario controlling environm	ental exposure
2.1.1	Production of sintered hardmetal articles ES 1	STP Discharge (ERC 6a)
Frequency and duration of use	3	
Daily amount per site <= 0.654 to	onnes/day	
Annual amount per site <= 170 te	onnes/year	
Emission days >= 260 days/year	r	
Technical onsite conditions ar	nd measures to reduce or limit discharges, air o	emissions and releases to soil
Electrostatic precipitator or wet e scrubber.	electrostatic precipitator or cyclones or fabric/bag fi	Iter or ceramic/metal mesh filter or wet
Chemical precipitation or sedime	entation or filtration or electrolysis or reverse osmo	sis or ion exchange.
Conditions and measures rela	ted to municipal sewage treatment plant	
Municipal sewage treatment plan	nt is assumed.	
Assumed domestic sewage treat	tment plant flow >= 2E3 m³/day	
Conditions and measures rela	ted to external treatment of waste for disposal	
Dispose of waste product or use	d containers according to local regulations.	
Other given operational conditional	tions affecting environmental exposure	
No discharge to marine water as	sumed.	
Local freshwater dilution factor 1	00.	
2.1.2	Production of sintered hardmetal articles ES 2	Marine Discharge
Frequency and duration of use	3	
Daily amount per site <= 0.654 to	onnes/day	
Annual amount per site <= 170 te	onnes/year	
Emission days >= 260 days/year		
Technical onsite conditions ar	nd measures to reduce or limit discharges, air o	emissions and releases to soil
Electrostatic precipitator or wet e scrubber.	electrostatic precipitator or cyclones or fabric/bag fi	Iter or ceramic/metal mesh filter or wet
Chemical precipitation or sedime	entation or filtration or electrolysis or reverse osmo	sis or ion exchange.
Conditions and measures rela	ted to external treatment of waste for disposal	
Dispose of waste product or use	d containers according to local regulations.	
Other given operational conditional	tions affecting environmental exposure	
Assumed effluent discharge flow	r from site >= 2E3 m³/day	
Local marine water dilution facto		
2.2	Contributing scenario controlling worker ex	posure
2.2.1	Transfer to mixer (PROC 8b)	
Product characteristics		
Physical form of product: Solid, r		
Physical form of product: Solid, r Covers percentage substance in	the product up to 25 %.	
Physical form of product: Solid, r Covers percentage substance in Frequency and duration of use	the product up to 25 %.	
Physical form of product: Solid, r Covers percentage substance in Frequency and duration of use Avoid carrying out activities invol	the product up to 25 %.	

Conditions and measures relate	ed to personal protection, hygiene and health evaluation
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.2	Mixing (PROC 3)
Product characteristics	
Physical form of product: Solid, m	edium dustiness
Covers percentage substance in t	he product up to 25 %.
Frequency and duration of use	
Covers daily exposures up to 8 ho	purs.
Technical conditions and meas	ures to control dispersion from source towards the worker
Use in closed process.	• • •
· ·	ed to personal protection, hygiene and health evaluation
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further
Use suitable eye protection. For fu	Irther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.3	Press charging (PROC 8b)
Product characteristics	
Physical form of product: Solid, m	edium dustiness
Covers percentage substance in t	
Frequency and duration of use	
Covers daily exposures up to 8 ho	urs.
Technical conditions and meas	ures to control dispersion from source towards the worker
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %
	d to personal protection, hygiene and health evaluation
Wear respiratory protection provid specification, refer to section 8 of	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.4	Pressing (PROC 14)
Product characteristics	
Physical form of product: Solid, m	edium dustiness
Covers percentage substance in t	
Frequency and duration of use	· ·
Covers daily exposures up to 8 hc	urs.
	ures to control dispersion from source towards the worker
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %
	ed to personal protection, hygiene and health evaluation
	in a minimum contraction factor of 40 (a minimum officiance of 00%). For further
Wear respiratory protection provid specification, refer to section 8 of	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.

Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.		
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.5	Shaping (PROC 21)		
Product characteristics			
Physical form of product: Solid, P	owder / Dust		
Maximum emission potential: Med	dium (abrasion based)		
Covers percentage substance in t	he product up to 25 %.		
Frequency and duration of use			
Covers daily exposures up to 8 ho	Durs.		
Technical conditions and meas	ures to control dispersion from source towards the worker		
local exhaust ventilation. Inhalatio	on - minimum efficiency of 78 %		
Conditions and measures relate	ed to personal protection, hygiene and health evaluation		
	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nce can be excluded. For further specification, refer to section 8 of the SDS.		
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.		
Wear protective suit conforming to	o EN 13982 in cases where direct contact with the substance cannot be avoided.		
2.2.6 Sintering (PROC 22)			
Product characteristics			
Physical form of product: Solid, P	owder / Dust		
Maximum emission potential: Low	ν (temperature based)		
Covers percentage substance in t	he product up to 25 %.		
Frequency and duration of use			
Covers daily exposures up to 8 ho	ours.		
Technical conditions and meas	ures to control dispersion from source towards the worker		
Assumes process temperature up	o to 1.49E3 °C.		
Use of an integrated local exhaus	t ventilation is required. Inhalation - minimum efficiency of 84 %		
Use in closed process.			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation		
	ding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nce can be excluded. For further specification, refer to section 8 of the SDS.		
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.		
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.		
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.7	Grinding and/or turning (PROC 24)		
Product characteristics			
Physical form of product: Bound in	n article.		
Maximum emission potential: High	h (abrasion based)		
Covers percentage substance in t	he product up to 25 %.		
Frequency and duration of use			
Covers daily exposures up to 8 ho	ours.		
Technical conditions and meas	ures to control dispersion from source towards the worker		
local exhaust ventilation. Inhalatic	n - minimum efficiency of 78 %		
Conditions and measures relate	ed to personal protection, hygiene and health evaluation		
Manual and a second second second			

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.

Use suitable eye protection. For furt	ther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN37	74. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to E	EN 13982 in cases where direct contact with the substance cannot be avoided.
· · ·	Edge rounding (PROC 24)
Product characteristics	
Physical form of product: Bound in a	article
Maximum emission potential: High (
Covers percentage substance in the	
Frequency and duration of use	
Covers daily exposures up to 8 hour	
	res to control dispersion from source towards the worker
local exhaust ventilation. Inhalation	
Use in closed process.	
	t to personal protection, hygiene and health evaluation
	ng a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless
	ce can be excluded. For further specification, refer to section 8 of the SDS.
Use suitable eye protection. For furt	ther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN37	74. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to E	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.9	Coating (PROC 1)
Product characteristics	
Physical form of product: Bound in a	article.
Maximum emission potential: Very le	low
Covers percentage substance in the	e product up to 25 %.
Frequency and duration of use	
Covers daily exposures up to 8 hour	Irs.
Technical conditions and measur	res to control dispersion from source towards the worker
Use of an integrated local exhaust v	ventilation is required. Inhalation - minimum efficiency of 84 %
Use in closed process.	
Conditions and measures related	t to personal protection, hygiene and health evaluation
Wear respiratory protection providin specification, refer to section 8 of the	ng a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further ne SDS.
Use suitable eye protection. For furt	ther specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN37	74. For further specification, refer to section 8 of the SDS.
Wear protective suit conforming to E	EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.10 E	Brazing or welding (PROC 25)
Product characteristics	
Physical form of product: Molten	
Maximum emission potential: High ((temperature based)
Covers percentage substance in the	e product up to 25 %.
Frequency and duration of use	
Covers daily exposures up to 8 hour	Irs.
Technical conditions and measur	res to control dispersion from source towards the worker
Elevated temperature. Covers use a	at temperatures below melting point.
local exhaust ventilation. Inhalation	- minimum efficiency of 78 %

Conditions and measures related	ed to personal protection, hygiene and health evaluation			
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.			
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.11	Marking (PROC 21)			
Product characteristics				
Physical form of product: Bound in	n article.			
Maximum emission potential: Ver	y low			
Covers percentage substance in t	he product up to 25 %.			
Frequency and duration of use				
Covers daily exposures up to 8 he	burs.			
Technical conditions and meas	ures to control dispersion from source towards the worker			
Use of an integrated local exhaus	t ventilation is required. Inhalation - minimum efficiency of 84 %			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless not can be excluded. For further specification, refer to section 8 of the SDS.			
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.12	Packaging (PROC 21)			
Product characteristics				
Physical form of product: Bound i	n article.			
Maximum emission potential: Ver	y low			
Covers percentage substance in t	he product up to 25 %.			
Frequency and duration of use				
Covers daily exposures up to 8 ho	purs.			
Technical conditions and meas	ures to control dispersion from source towards the worker			
Use of an integrated local exhaus	t ventilation is required. Inhalation - minimum efficiency of 84 %			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless not can be excluded. For further specification, refer to section 8 of the SDS.			
Use suitable eye protection. For f	urther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	1374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.			
2.2.13	Cleaning & Maintenance (PROC 28)			
Product characteristics				
Physical form of product: Solid, m	edium dustiness			
Frequency and duration of use				
Covers daily exposures up to 8 ho	purs.			
Technical conditions and meas	ures to control dispersion from source towards the worker			
Process is carried out at ambient	pressure.			
Covers use at ambient temperatu	res			
local exhaust ventilation. Inhalation	n - minimum efficiency of 78 %			

Conditions and measures related t	to personal prot	ection, hygiene	and health evaluation	า	
Wear respiratory protection providing inhalation exposure to the substance					
Use suitable eye protection. For furth	er specification,	refer to section 8	of the SDS.		
Wear suitable gloves tested to EN37	4. For further spe	ecification, refer to	section 8 of the SDS.		
Wear protective suit conforming to E	N 13982 in cases	s where direct cor	ntact with the substanc	e cannot be	e avoided.
SECTION 3:	33.3 Exposure	e estimation			
3.1 Environment					
Release estimation method: Estimate	ed release factor				
			Release rate		
	Wa	ater	Air		Soil
Production of sintered hardmetal articles ES 1 STP Discharge	0.065	kg/day	0.196 kg/da	y	0 kg/day
Production of sintered hardmetal articles ES 2 Marine Discharge	0.065	kg/day	0.196 kg/da	y	0 kg/day
Production of sintered hardmetal artic	cles ES 1 STP D	ischarge			
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk ch	naracterisation ratio (RCR)
Fresh water			4E-4 mg/l SES 2.1.2)	0.211	
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method metals)	0.168	
Sewage Treatment Plant			02 mg/l SES 2.1.2)		0.053
Agricultural soil			mg/kg dw SES 2.1.2)		0.073
Man via Environment - Inhalation (Sys	stemic effects)		-5 mg/m³ SES 2.1.2)		< 0.01
Man via Environment - Inhalation (Local effects)			-5 mg/m³ SES 2.1.2)		< 0.01
Man via Environment - Oral			mg/kg bw/day sured data)	0.036	
Man via Environment - Combined rou	ites				0.041
Production of sintered hardmetal artic	cles ES 2 Marine	Discharge		L	
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk ch	naracterisation ratio (RCR)
Fresh water		(Clocal calcul	157 μg/l ation with Kp susp. er marine)		0.067
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method metals)		0.362
Agricultural soil			mg/kg dw SES 2.1.2)		0.022
Man via Environment - Inhalation (Sy	stemic effects)		-5 mg/m³ SES 2.1.2)		< 0.01
Man via Environment - Inhalation (Lo	cal effects)	3.9E	-5 mg/m³		< 0.01

	(EUSES 2.1.2)	
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.04
3.2 Worker		
Transfer to mixer (PROC 8b)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	0.5 μg/m³	< 0.01
Inhalation, Local effects, Long Term	0.5 μg/m³	0.013
Dermal, Systemic effects, Long Term	1.9 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		< 0.01
Mixing (PROC 3)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	4 μg/m³	0.074
Inhalation, Local effects, Long Term	4 μg/m³	0.1
Dermal, Systemic effects, Long Term	0.1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.074
Press charging (PROC 8b)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	17.6 µg/m³	0.325
Inhalation, Local effects, Long Term	17.6 µg/m³	0.44
Dermal, Systemic effects, Long Term	15.5 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.327
Pressing (PROC 14)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	17.6 µg/m³	0.325
Inhalation, Local effects, Long Term	17.6 µg/m³	0.44
Dermal, Systemic effects, Long Term	15.5 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.326

Shaping (PROC 21)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	15 μg/m³	0.277
Inhalation, Local effects, Long Term	15 μg/m³	0.375
Dermal, Systemic effects, Long Term	15.5 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.279
Sintering (PROC 22)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	6 µg/m³ (MEASE, PROC 9)	0.111
Inhalation, Local effects, Long Term	6 μg/m³ (MEASE, PROC 9)	0.15
Dermal, Systemic effects, Long Term	0.3 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.111
Grinding and/or turning (PROC 24)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18 μg/m³	0.333
Inhalation, Local effects, Long Term	18 μg/m³	0.45
Dermal, Systemic effects, Long Term	23.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.336
Edge rounding (PROC 24)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	3 µg/m³	0.055
Inhalation, Local effects, Long Term	3 µg/m³	0.075
Dermal, Systemic effects, Long Term	23.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.059
Coating (PROC 1)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	7.4 μg/m³	0.137
Inhalation, Local effects, Long Term	7.4 μg/m³	0.185
Dermal, Systemic effects, Long Term	0.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.137

Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		24 µg/m³	0.444
Inhalation, Local effects, Long Term		24 μg/m³	0.6
Dermal, Systemic effects, Long Term		0.3 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long	g Term		0.444
Marking (PROC 21)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		24 µg/m³	0.444
Inhalation, Local effects, Long Term		24 µg/m³	0.6
Dermal, Systemic effects, Long Term		15.5 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			0.444
Packaging (PROC 21)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		4.5 μg/m³	0.083
Inhalation, Local effects, Long Term		4.5 μg/m³	0.112
Dermal, Systemic effects, Long Term		15.5 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long	g Term		0.085
Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		11 µg/m³	0.203
Inhalation, Local effects, Long Term		11 μg/m³	0.275
Dermal, Systemic effects, Long Term		62.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long	g Term		0.212
	3.4 Guidance le ES	to DU to evaluate whether he v	works inside the boundaries set by
Health/ Environment			
The DU works inside the boundaries set met or the downstream user can demons measures are adequate. For human hea below the DNEL (given that the processe If measured data are not available, the D	strate on his o hth, this has to es and activitie U may make	wn that his operational conditions be done by showing that they lin as in question are covered by the use of an appropriate scaling tool	and implemented risk management nit the inhalation exposure to a level PROCs listed above) as given below.

they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

34. Exposure Scenario 34: Use at industrial sites; Production of hardmetal powder for surface technology

SECTION 1:	34.1 Title of exposure scenario				
	Use at industrial sites; Production of hardmetal powder for surface technology				
hemical product category [PC]					
Base metals and alloys	alloys PC 7				
Contributing scenario controllin	g environmental exposure				
Production of hardmetal powder for	or surface technology ES 1 STP Discharge	ERC 6a			
	or surface technology ES 2 Marine Discharge	ERC 6a			
Contributing scenario controllin					
Weighing powders for suspension		PROC 26			
Agglomeration		PROC 3			
Sieving		PROC 3			
Sintering		PROC 22			
Classifying of powder		PROC 3			
Packaging		PROC 26			
Cleaning & Maintenance		PROC 28			
Subsequent service life exposu	re scenario(s)				
Service life (worker at industrial sit industrial settings	ite); Service life of hardmetal articles in ES35				
SECTION 2:	34.2 Operational conditions and risk management measures				
2.1	Contributing scenario controlling environmental exposure				
2.1.1	Production of hardmetal powder for surface technology ES 1 STP Discharge (ERC 6a)				
Frequency and duration of use					
Daily amount per site <= 0.654 tor	nnes/day				
Annual amount per site <= 0.004 tormes/day Annual amount per site <= 170 tormes/year					
Emission days >= 260 days/year					
Technical onsite conditions and	measures to reduce or limit discharges, air	emissions and releases to soil			
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber.					
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osm	osis or ion exchange.			
Conditions and measures relate	d to municipal sewage treatment plant				
Municipal sewage treatment plant	is assumed.				
Assumed domestic sewage treatm	nent plant flow >= 2E3 m³/day				
Conditions and measures relate	d to external treatment of waste for disposa	1			
Dispose of waste product or used	containers according to local regulations.				
Other given operational condition	ons affecting environmental exposure				
No discharge to marine water assu	umed.				
Local freshwater dilution factor 100.					
2.1.2	Production of hardmetal powder for surface te	echnology ES 2 Marine Discharge (ERC 6a)			
Frequency and duration of use					
Daily amount per site <= 0.654 tor	ines/day				
Annual amount per site <= 170 tor	nnes/vear				

Emission days >= 260 days/year	Emission days >= 260 days/year					
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil						
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber.						
Chemical precipitation or sedimen	tation or filtration or electrolysis or reverse osmosis or ion exchange.					
Conditions and measures relate	d to external treatment of waste for disposal					
Dispose of waste product or used	containers according to local regulations.					
Other given operational condition	ons affecting environmental exposure					
Assumed effluent discharge flow f	rom site >= 2E3 m³/day					
Local marine water dilution factor	100.					
2.2	Contributing scenario controlling worker exposure					
2.2.1	Weighing powders for suspension (PROC 26)					
Product characteristics						
Physical form of product: Solid, me	edium dustiness					
Covers percentage substance in the	ne product up to 25 %.					
Frequency and duration of use						
Covers daily exposures up to 8 ho	urs.					
Technical conditions and measu	ures to control dispersion from source towards the worker					
local exhaust ventilation. Inhalation	n - minimum efficiency of 78 %					
Conditions and measures relate	d to personal protection, hygiene and health evaluation					
	Wear respiratory protection providing a minimum assigned protection factor of 20 (a minimum efficiency of 95%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.						
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.					
2.2.2	Agglomeration (PROC 3)					
Product characteristics						
Physical form of product: Solid, medium dustiness						
Covers percentage substance in the	ne product up to 25 %.					
Frequency and duration of use						
Covers daily exposures up to 8 ho	urs.					
Technical conditions and measu	ures to control dispersion from source towards the worker					
Use in closed process.	Use in closed process.					
Conditions and measures related to personal protection, hygiene and health evaluation						
Wear respiratory protection providing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). 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 suitable gloves tested to EN374. For further specification, refer to section 8 of the SDS.						
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.					
2.2.3	Sieving (PROC 3)					
Product characteristics						
Physical form of product: Solid, me	edium dustiness					
Covers percentage substance in the	ne product up to 25 %.					
Frequency and duration of use						
Covers daily exposures up to 8 hours.						

Technical conditions and measu	ares to control dispersion from source towards the worker					
local exhaust ventilation. Inhalation - minimum efficiency of 78 %						
Use in closed process.	·					
Conditions and measures related to personal protection, hygiene and health evaluation						
	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless ce can be excluded. For further specification, refer to section 8 of the SDS.					
Use suitable eye protection. For fu	rther specification, refer to section 8 of the SDS.					
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.					
Wear protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.					
2.2.4	Sintering (PROC 22)					
Product characteristics						
Physical form of product: Solid, Pc	wder / Dust					
Maximum emission potential: Low	(temperature based)					
Covers percentage substance in the	ne product up to 25 %.					
Frequency and duration of use						
Covers daily exposures up to 8 ho	urs.					
Technical conditions and measu	ires to control dispersion from source towards the worker					
Elevated temperature. Covers use	at temperatures below melting point.					
Use of an integrated local exhaust	ventilation is required. Inhalation - minimum efficiency of 84 %					
Use in closed process.						
Conditions and measures relate	Conditions and measures related to personal protection, hygiene and health evaluation					
	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.					
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 protective suit conforming to	EN 13982 in cases where direct contact with the substance cannot be avoided.					
2.2.5	Classifying of powder (PROC 3)					
Product characteristics						
Physical form of product: Solid, medium dustiness						
Covers percentage substance in the product up to 25 %.						
Frequency and duration of use						
Covers daily exposures up to 8 ho	urs.					
Technical conditions and measu	ires to control dispersion from source towards the worker					
local exhaust ventilation. Inhalation	n - minimum efficiency of 78 %					
Use in closed process.						
Conditions and measures related to personal protection, hygiene and health evaluation						
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.						
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 protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.						
2.2.6						
Product characteristics						
Physical form of product: Solid, medium dustiness						
Covers percentage substance in the	ne product up to 25 %.					

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Frequency and duration of use					
Covers daily exposures up to 8 hour	S.				
Technical conditions and measure	es to control dis	persion from so	urce towards the wor	ker	
Use of general ventilation with an eff	iciency of at least	17% is required.			
Conditions and measures related	to personal prot	ection, hygiene	and health evaluatior	ı	
Wear respiratory protection providing inhalation exposure to the substance					-
Use suitable eye protection. For furth	ner specification,	refer to section 8	of the SDS.		
Wear suitable gloves tested to EN37	4. For further spe	ecification, refer to	section 8 of the SDS.		
Wear protective suit conforming to E	N 13982 in cases	where direct cor	ntact with the substance	e cannot be	e avoided.
2.2.13 C	leaning & Mainte	nance (PROC 28)		
Product characteristics					
Physical form of product: Solid, med	ium dustiness				
Frequency and duration of use					
Covers daily exposures up to 8 hour	S.				
Technical conditions and measure	es to control dis	persion from so	urce towards the wor	ker	
local exhaust ventilation. Inhalation -	minimum efficier	ncy of 78 %			
Conditions and measures related	to personal prot	ection, hygiene	and health evaluatior)	
Wear respiratory protection providing specification, refer to section 8 of the		gned protection fa	actor of 20 (a minimum	efficiency	of 95%). For further
Use suitable eye protection. For furth	ner specification,	refer to section 8	of the SDS.		
Wear suitable gloves tested to EN37	4. For further spe	ecification, refer to	section 8 of the SDS.		
Wear protective suit conforming to E	N 13982 in cases	where direct cor	ntact with the substance	e cannot be	e avoided.
SECTION 3:	34.3 Exposure	34.3 Exposure estimation			
3.1 Environment	3.1 Environment				
Release estimation method: Estimat	ed release factor				
			Release rate		
	Wa	ater	Air		Soil
Production of hardmetal powder for	0.065	kg/day	0.196 kg/da	1	0 kg/day
surface technology ES 1 STP Discharge	0.000	Ng/day	0.100 kg/da	/	o kg/day
Production of hardmetal powder for surface technology ES 2 Marine Discharge	0.065	kg/day	0.196 kg/da	/	0 kg/day
Production of hardmetal powder for	surface technolog	y ES 1 STP Disc	harge		
Protection target Exposure concentration Risk characterisation rati (PEC, Predicted Exposure (RCR) Concentration)					
Fresh water		2.24E-4 mg/l (EUSES 2.1.2)		0.211	
Sedimentation (Fresh water)	(PEC sediment ca		mg/kg dw t calculation method metals)		0.168
Sewage Treatment Plant	0.02 mg/l (EUSES 2.1.2)		0		0.053
Agricultural soil			mg/kg dw SES 2.1.2)		0.073

Man via Environment - Inhalation (Systemic effects)	3.9E-5 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	3.9E-5 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.24E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.041
Production of hardmetal powder for surface technolog	gy ES 2 Marine Discharge	
Protection target	Exposure concentration (PEC, Predicted Exposure Concentration)	Risk characterisation ratio (RCR)
Fresh water	0.157 µg/l (Clocal calculation with Kp susp. matter marine)	0.067
Sedimentation (Fresh water)	25.3 mg/kg dw (PEC sediment calculation method for metals)	0.362
Agricultural soil	0.24 mg/kg dw (EUSES 2.1.2)	0.022
Man via Environment - Inhalation (Systemic effects)	3.9E-5 mg/m ³ (EUSES 2.1.2)	< 0.01
Man via Environment - Inhalation (Local effects)	3.9E-5 mg/m³ (EUSES 2.1.2)	< 0.01
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036
Man via Environment - Combined routes		0.04
3.2 Worker	<u>.</u>	
Weighing powders for suspension (PROC 26)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	27 µg/m³	0.499
Inhalation, Local effects, Long Term	27 µg/m³	0.675
Dermal, Systemic effects, Long Term	23.2 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.502
Agglomeration (PROC 3)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	6.4 µg/m³	0.118
Inhalation, Local effects, Long Term	6.4 µg/m³	0.16
Dermal, Systemic effects, Long Term	0.1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.118

Sieving (PROC 3)		
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	16 μg/m³	0.296
Inhalation, Local effects, Long Term	16 µg/m³	0.4
Dermal, Systemic effects, Long Term	0.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.296
Sintering (PROC 22)		·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18.6 µg/m³	0.344
Inhalation, Local effects, Long Term	18.6 µg/m³	0.465
Dermal, Systemic effects, Long Term	0.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.344
Classifying of powder (PROC 3)		·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	16 µg/m³	0.296
Inhalation, Local effects, Long Term	16 μg/m³	0.4
Dermal, Systemic effects, Long Term	0.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.296
Packaging (PROC 26)		·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	5.8 µg/m³	0.107
Inhalation, Local effects, Long Term	5.8 µg/m³	0.145
Dermal, Systemic effects, Long Term	26.7 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.111
Cleaning & Maintenance (PROC 28)		· · · ·
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term	18.6 µg/m³	0.344
Inhalation, Local effects, Long Term	18.6 µg/m³	0.465
Dermal, Systemic effects, Long Term	62.2 µg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term		0.352

SECTION 4:	34.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES
Health/ Environment	
met or the downstream user can dem measures are adequate. For human I below the DNEL (given that the proce If measured data are not available, th (www.ebrc.de/mease.html) to estimat they limit the PEC below the PNEC for	set by the ES if either the proposed risk management measures as described above are constrate on his own that his operational conditions and implemented risk management health, this has to be done by showing that they limit the inhalation exposure to a level asses and activities in question are covered by the PROCs listed above) as given below. The DU may make use of an appropriate scaling tool such as MEASE are the associated exposure. For the environment, this has to be done by showing that for the respective environmental compartment. If measured data are not available, the DU ing tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA- EC values.

SECTION 1:	35.1 Title of exposure scenario					
	Service life (worker at industrial site); Service life of hardmetal articles in industrial settings					
Article Categories [AC]						
Machinery, mechanical appliances	s, electrical/electronic articles	AC2				
Contributing scenario controllir	ng environmental exposure					
Service life of hardmetal articles in	n industrial settings	ERC 12a				
Contributing scenario controllin	ng worker exposure					
Handling and use of hardmetal art	icles	PROC 24				
Exposure scenario of the uses I	eading to the inclusion of the substance into	o the article				
Use at industrial sites; Production	Use at industrial sites; Production of hardmetal powder ES32					
Use at industrial sites; Production	Use at industrial sites; Production of sintered hardmetal articles ES33					
Use at industrial sites; Production	Use at industrial sites; Production of hardmetal powder for surface technology ES34					
SECTION 2:	35.2 Operational conditions and risk management measures					
2.1	Contributing scenario controlling environmental exposure					
2.1.1	Service life of hardmetal articles in industrial settings (ERC 12a)					
Frequency and duration of use						
Daily amount per site <= 10 tonne	s/day					
Annual amount per site <= 1E3 tonnes/year						
Conditions and measures related to municipal sewage treatment plant						
Municipal sewage treatment plant is assumed.						
Assumed domestic sewage treatm	Assumed domestic sewage treatment plant flow >= 2E3 m ³ /day					
Conditions and measures related to external treatment of waste for disposal						
Dispose of waste product or used containers according to local regulations.						

35. Exposure Scenario 35: Service life (worker at industrial site); Service life of hardmetal articles in industrial settings

2.2	Contributing scer	nario controlling	g worker exposure		
2.2.1	Handling and use of hardmetal articles (PROC 24)				
Product characteristics					
Physical form of product: Bound in	article.				
Maximum emission potential: Low	(abrasion based)				
Covers percentage substance in th	e product up to 25 9	%.			
Conditions and measures related	to personal prote	ection, hygiene	and health evaluation		
Wear respiratory protection providi inhalation exposure to the substant	0 0	, ,	· ·		,
Use suitable eye protection. For fu	ther specification, r	efer to section 8	of the SDS.		
Wear suitable gloves tested to EN3	74. For further spec	cification, refer to	o section 8 of the SDS.		
SECTION 3:	35.3 Exposure	estimation			
3.1 Environment	- F				
Release estimation method: Estimation	ated release factor				
			Release rate		
	Wat	ter	Air		Soil
Service life of hardmetal articles in industrial settings	0 kg/	′day	0 kg/day		0 kg/day
3.2 Worker					
Handling and use of hardmetal arti	cles (PROC 24)				
Exposure route Exposure estimation Risk characterisation (RCR)			naracterisation ratio		
Inhalation, Systemic effects, Long	Term	0.1 µg/m³		< 0.01	
Inhalation, Local effects, Long Ter	n	0.1 µg/m³		< 0.01	
Dermal, Systemic effects, Long Te	ſm	26.7 µg/kg bw/	/day	< 0.01	
Combined routes, Systemic effects	, Long Term			< 0.01	
SECTION 4:	35.4 Guidance the ES	to DU to evalua	ate whether he works ir	side the	boundaries set by
Health/ Environment					
The DU works inside the boundarie met or the downstream user can de measures are adequate. For huma below the DNEL (given that the pro- measured data are not available, th (www.ebrc.de/mease.html) to estim- they limit the PEC below the PNEC may make use of an appropriate so toolbox/duscaling-tool) to estimate	emonstrate on his or n health, this has to ne DU may make us nate the associated for the respective e caling tool such as the	wn that his operative be done by sho es in question are se of an appropri exposure. For the environmental co	ational conditions and im wing that they limit the ir e covered by the PROCs ate scaling tool such as he environment, this has compartment. If measured	plemente halation listed ab MEASE to be don data are	d risk management exposure to a level ove) as given below. If e by showing that not available, the DU

36. Exposure Scenario 36: Service life (Professional worker); Service life of hardmetal articles in professional settings

SECTION 1:	36.1 Title of expos	36.1 Title of exposure scenario				
	Service life (Profes	sional worker); S	Service life of	hardmetal arti	cles in	professional settings
Article Categories [AC]						
Machinery, mechanical appliances	electrical/electronic articles AC2					
Contributing scenario controllin	g environmental ex	cposure				
Service life of hardmetal articles in	professional setting	S		ERC 10a, ERC	C 11a	
Contributing scenario controllin	g worker exposure	•				
Handling and use of hardmetal arti				PROC 24		
Exposure scenario of the uses lo		sion of the subs				
•	•					
Use at industrial sites; Production				ES33		
SECTION 2:	36.2 Operational of					
2.1	Contributing scen	ario controlling	g environme	ntal exposure	•	
2.1.1	Service life of hard	metal articles in	professional	settings (ERC	10a, E	RC 11a)
Conditions and measures relate	d to municipal sew	age treatment p	olant			
Municipal sewage treatment plant	s assumed.					
Conditions and measures relate	d to external treatn	nent of waste fo	or disposal			
Dispose of waste product or used	containers according	g to local regulati	ons.			
2.2	Contributing scen	Contributing scenario controlling worker exposure				
2.2.1	Handling and use of	andling and use of hardmetal articles (PROC 24)				
Product characteristics						
Physical form of product: Bound in	article.					
Maximum emission potential: Low	(abrasion based)					
Covers percentage substance in th	e product up to 25 %	%.				
Conditions and measures relate	d to personal prote	ection, hygiene	and health e	valuation		
Wear respiratory protection providi inhalation exposure to the substan						
Use suitable eye protection. For fu	rther specification, r	efer to section 8	of the SDS.			
Wear suitable gloves tested to EN	374. For further spec	cification, refer to	section 8 of	the SDS.		
SECTION 3:	36.3 Exposure	estimation				
3.1 Environment						
Release estimation method: Estim	ated release factor					
			Release	e rate		
	10/04	for				Soil
		Water Air				
Service life of hardmetal articles in professional settings	0 kg/	0 kg/day 0 kg/day 0 kg/day			0 kg/day	
3.2 Worker						
Handling and use of hardmetal arti	cles (PROC 24)					
Exposure route	Exposure estimation Risk characterisat (RCR)		naracterisation ratio			
Inhalation, Systemic effects, Long	ong Term 0.1 μg/m³ < 0.01					
initiation, bysternic enects, LONg	i Gilli	0.1 µg/m²		<	0.01	

Inhalation, Local effects, Long Term		0.1 μg/m³	< 0.01
Dermal, Systemic effects, Long Term		26.7 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, Long Term			< 0.01
SECTION 4: 36.4 Guidance the ES		to DU to evaluate whether he works ir	iside the boundaries set by
Health/ Environment			
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.			

37. Exposure Scenario 37: Service life (Consumers); Service life of hard metal articles used by consumers

SECTION 1:	37.1 Title of exposure scenario				
	Service life (Consumers); Service life of hard metal articles used by consumers				
Article Categories [AC]					
Machinery, mechanical appliances	s, electrical/electronic articles	AC2			
Contributing scenario controllin	ng environmental exposure				
Service life of hard metal articles	used by consumers	ERC 10a, ERC 11a			
Contributing scenario controllin	ng consumer exposure				
Handling of hard metal articles		AC2			
Exposure scenario of the uses I	eading to the inclusion of the substance into	the article			
Use at industrial sites; Production	of sintered hardmetal articles	ES33			
SECTION 2:	37.2 Operational conditions and risk management measures				
2.1	Contributing scenario controlling environmental exposure				
2.1.1	Service life of hard metal articles used by consumers (ERC 10a, ERC 11a)				
Conditions and measures related to external treatment of waste for disposal					
Dispose of waste product or used	containers according to local regulations.				
Other given operational condition	ons affecting environmental exposure				
Municipal sewage treatment plant	is assumed.				
2.2	Contributing scenario controlling consumer exposure				
2.2.1	Handling of hard metal articles (AC 2)				
Product characteristics					
Physical form of product: Bound in article.					
Inhalation exposure is considered to be not relevant.					

Dermal exposure assumed to be neg	ligible.					
Oral exposure is considered to be no	t relevant.					
SECTION 3:	37.3 Exposure	estimation				
3.1 Environment						
Release estimation method: Estimate	ed release factor					
			Release rate			
	Wat	er	Air		Soil	
Service life of hard metal articles used by consumers	0 kg/	day	0 kg/day		0 kg/day	
3.2 Consumer						
Handling of hard metal articles (AC 2)					
Exposure route	Exposure estimation Risk characterisation (RCR)			naracterisation ratio		
Inhalation, Systemic effects, Long Te	erm	0 μg/m³ (Qualitative assessment)		< 0.01		
Inhalation, Local effects, Long Term		0 µg/m³ (Qualitative assessment)		< 0.01		
			0 mg/kg bw/day (Qualitative assessment)		< 0.01	
Inhalation, Systemic effects, Long Te	erm 0 μg/kg bw/day (Qualitative < 0.01 assessment)					
Combined routes, Systemic effects, L	ong Term			< 0.01		
SECTION 4:	37.4 Guidance the ES	to DU to evalua	te whether he works ir	nside the	boundaries set by	
Health/ Environment						
The DU works inside the boundaries met or the downstream user can dem measures are adequate. For human below the DNEL (given that the proce measured data are not available, the (www.ebrc.de/mease.html) to estimat they limit the PEC below the PNEC for may make use of an appropriate scal toolbox/duscaling-tool) to estimate PE	nonstrate on his or nealth, this has to asses and activitie DU may make us the associated or the respective e ing tool such as th	wn that his opera be done by sho is in question are e of an appropri- exposure. For the environmental co	ational conditions and im wing that they limit the in a covered by the PROCs ate scaling tool such as l e environment, this has mpartment. If measured	plemente halation e listed ab MEASE to be don data are	d risk management exposure to a level ove) as given below. If e by showing that not available, the DU	

38. Exposure Scenario 38: Use at industrial sites; Use of cobalt as an intermediate in the manufacture of catalysts

SECTION 1:	38.1 Title of exposure scenario			
	Use at industrial sites; Use of cobalt as an intermediate in the manufacture of catalysts			
Sectors of use [SU]				
Manufacture of bulk, large scale c	hemicals (including petroleum products)	SU 8		
Manufacture of fine chemicals		SU 9		
Contributing scenario controllin	og environmental exposure			
	n the manufacture of catalysts ES 1 STP	ERC 6a		
Discharge				
Use of cobalt as an intermediate ir Discharge	n the manufacture of catalysts ES 2 Direct	ERC 6a		
Use of cobalt as an intermediate in Discharge	n the manufacture of catalysts ES 3 Marine	ERC 6a		
Contributing scenario controllin	g worker exposure			
Use of cobalt as an intermediate in conditions	n the manufacture of catalysts in closed	PROC 1, PROC 2		
Use of cobalt as an intermediate in conditions	n the manufacture of catalysts in semi-closed	PROC 3, PROC 9, PROC 4, PROC 8b		
Cleaning & Maintenance		PROC 28		
SECTION 2:	38.2 Operational conditions and risk mana	gement measures		
2.1	Contributing scenario controlling environn	nental exposure		
2.1.1	Use of cobalt as an intermediate in the manufacture of catalysts ES 1 STP Discharge (ERC 6a)			
Frequency and duration of use				
Daily amount per site <= 0.272 tor	nnes/day			
Annual amount per site <= 98 tonr	nes/year			
Emission days >= 360 days/year				
Technical onsite conditions and	I measures to reduce or limit discharges, air	emissions and releases to soil		
scrubber.	ectrostatic precipitator or cyclones or fabric/bag			
	tation or filtration or electrolysis or reverse osmo	osis or ion exchange.		
	d to municipal sewage treatment plant			
Municipal sewage treatment plant				
Assumed domestic sewage treatm				
	d to external treatment of waste for disposa	1		
Dispose of waste product or used	containers according to local regulations.			
Other given operational condition	ons affecting environmental exposure			
No discharge to marine water ass	umed.			
Local freshwater dilution factor 10	0.			
2.1.2	Use of cobalt as an intermediate in the manufa (ERC 6a)	acture of catalysts ES 2 Direct Discharge		
Frequency and duration of use				
Daily amount per site <= 0.272 tor	nnes/day			
Annual amount per site <= 98 tonr	nes/year			
Emission days >= 360 days/year				

	d measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sedimer	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	ed to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational condition	ons affecting environmental exposure
Assumed effluent discharge flow f	rom site >= 250 m³/day
No discharge to marine water ass	umed.
Local freshwater dilution factor 50	0.
2.1.3	Use of cobalt as an intermediate in the manufacture of catalysts ES 3 Marine Discharge (ERC 6a)
Frequency and duration of use	
Daily amount per site <= 0.272 to	nnes/day
Annual amount per site <= 98 ton	nes/year
Emission days >= 360 days/year	
Technical onsite conditions and	d measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or wet ele scrubber.	ectrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
Chemical precipitation or sedimer	tation or filtration or electrolysis or reverse osmosis or ion exchange.
Conditions and measures relate	ed to external treatment of waste for disposal
Dispose of waste product or used	containers according to local regulations.
Other given operational conditi	ons affecting environmental exposure
Assumed effluent discharge flow f	rom site >= 250 m³/day
No discharge to freshwater assum	ned.
-	100.
Local marine water dilution factor 2.2	100. Contributing scenario controlling worker exposure
Local marine water dilution factor 2.2	
Local marine water dilution factor 2.2 2.2.1	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions
Local marine water dilution factor 2.2 2.2.1 Product characteristics	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2)
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Pe	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Peroduct Characteristics Maximum emission potential: High	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Pe Maximum emission potential: High Covers percentage substance in t	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Peroduct: Solid, Perodu	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %.
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Per Maximum emission potential: High Covers percentage substance in t Frequency and duration of use Covers daily exposures up to 8 ho	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %.
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Po Maximum emission potential: High Covers percentage substance in t Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and meas	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %. ours. ures to control dispersion from source towards the worker
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Per Maximum emission potential: High Covers percentage substance in t Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and meas Assumes process temperature up	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %. ours. ures to control dispersion from source towards the worker
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Per Maximum emission potential: High Covers percentage substance in t Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and meas Assumes process temperature up Use in closed process.	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %. ours. ures to control dispersion from source towards the worker
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Po Maximum emission potential: High Covers percentage substance in t Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and meas Assumes process temperature up Use in closed process. Use of an integrated local exhaus	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %. ours. ures to control dispersion from source towards the worker n to 600 °C.
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Per Maximum emission potential: High Covers percentage substance in t Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and meas Assumes process temperature up Use in closed process. Use of an integrated local exhaus Conditions and measures related Wear respiratory protection provice	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %. ours. ures to control dispersion from source towards the worker o to 600 °C. t ventilation is required. Inhalation - minimum efficiency of 90 % ed to personal protection, hygiene and health evaluation ling a minimum assigned protection factor of 20 (a minimum efficiency of 95%). For further
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Po Maximum emission potential: High Covers percentage substance in t Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and meass Assumes process temperature up Use in closed process. Use of an integrated local exhauss Conditions and measures related Wear respiratory protection provic specification, refer to section 8 of	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %. ours. ures to control dispersion from source towards the worker o to 600 °C. t ventilation is required. Inhalation - minimum efficiency of 90 % ed to personal protection, hygiene and health evaluation ling a minimum assigned protection factor of 20 (a minimum efficiency of 95%). For further
Local marine water dilution factor 2.2 2.2.1 Product characteristics Physical form of product: Solid, Per Maximum emission potential: High Covers percentage substance in t Frequency and duration of use Covers daily exposures up to 8 ho Technical conditions and meas Assumes process temperature up Use in closed process. Use of an integrated local exhaus Conditions and measures related Wear respiratory protection provice specification, refer to section 8 of Use suitable eye protection. For fu	Contributing scenario controlling worker exposure Use of cobalt as an intermediate in the manufacture of catalysts in closed conditions (PROC 1, PROC 2) owder / Dust, Shaped catalysts n he product up to 100 %. ours. ures to control dispersion from source towards the worker n to 600 °C. t ventilation is required. Inhalation - minimum efficiency of 90 % ed to personal protection, hygiene and health evaluation ting a minimum assigned protection factor of 20 (a minimum efficiency of 95%). For further the SDS.

2.2.2	Use of cobalt as an intermediate in (PROC 3, PROC 9, PROC 4, PROC		emi-closed conditions
Product characteristics			
Physical form of product: Solid, Por	wder / Dust, Shaped catalysts		
Maximum emission potential: High			
Covers percentage substance in th	e product up to 100 %.		
Frequency and duration of use			
Covers daily exposures up to 8 hou	irs.		
Technical conditions and measu	res to control dispersion from so	urce towards the worker	
Assumes process temperature up t	o 160 °C.		
Semi-closed system.			
Use of an integrated local exhaust	ventilation is required. Inhalation - m	inimum efficiency of 90 %	
Conditions and measures related	to personal protection, hygiene	and health evaluation	
Wear respiratory protection providion specification, refer to section 8 of the section 8 of	ng a minimum assigned protection fa	actor of 20 (a minimum efficiency	of 95%). For further
	ther specification, refer to section 8		
Wear suitable gloves tested to EN3	74. For further specification, refer to	section 8 of the SDS.	
Wear protective suit conforming to	EN 13982 in cases where direct cor	tact with the substance cannot b	e avoided.
2.2.3	Cleaning & Maintenance (PROC 28)	
Product characteristics			
Physical form of product: Various			
Maximum emission potential: Low			
Covers percentage substance in th	e product up to 100 %.		
Frequency and duration of use			
Typical duration per shift = 120 mir			
Typical number of shifts per year =	48 Shifts/year		
Technical conditions and measu	res to control dispersion from so	urce towards the worker	
Process is carried out at ambient p	ressure		
Covers use at ambient temperature			
Conditions and measures related	to personal protection, hygiene	and health evaluation	
Wear respiratory protection providin specification, refer to section 8 of th	ng a minimum assigned protection fance sDS.	actor of 10 (a minimum efficiency	of 90%). For further
Use suitable eye protection. For fu	ther specification, refer to section 8	of the SDS.	
Wear suitable gloves tested to EN3	74. For further specification, refer to	section 8 of the SDS.	
-	EN 13982 in cases where direct cor		e avoided.
SECTION 3:	38.3 Exposure estimation		
3.1 Environment			
Release estimation method: Estima	ated release factor		
		Release rate	
	Water	Air	Soil
Use of cobalt as an intermediate in the manufacture of catalysts ES 1 STP Discharge	8.7E-3 kg/day	7.89E-3 kg/day	0 kg/day
Use of cobalt as an intermediate in the manufacture of catalysts ES 2 Direct Discharge	8.7E-3 kg/day	7.89E-3 kg/day	0 kg/day

Use of cobalt as an intermediate in the manufacture of catalysts ES 3 Marine Discharge	8.7E-3 kg/day	7.89E-3 kg/da	y 0 kg/day	
Use of cobalt as an intermediate in the man	nufacture of catalysts ES 1	STP Discharge		
Protection target	(PEC, Pre	re concentration edicted Exposure ncentration)	Risk characterisation ratio (RCR)	
Fresh water		16E-4 mg/l JSES 2.1.2)	0.11	
Sedimentation (Fresh water)	(PEC sedime	9 mg/kg dw ent calculation method or metals)	0.091	
Sewage Treatment Plant		61E-3 mg/l JSES 2.1.2)	< 0.01	
Agricultural soil		12 mg/kg dw JSES 2.1.2)	0.029	
Man via Environment - Inhalation (Systemic	,	1E-6 mg/m³ JSES 2.1.2)	< 0.01	
Man via Environment - Inhalation (Local effe		1E-6 mg/m³ JSES 2.1.2)	< 0.01	
Man via Environment - Oral		4 mg/kg bw/day asured data)	0.036	
Man via Environment - Combined routes			0.036	
Use of cobalt as an intermediate in the man	nufacture of catalysts ES 2	2 Direct Discharge		
Protection target	(PEC, Pre	re concentration edicted Exposure ncentration)	Risk characterisation ratio (RCR)	
Fresh water		44E-4 mg/l JSES 2.1.2)	0.136	
Sedimentation (Fresh water)	(PEC sedime	95 mg/kg dw ent calculation method or metals)	0.111	
Agricultural soil		39 mg/kg dw JSES 2.1.2)	0.022	
Man via Environment - Inhalation (Systemic	,	1E-6 mg/m³ JSES 2.1.2)	< 0.01	
Man via Environment - Inhalation (Local effe	'	1E-6 mg/m³ JSES 2.1.2)	< 0.01	
Man via Environment - Oral		4 mg/kg bw/day asured data)	0.036	
Man via Environment - Combined routes			0.036	
Use of cobalt as an intermediate in the man	nufacture of catalysts ES	3 Marine Discharge		
Protection target	(PEC, Pre	re concentration edicted Exposure ncentration)	Risk characterisation ratio (RCR)	
Marine water	(Clocal cald	D.166 μg/l ulation with Kp susp. atter marine)	0.07	
Sedimentation (Marine water)	(PEC sedime	.1 mg/kg dw ent calculation method or metals)	0.374	
Agricultural soil		39 mg/kg dw JSES 2.1.2)	0.022	

Man via Environment - Inhalation (Systemic effects)	2.31E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Inhalation (Local effects)	2.31E-6 mg/m ³ (EUSES 2.1.2)	< 0.01	
Man via Environment - Oral	3.17E-4 mg/kg bw/day (Measured data)	0.036	
Man via Environment - Combined routes		0.036	
3.2 Worker			
Use of cobalt as an intermediate in the manufacture	of catalysts in closed conditions (PRO	C 1, PROC 2)	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	0.8 μg/m³	0.015	
Inhalation, Local effects, Long Term	0.8 µg/m³	0.02	
Dermal, Systemic effects, Long Term	0.4 µg/kg bw/day	< 0.01	
Combined routes, Systemic effects, Long Term		0.015	
Use of cobalt as an intermediate in the manufacture PROC 8b)	of catalysts in semi-closed conditions	(PROC 3, PROC 9, PROC 4,	
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	0.8 µg/m³	0.015	
Inhalation, Local effects, Long Term	0.8 µg/m³	0.02	
Dermal, Systemic effects, Long Term	1.3 μg/kg bw/day	< 0.01	
Combined routes, Systemic effects, Long Term		0.015	
Cleaning & Maintenance (PROC 28)			
Exposure route	Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term	2.4 μg/m³	0.044	
Inhalation, Local effects, Long Term	2.4 μg/m³	0.06	
Dermal, Systemic effects, Long Term	23.2 µg/kg bw/day	< 0.01	
Combined routes, Systemic effects, Long Term		0.048	
SECTION 4: 38.4 Guidan the ES	ce to DU to evaluate whether he wor	ks inside the boundaries set by	
Health/ Environment			
The DU works inside the boundaries set by the ES met or the downstream user can demonstrate on his measures are adequate. For human health, this has below the DNEL (given that the processes and activity If measured data are not available, the DU may main (www.ebrc.de/mease.html) to estimate the associat	s own that his operational conditions ar to be done by showing that they limit t rities in question are covered by the PR ke use of an appropriate scaling tool su	nd implemented risk management the inhalation exposure to a level ROCs listed above) as given below. Inch as MEASE	

(www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSA-toolbox/duscaling-tool) to estimate PEC values.

39. Exposure Scenario 39: Formulation or re-packing; Formulation of cobalt for the use in brazing techniques

SECTION 1:	39.1 Title of exposure scenario			
	Formulation or re-packing; Formulation of cobalt for the use in brazing techniques			
Chemical product category [PC]				
Welding and soldering products, fl	x products PC 38			
Contributing scenario controllin	g environmental exposure			
Formulation of cobalt for the use in		ERC 2		
Contributing scenario controllin				
Raw material handling		PROC 26, PROC 8b, PROC 9		
Formulation process		PROC 5. PROC 4		
•		· · · · · · · · · · · · · · · · · · ·		
Handling of formulated end-produc	CT	PROC 8b, PROC 9		
Cleaning & Maintenance		PROC 28		
SECTION 2:	39.2 Operational conditions and risk	management measures		
2.1	Contributing scenario controlling env	rironmental exposure		
2.1.1	Formulation of cobalt for the use in brazil	ing techniques (ERC 2)		
Frequency and duration of use				
Daily amount per site <= 0.1 tonne	es/day			
Annual amount per site <= 1 tonne	es/year			
Conditions and measures relate	d to municipal sewage treatment plant			
Municipal sewage treatment plant	is assumed.			
Assumed domestic sewage treatm	ent plant flow >= 2E3 m³/day			
Conditions and measures relate	d to external treatment of waste for dis	posal		
Dispose of waste product or used	containers according to local regulations.			
Other given operational condition	ons affecting environmental exposure			
Receiving surface water flow >= 1	.8E4 m³/day			
No discharge to marine water ass	umed.			
2.2	Contributing scenario controlling wo	rker exposure		
2.2.1	Raw material handling (PROC 26, PRO	C 8b. PROC 9)		
Product characteristics	adium ductinese			
Physical form of product: Solid, me Additional physical form of produc				
Covers percentage substance in the				
Frequency and duration of use				
Covers daily exposures up to 8 ho	urs.			
	ures to control dispersion from source	towards the worker		
Covers use at ambient temperatur	-			
Semi-automated task.				
	ventilation is required. Inhalation - minim	um efficiency of 90 %		
-	d to personal protection, hygiene and l	•		
Wear respiratory protection provid specification, refer to section 8 of t	с ,	of 20 (a minimum efficiency of 95%). For further		
	irther specification, refer to section 8 of the			

Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.			
Wear protective suit conforming to EN 13982 in cases where direct contact with the substance cannot be avoided.				
2.2.2	Formulation process (PROC 5, PROC 4)			
Product characteristics				
Physical form of product: Pastes				
Maximum emission potential: Very	/ low			
Covers percentage substance in t	he product up to 100 %.			
Frequency and duration of use				
Covers daily exposures up to 8 ho	burs.			
Technical conditions and meas	ures to control dispersion from source towards the worker			
Covers use at ambient temperatur	res.			
local exhaust ventilation. Inhalatio	n - minimum efficiency of 78 %			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.			
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.			
2.2.3	Handling of formulated end-product (PROC 8b, PROC 9)			
Product characteristics				
Physical form of product: Pastes				
Additional physical form of produc	t: Brazing tape			
Maximum emission potential: Very	/ low			
Covers percentage substance in t	he product up to 100 %.			
Frequency and duration of use				
Covers daily exposures up to 8 ho	burs.			
Technical conditions and meas	ures to control dispersion from source towards the worker			
Covers use at ambient temperatur	res.			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
	ling a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless nee can be excluded. For further specification, refer to section 8 of the SDS.			
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.			
Wear suitable gloves tested to EN	374. For further specification, refer to section 8 of the SDS.			
2.2.3	Cleaning & Maintenance (PROC 28)			
Product characteristics				
Physical form of product: Solid, his	gh dustiness			
Frequency and duration of use				
Covers daily exposures up to 8 ho	purs.			
Technical conditions and meas	ures to control dispersion from source towards the worker			
Process is carried out at ambient	pressure			
Covers use at ambient temperatur	res.			
Maintenance and repair work only operation.	at facilities which are not in operation. Minor cleaning tasks may be conducted under			
Conditions and measures relate	ed to personal protection, hygiene and health evaluation			
Wear respiratory protection provid specification, refer to section 8 of	ing a minimum assigned protection factor of 10 (a minimum efficiency of 90%). For further the SDS.			
Use suitable eye protection. For fu	urther specification, refer to section 8 of the SDS.			

Wear suitable gloves tested to EN37	4. For further spe	ecification, refer to	section 8 of the SDS.			
Wear protective suit conforming to E				e cannot b	e avoided.	
SECTION 3:	39.3 Exposure estimation					
3.1 Environment						
Release estimation method: Estimate	ed release factor					
		Release rate				
	Wa	Water Air		Soil		
Formulation of cobalt for the use in brazing techniques	5E-3	kg/day	5E-3 kg/day		0 kg/day	
Formulation of cobalt for the use in b	razing technique	s (ERC 2)				
Protection target		(PEC, Pred	concentration icted Exposure entration)	Risk ch	aracterisation ratio (RCR)	
Fresh water			5E-4 mg/l SES 2.1.2)		0.184	
Sedimentation (Fresh water)		(PEC sedimen	mg/kg dw t calculation method metals)		0.148	
Sewage Treatment Plant			E-3 mg/l SES 2.1.2)	< 0.01		
Agricultural soil		0.281 mg/kg dw (EUSES 2.1.2)		0.026		
Man via Environment - Inhalation (Systemic effects)		1.88E-7 mg/m³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Inhalation (Local effects)			E-7 mg/m³ SES 2.1.2)	< 0.01		
Man via Environment - Oral		3.23E-4 mg/kg bw/day (Measured data)			0.036	
Man via Environment - Combined rou	ites				0.036	
3.2 Worker						
Raw material handling (PROC 26, PI	ROC 8b, PROC 9	9)				
Exposure route		Exposure est	imation	Risk cl (RCR)	haracterisation ratio	
Inhalation, Systemic effects, Long Te	erm	23.5 μg/m³		0.434		
Inhalation, Local effects, Long Term		23.5 μg/m³		0.588		
Dermal, Systemic effects, Long Term	1	3.2 μg/kg bw/day		< 0.01		
Combined routes, Systemic effects, I	_ong Term			0.435		
Formulation process (PROC 5, PRO	C 4)					
Exposure route		Exposure est	imation	Risk cl (RCR)	haracterisation ratio	
Inhalation, Systemic effects, Long Te	erm	11 µg/m³ (MEASE, PROC 5)		0.203		
Inhalation, Local effects, Long Term		11 µg/m³ (MEA	SE, PROC 5)	0.275		
Dermal, Systemic effects, Long Term	ı	1 μg/kg bw/day < 0.01				

Combined routes, Systemic effects, Long Term			0.203
Handling of formulated end-product (PROC 8b, PROC	; 9)	
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		10 µg/m³ (MEASE, PROC 8b)	0.185
Inhalation, Local effects, Long Term		10 µg/m³ (MEASE, PROC 8b)	0.25
Dermal, Systemic effects, Long Term		1 μg/kg bw/day	< 0.01
Combined routes, Systemic effects, L	ong Term		0.185
Cleaning & Maintenance (PROC 28)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)
Inhalation, Systemic effects, Long Term		10.9 µg/m³	0.201
Inhalation, Local effects, Long Term		10.9 µg/m³	0.273
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013
Combined routes, Systemic effects, L	ong Term		0.214
SECTION 4:	39.4 Guidance the ES	e to DU to evaluate whether he works	inside the boundaries set by
Health/ Environment			
met or the downstream user can dem measures are adequate. For human I below the DNEL (given that the proce If measured data are not available, th (www.ebrc.de/mease.html) to estimat they limit the PEC below the PNEC for	onstrate on his c nealth, this has to esses and activitie e DU may make the associated or the respective ing tool such as t	wither the proposed risk management me own that his operational conditions and it to be done by showing that they limit the es in question are covered by the PROC use of an appropriate scaling tool such exposure. For the environment, this has environmental compartment. If measure the DU-Scaling tool (http://www.arche-co	mplemented risk management inhalation exposure to a level S listed above) as given below. as MEASE s to be done by showing that d data are not available, the DU

40. Exposure Scenario 40: Use at industrial sites; Industrial use of cobalt-containing mixtures in brazing techniques

SECTION 1:	40.1 Title of exposure scenario		
	Use at industrial sites; Industrial use of cobalt-containing mixtures in brazing techniques		
Chemical product category [PC]			
Welding and soldering products, fl	ux products	PC 38	
Contributing scenario controllin	g environmental exposure		
Industrial use of cobalt-containing	mixtures in brazing techniques	ERC 5	
Contributing scenario controllin	g worker exposure		
Raw material handling	<u> </u>	PROC 8b, PROC 9	
Brazing in industrial settings		PROC 25	
SECTION 2:	40.2 Operational conditions and risk manage	gement measures	
2.1	Contributing scenario controlling environm		
2.1.1	Industrial use of cobalt-containing mixtures in I		
Frequency and duration of use			
Daily amount per site <= 5E-6 ton	•		
Annual amount per site <= 1E-4 to	onnes/year		
Conditions and measures relate	d to municipal sewage treatment plant		
Municipal sewage treatment plant	is assumed.		
Assumed domestic sewage treatm	nent plant flow >= 2E3 m³/day		
Conditions and measures relate	d to external treatment of waste for disposal		
Dispose of waste product or used	containers according to local regulations.		
Other given operational condition	ons affecting environmental exposure		
Receiving surface water flow >= 1	.8E4 m³/day		
No discharge to marine water assu	umed.		
2.2	Contributing scenario controlling worker ex	kposure	
2.2.1	Raw material handling (PROC 8b, PROC 9)		
Product characteristics			
Physical form of product: Pastes			
Additional physical form of produc	t: Brazing tape		
Maximum emission potential: Very	• •		
Covers percentage substance in the			
Frequency and duration of use			
Covers daily exposures up to 8 ho	urs.		
, , , ,	d to personal protection, hygiene and health	evaluation	
Wear respiratory protection provid	ing a minimum assigned protection factor of 10 ace can be excluded. For further specification, re	(a minimum efficiency of 90%) unless	
Use suitable eye protection. For fu	irther specification, refer to section 8 of the SDS		
Wear suitable gloves tested to EN	374. For further specification, refer to section 8	of the SDS.	
2.2.2	Brazing in industrial settings (PROC 25)		
Product characteristics			
Physical form of product: Molten			

Maximum emission potential: Low (te	emperature base	d)			
Covers percentage substance in the	-				
Frequency and duration of use					
Covers daily exposures up to 8 hour	s.				
Technical conditions and measure	es to control dis	persion from sou	Irce towards the wor	ker	
Assumes process temperature up to	900 °C.				
Conditions and measures related	to personal prot	ection, hygiene	and health evaluatior	า	
Wear respiratory protection providing specification, refer to section 8 of the		gned protection fa	actor of 20 (a minimum	efficiency	of 95%). For further
Use suitable eye protection. For furth	-				
Wear suitable gloves tested to EN37	4. For further spe	ecification, refer to	section 8 of the SDS.		
SECTION 3:	40.3 Exposure	estimation			
3.1 Environment					
Release estimation method: Estimat	ed release factor				
			Release rate		
	Wa	ater	Air		Soil
Industrial use of cobalt-containing mixtures in brazing techniques	2.5E-3	kg/day	2.5E-3 kg/da	у	5E-5 kg/day
Industrial use of cobalt-containing m	ixtures in brazing	techniques (ERC	5)		
Protection target		(PEC, Predi	concentration cted Exposure entration)	Risk ch	aracterisation ratio (RCR)
Fresh water		1.47E-4 mg/l (EUSES 2.1.2)		0.139	
Sedimentation (Fresh water)		6.1 mg/kg dw (PEC sediment calculation method for metals)		0.113	
Sewage Treatment Plant		7.5E-4 mg/l (EUSES 2.1.2)		< 0.01	
Agricultural soil		0.26 mg/kg dw (EUSES 2.1.2)		0.024	
Man via Environment - Inhalation (Sy	stemic effects)	1.88E-7 mg/m³ (EUSES 2.1.2)		< 0.01	
Man via Environment - Inhalation (Lo	cal effects)		E-7 mg/m³ ES 2.1.2)	< 0.01	
Man via Environment - Oral			mg/kg bw/day ured data)	0.036	
Man via Environment - Combined rou	ites				0.036
3.2 Worker					
Raw material handling (PROC 8b, P	ROC 9)				
Exposure route		Exposure esti	mation	Risk cl (RCR)	naracterisation ratio
Inhalation, Systemic effects, Long T	erm	10 µg/m³		0.185	
Inhalation, Local effects, Long Term		10 µg/m³		0.25	
Dermal, Systemic effects, Long Term	n	1 µg/kg bw/day		< 0.01	
Combined routes, Systemic effects,	l ong Term			0.185	

Brazing in industrial settings (PROC	25)			
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term		25 μg/m³ (MEASE)	0.462	
Inhalation, Local effects, Long Term		25 μg/m³ (MEASE)	0.625	
Dermal, Systemic effects, Long Term		8.8 μg/kg bw/day	< 0.01	
Combined routes, Systemic effects, Long Term			0.463	
SECTION 4:	40.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES			
Health/ Environment	÷			
		ither the proposed risk management mea wn that his operational conditions and im		

met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. For human health, this has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure. For the environment, this has to be done by showing that they limit the PEC below the PNEC for the respective environmental compartment. If measured data are not available, the DU may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSAtoolbox/duscaling-tool) to estimate PEC values.

41. Exposure Scenario 41: Use at industrial sites; Use of cobalt-containing alloys for sandblasting in industrial settings

SECTION 1:	41.1 Title of exposure scenario		
	Use at industrial sites; Use of cobalt-containing alloys for sandblasting in industrial settings		
Chemical product category [PC]		
Base metals and alloys		PC 7	
Sectors of use [SU]		-	
Manufacture of fabricated metal products, except machinery and equipment		SU 15	
Contributing scenario controllin	ng environmental exposure		
Use of cobalt-containing alloys for sandblasting in industrial settings ERC 4			
Contributing scenario controllin	ng worker exposure		
Raw material handling		PROC 26	
Blasting operations		PROC 1	
Cleaning & Maintenance	Cleaning & Maintenance PROC 28		
SECTION 2:	41.2 Operational conditions and risk management measures		
2.1	Contributing scenario controlling environmental exposure		
2.1.1	Use of cobalt-containing alloys for sandblasting in industrial settings (ERC 4)		
Frequency and duration of use			
Daily amount per site <= 7.5E-6 to	onnes/day		

Annual amount per site <= 1.	5E-3 tonnes/year
Emission days >= 200 days/y	rear
Technical onsite conditions	s and measures to reduce or limit discharges, air emissions and releases to soil
Electrostatic precipitator or w scrubber.	et electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet
The substance should not be	released to water.
Conditions and measures r	elated to external treatment of waste for disposal
Dispose of waste product or	used containers according to local regulations.
2.2	Contributing scenario controlling worker exposure
2.2.1	Raw material handling (PROC 26)
Product characteristics	·
Physical form of product: Soli	id, medium dustiness
Additional physical form of pr	oduct: Solid, Granulate
Covers percentage substance	e in the product up to 5 %.
Frequency and duration of	use
Covers daily exposures up to	8 hours.
Technical conditions and m	neasures to control dispersion from source towards the worker
Covers use at ambient tempe	
Semi-automated task.	
	haust ventilation is required. Inhalation - minimum efficiency of 90 %
	related to personal protection, hygiene and health evaluation
specification, refer to section	
Use suitable eye protection. I	For further specification, refer to section 8 of the SDS.
Wear suitable gloves tested t	o EN374. For further specification, refer to section 8 of the SDS.
Wear protective suit conform	ing to EN 13982 in cases where direct contact with the substance cannot be avoided.
2.2.2	Blasting operations (PROC 1)
Product characteristics	
Physical form of product: Soli	id, Powder / Dust
Additional physical form of pr	oduct: Solid, Granulate
Maximum emission potential:	High (abrasion based)
Covers percentage substance	e in the product up to 5 %.
Frequency and duration of	use
Covers daily exposures up to	8 hours.
Technical conditions and m	neasures to control dispersion from source towards the worker
Automated task.	
Use of an integrated local exl	haust ventilation is required. Inhalation - minimum efficiency of 90 %
Use in closed process.	
Conditions and measures r	elated to personal protection, hygiene and health evaluation
	roviding a minimum assigned protection factor of 10 (a minimum efficiency of 90%) unless bstance can be excluded. 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 suitable gloves tested t	o EN374. For further specification, refer to section 8 of the SDS.
2.2.2	Cleaning & Maintenance (PROC 28)
Product characteristics	
Physical form of product: Soli	id, high dustiness

Frequency and duration of use						
Covers daily exposures up to 8 hours.						
Technical conditions and measures to control dispersion from source towards the worker						
Process is carried out at ambient pre	-					
Covers use at ambient temperatures						
Maintenance and repair work only at operation.	facilities which a	re not in operation	n. Minor cleaning tasks	may be co	onducted under	
Conditions and measures related	o personal prot	ection, hygiene	and health evaluatior	1		
Wear respiratory protection providing specification, refer to section 8 of the		gned protection fa	actor of 20 (a minimum	efficiency	of 95%). For further	
Use suitable eye protection. For furth	er specification,	refer to section 8	of the SDS.			
Wear suitable gloves tested to EN37	4. For further spe	ecification, refer to	section 8 of the SDS.			
Wear protective suit conforming to E	N 13982 in cases	where direct cor	tact with the substance	e cannot b	e avoided.	
SECTION 3:	41.3 Exposure	estimation				
3.1 Environment	,					
Release estimation method: Estimate	ed release factor					
	Release rate					
	Wa	ater	Air		Soil	
Use of cobalt-containing alloys for sandblasting in industrial settings	0 kg/day 1.5E-5 kg/da		у	0 kg/day		
Use of cobalt-containing alloys for sa	ndblasting in indu	ustrial settings (E	RC 4)			
Protection target		Exposure concentration Risk cl (PEC, Predicted Exposure Concentration)		aracterisation ratio (RCR)		
Agricultural soil		0.239 mg/kg dw (EUSES 2.1.2)		0.022		
Man via Environment - Inhalation (Systemic effects)		1.52E-7 mg/m³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Inhalation (Local effects)		1.52E-7 mg/m³ (EUSES 2.1.2)		< 0.01		
Man via Environment - Oral		3.17E-4 mg/kg bw/day (Measured data)		0.036		
Man via Environment - Combined routes				0.036		
3.2 Worker						
Raw material handling (PROC 26)						
Exposure route		Exposure esti	mation	Risk cl (RCR)	haracterisation ratio	
Inhalation, Systemic effects, Long Term		4 μg/m³ (MEASE)		0.074	0.074	
Inhalation, Local effects, Long Term		4 µg/m³ (MEAS	g/m³ (MEASE) 0.1			
Dermal, Systemic effects, Long Term		3.2 µg/kg bw/day < 0.01				
Combined routes, Systemic effects, I			0.074			

Blasting operations (PROC 1)				
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term		2 µg/m³ (MEASE)	0.037	
Inhalation, Local effects, Long Term		2 µg/m³ (MEASE)	0.05	
Dermal, Systemic effects, Long Term		0.4 μg/kg bw/day	< 0.01	
Combined routes, Systemic effects, Long Term			0.037	
Cleaning & Maintenance (PROC 28				
Exposure route		Exposure estimation	Risk characterisation ratio (RCR)	
Inhalation, Systemic effects, Long Term		10.9 µg/m³ (MEASE)	0.201	
Inhalation, Local effects, Long Term		10.9 µg/m³ (MEASE)	0.273	
Dermal, Systemic effects, Long Term		92.8 µg/kg bw/day	0.013	
Combined routes, Systemic effects, Long Term			0.214	
SECTION 4:	41.4 Guidance the ES	41.4 Guidance to DU to evaluate whether he works inside the boundaries set by the ES		
Health/ Environment				
met or the downstream user can de measures are adequate. For human below the DNEL (given that the prod If measured data are not available, t (www.ebrc.de/mease.html) to estimat	nonstrate on his o health, this has to esses and activitie he DU may make ate the associated	ither the proposed risk management me won that his operational conditions and ir b be done by showing that they limit the i es in question are covered by the PROC use of an appropriate scaling tool such a exposure. For the environment, this has environmental compartment. If measure	nplemented risk management nhalation exposure to a level s listed above) as given below. as MEASE s to be done by showing that	

may make use of an appropriate scaling tool such as the DU-Scaling tool (http://www.arche-consulting.be/Metal-CSAtoolbox/duscaling-tool) to estimate PEC values.