

Exposure Scenario provided in accordance with EU Directive 2004/37/EC, Regulation (EC) No 1907/2006 Annex I and the terms of the REACH authorisation No. REACH/20/10/0

1. TITLE SECTION

Substance	Dichromium tris(chromate) (CAS number 24613-89-6, EC number 246-356-2)
ES/use name	<p>Use in chemical conversion coating applications by aerospace and defence sector¹ where any of the following key functionalities or properties is necessary for the intended use: corrosion resistance, active corrosion inhibition, adhesion promotion, chemical resistance, layer thickness, electrical properties</p> <p>Dichromium tris(chromate) may only be used for chemical conversion coating applications by the aerospace and defence sector.</p> <p><u>Important note:</u> The authorisation for the use of dichromium tris(chromate) is <u>not</u> granted for use in chemical conversion coating applications by the aerospace and defence sector where none of the key functionalities or properties listed in the use is necessary for the intended use.</p>

1.1. Scope

ENVIRONMENT (Environment Contributing Scenario – ECS)

ECS 1: Surface Treatment	ERC 6b
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WORKER (Worker Contributing Scenario – WCS)

WCS 1: Delivery and storage of raw material	PROC 1
WCS 2: Decanting of liquids	PROC 8b
WCS 3: Mixing - liquids	PROC 5
WCS 4: Re-filling of baths for concentration adjustment	PROC 8b
WCS 5: Use of dichromium tris(chromate) for chemical conversion coating applications by aerospace and defence companies and their associated supply chains – bath application	PROC 13
WCS 6: Use of dichromium tris(chromate) for chemical conversion coating applications by aerospace and defence companies and their associated supply chains – filling of parts	PROC 13
WCS 7: Maintenance of equipment	PROC 8a
WCS 8: Sampling	PROC 8b
WCS 9: Surface treatment with Cr(VI) - by rolling and brushing	PROC 10
WCS 10: Surface treatment with Cr(VI) - by touch-up pen application	PROC 10
WCS 11: Machining operations on small to medium sized parts containing Cr(VI) on an extracted bench/extraction booth including cleaning	PROC 21, 24
WCS 12: Machining operations in large work areas on parts containing Cr(VI) including cleaning	PROC 21, 24
WCS 13: Machining operations on parts containing Cr(VI) in small work areas including cleaning	PROC 21, 24
WCS 14: Storage of articles	PROC 1
WCS 15: Waste management	PROC 8b
WCS 16: End of Life	PROC 8a

This ES includes relevant information provided in the Wesco Aircraft EMEA Chemical Safety Report (CSR) for dichromium tris(chromate) (see [AfA No. 0116-01](#)), in accordance with ECHA's illustrative example of an exposure scenario, and follows ECHA's guidance on extracting the relevant information from the comprehensive exposure scenarios in the CSR.

¹ Aerospace and defence sector includes companies principally engaged in carrying out the design, development, manufacture, maintenance, modification, overhaul, repair, or support of civil or military aerospace and defence equipment, systems, or structures, plus any derivative uses.

1.2. Explanation on the approach taken for the ES

All worker exposure estimates are given in terms of Cr(VI) and are expressed as 8-hour Time Weighted Average (TWA).

The frequency of a specific activity in the worker sub-scenarios is expressed as daily activity unless otherwise stated. *As long-term exposure is the relevant period for long-term health effects, the duration of exposure per day as set out in the ES is expressed as average duration per day over a longer period (e.g. 2 hours each day are equal to 4 hours every second day). Therefore, the duration of exposure per day is not the same as the maximum allowed duration in any one day.*

Occupational exposure estimates are based on measured data and/or on modelled data, using the exposure model 'Advanced REACH Tool 1.5' or 'ART'². ART is a second-tier model calibrated to assess exposure to inhalable dust, vapours, and mists; this Exposure Scenario is within the scope of ART. Additional parameters used for the purpose of modelling are provided in the CSR for the relevant worker contributing scenarios (WCS).

Where the sample size and sampling strategy is adequate (i.e. personal sampling data), the risk characterisation relies on the measured exposure values. The results of exposure modelling were used for the risk characterisation when adequate measurement data were not available.

2. CONDITIONS OF USE AFFECTING EXPOSURE

This section includes the Operational Conditions (OCs) and Risk Management Measures (RMMs) for each contributing scenario.

2.1. ENVIRONMENT CONTRIBUTING SCENARIO: Surface treatment (ECS 1) (ERC 6b)

Amount used, frequency and duration of use (or from service life)	
▪ Daily use at site:	<= 0.00006 tonnes/day [as Cr(VI)]
▪ Annual use at a site:	<= 0.006 tonnes/year [as Cr(VI)]
Technical and organisational conditions and measures	
<ul style="list-style-type: none"> ▪ Air emission abatement: at least 99% efficiency. For operations where exposure potential is low [i.e. operations are infrequent using only small quantities of Cr(VI)], air emission abatement may not be required. ▪ Negligible discharge of Cr(VI) in wastewater from the site ▪ All solid and any liquid waste is collected and either the collected waste is directly forwarded to an external waste management company, or Cr(VI) in wastewater is reduced to Cr(III) on-site, and the treated waste is either recycled or forwarded to an external waste management company (licenced contractor) for disposal as hazardous waste 	
Conditions and measures related to sewage treatment plant	
<ul style="list-style-type: none"> ▪ Not applicable – negligible discharge of Cr(VI) in wastewater from the site 	
Conditions and measures related to treatment of waste (including article waste)	
<ul style="list-style-type: none"> ▪ Collection of all solid and liquid waste, elimination of Cr(VI) from wastewater, disposal as hazardous waste by an external waste management company (licenced contractor) 	
Other conditions affecting environmental exposure	
<ul style="list-style-type: none"> ▪ When needed, exhaust air is passed through filters or wet scrubbers according to best available technique (minimum efficiency 99 %) 	

² The use of ART for workers exposure assessment under REACH is described in ECHA's updated Guidance on Information Requirements and chemical safety assessment R.14, Vers. 2, May 2010. Background information for ART are provided in: Fransman W., Cherrie J., van Tongeren M., Schneider T., Tischer M., Schinkel J., Marquart H., Warren, N.D., Spankie S., Kromhout H., Tielemans E. Development of a mechanistic model for the Advanced REACH Tool (ART). Version 1.5, January 2013.

2.1.1. Specific Conditions of REACH authorisation [C\(2020\) 2056](#) (Article 2, points 13(b), 14, 16, 17 and 18)

- Implement at least annual monitoring programmes for chromium (VI) emissions to wastewater and air from local exhaust ventilation. Those programmes shall be based on relevant standard methodologies or protocols and be representative of the operational conditions and risk management measures (such as wastewater treatment systems, gaseous emission abatement techniques) used at the individual sites where relevant measurements are carried out.
- The information gathered via the measurements and related contextual information shall be used by the authorisation holder and its downstream users to regularly review the appropriateness and effectiveness of the risk management measures and operational conditions in place and to introduce measures to further reduce exposure and emissions.
- The results of those measurements as well as of any action taken following the review shall be documented and be made available by the authorisation holder and their downstream users, upon request, to the competent authorities of the Member State where the authorised uses take place.
- The downstream users shall make available to the Agency the information from the monitoring programme, including the contextual information associated with each set of measurements, for the first time by 8 April 2021, for transmission to the authorisation holder for the purpose of verifying and validating the specific exposure scenarios and afterwards for the preparation of the review report according to Article 61(1) of Regulation (EC) No 1907/2006.
- Continuation of monitoring requirements
 - Downstream users may reduce the frequency of measurements once they can clearly demonstrate to the competent authority of the Member State where the use takes place that exposure to humans and releases to the environment have been reduced to as low a level as technically and practically possible and that the risk management measures and operational conditions correspond to the exposure scenarios and function appropriately.
 - Where the frequency of the monitoring programme has been reduced, any subsequent changes to the operational conditions or risk management measures that may affect the exposure at the site where the use takes place shall be documented. The authorisation holder and its downstream users shall assess the impact of such changes by monitoring, to demonstrate that exposure of workers and emissions to the environment continue to be reduced to as low a level as technically and practically possible.

2.2. WORKER CONTRIBUTING SCENARIOS 1 - 15

<i>WCS 1: Delivery and Storage of raw material (PROC 1) (e.g., in sealed containers or paper boxes (touch-up pens))</i>	
Product (Article) characteristics	
▪ Substance type	Substance as such/in a mixture
▪ Concentration of Cr(VI)	Small (1 - 5%)
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 1 hour
▪ Frequency of activity	Infrequent
Technical and organisational conditions and measures	
▪ General ventilation	Basic general ventilation (1-3 air changes per hour)
▪ Containment	Closed system (minimal contact during routine operations)
▪ Local exhaust ventilation	No localized controls

WCS 1: Delivery and Storage of raw material (PROC 1) (e.g., in sealed containers or paper boxes (touch-up pens))	
Occupational Health and Safety Management System	Advanced ³
Conditions and measures related to personal protection, hygiene and health evaluation	
PPE	Not required
Other conditions affecting workers exposure	
Place of use	Indoor
Temperature	Room temperature
Exposure Concentration	
Inhalation, local, long-term	0 µg/m ³ – no potential for worker exposure

WCS 2: Decanting of liquids (PROC 8b) (e.g. before re-filling of CCC baths or for further pre-mixing)	
Product (Article) characteristics	
Substance product type	Liquid
Concentration of Cr(VI) in mixture	Small (1 - 5%)
Vapour pressure of substance	< 0.01 Pa
Viscosity	Low
Amount used (or contained in articles), frequency and duration of use/exposure	
Duration of activity	< 15 min
Frequency of activity	1 time/week (reduction factor of 0.2 applied)
Technical and organisational conditions and measures	
General ventilation	Good natural ventilation (0 – 2 air changes per hour)
Local exhaust ventilation	No localized controls
Conditions and measures related to personal protection, hygiene and health evaluation	
PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
Process temperature	Room temperature
Work area	Indoors
Room size	Any size workroom
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Specific Condition(s) imposed by the granted authorisation	
Decanting of liquids shall be performed in a dedicated area, with controlled access by trained workers, following procedures established based on appropriate task-based risk assessment.	

³ Such systems are consistent with the duty of care set out through general Health and Safety at Work legislation, as well as via more specific legislation, such as the Carcinogens Directive (2004/37/EC) and the Chemical Agents at Work Directive (98/24/EC) and include, for example: areas using Cr(VI) are restricted to essential workers with appropriate PPE; workers are informed of temporary, planned higher exposure and how to minimise exposure; appropriate hygienic procedures are in place; appropriate training is provided on potential risks to health, exposure prevention, hygiene requirements, PPE, etc.; appropriate warning and hazard labelling is provided; workers are informed on abnormal exposures as quickly as possible, etc.

WCS 2: Decanting of liquids (PROC 8b) (e.g. before re-filling of CCC baths or for further pre-mixing)	
Exposure Concentration	
Inhalation, local, long-term	0.15 µg/m³ (modelled with ART 1.5)
Inhalation, local, long-term (adjusted for frequency)	0.03 µg/m³ (modelled with ART 1.5)

WCS 3: Mixing – liquids (PROC 5) (e.g. before re-filling of CCC baths)	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Small (1 – 5%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 30 min
▪ Frequency of activity	1 time/week (reduction factor of 0.2 applied)
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	No localized controls
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Room temperature
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Specific Condition(s) imposed by the granted authorisation	
Mixing of liquids shall be performed in a dedicated area, with controlled access by trained workers, following procedures established based on appropriate task-based risk assessment.	
Exposure Concentration	
Inhalation, local, long-term	0.11 µg/m³ (modelled with ART 1.5)
Inhalation, local, long-term (adjusted for frequency)	0.022 µg/m³ (modelled with ART 1.5)

WCS 4: Re-filling of baths for concentration adjustment (PROC 8b)⁴	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Small (1 - 5%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low

⁴ This scenario covers, as worst-case, activities associated with a complete emptying and re-filling of a bath.

WCS 4: Re-filling of baths for concentration adjustment (PROC 8b)⁴	
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 10 min
▪ Frequency of activity	1 time/week (reduction factor of 0.2 applied)
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	Fixed capturing hood ⁵ (90.00 % reduction)
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Above room temperature
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Specific Condition(s) imposed by the granted authorisation	
The authorisation holder and the downstream users shall, without undue delay, equip baths with appropriately installed and correctly functioning extraction systems with a design efficiency of at least 90%.	
The area in which bath treatment is conducted shall be restricted either physically by means of barriers/signage or through strict procedure during the activity and for a specified time after the operation.	
Effective cleaning practices shall be implemented to prevent surface contamination around treatment baths and other equipment.	
Exposure Concentration	
Inhalation, local, long-term	0.034 µg/m³ (modelled with ART 1.5)
Inhalation, local, long-term (adjusted for frequency)	6.8E-3 µg/m³ (modelled with ART 1.5)

WCS 5: Use of dichromium tris(chromate) for chemical conversion coating applications by aerospace and defence companies and their associated supply chains – bath application (PROC 13)⁶	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Small (1 - 5%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 1 h
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	Fixed capturing hood ⁵ (90.00 % reduction)

⁵ Or equivalent LEV to achieve the specified percent reduction.

⁶ Cleaning of equipment is not a separate task but conducted by those employees working in the bath area as part of their normal working procedure.

WCS 5: Use of dichromium tris(chromate) for chemical conversion coating applications by aerospace and defence companies and their associated supply chains – bath application (PROC 13)⁶

Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Above room temperature
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Specific Condition(s) imposed by the granted authorisation	
The authorisation holder and the downstream users shall, without undue delay, equip baths with appropriately installed and correctly functioning extraction systems with a design efficiency of at least 90%.	
The area in which bath treatment is conducted shall be restricted either physically by means of barriers/signage or through strict procedure during the activity and for a specified time after the operation.	
Effective cleaning practices shall be implemented to prevent surface contamination around treatment baths and other equipment.	
Exposure Concentration	
Inhalation, local, long-term	0.023 µg/m³ (modelled with ART 1.5)

WCS 6: Use of dichromium tris(chromate) for chemical conversion coating applications by aerospace and defence companies and their associated supply chains – filling of parts (PROC 13)⁷

Conditions by Sub-task	
Sub-task 1: Transfer into part	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Very small (0.5 - 1%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 20 min
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	Fixed capturing hood ⁵ (90.00 % reduction)
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Above room temperature

⁷ Cleaning of equipment is not a separate task but conducted by those employees working in the bath area as part of their normal working procedure.

Sub-task 1: Transfer into part	
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Specific Condition(s) imposed by the granted authorisation	
Effective cleaning practices shall be implemented to prevent surface contamination around treatment baths and other equipment.	

Sub-task 2: Coating	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Very small (0.5 - 1%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 20 min
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	Fixed capturing hood ⁵ (90.00 % reduction)
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Above room temperature
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Specific Condition(s) imposed by the granted authorisation	
Effective cleaning practices shall be implemented to prevent surface contamination around treatment baths and other equipment.	

Sub-task 3: Transfer into gallon⁸	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Very small (0.5 - 1%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low

⁸ Refers to transfer into a gallon (3.8 L) container or similar volume container.

Sub-task 3: Transfer into gallon⁸	
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 20 min
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	Fixed capturing hood ⁵ (90.00 % reduction)
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Above room temperature
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Specific Condition(s) imposed by the granted authorisation	
Effective cleaning practices shall be implemented to prevent surface contamination around treatment baths and other equipment.	

Exposure Concentrations for Worker contributing scenario 6: Use of dichromium tris(chromate) for chemical conversion coating applications by aerospace and defence companies and their associated supply chains – filling of parts (PROC 13)	
Inhalation, local, long-term	0.036 µg/m³ (modelled with ART 1.5)

WCS 7: Maintenance of equipment (PROC 8a) (e.g. baths and related equipment)	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Small (1 - 5%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 1 h
▪ Frequency of activity	1 time/2 weeks (reduction factor of 0.1 applied)
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	No localized controls
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.

WCS 7: Maintenance of equipment (PROC 8a) (e.g. baths and related equipment)	
Other conditions affecting worker exposure	
▪ Process temperature	Room temperature
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Specific Condition(s) imposed by the granted authorisation	
Effective cleaning practices shall be implemented to prevent surface contamination around treatment baths and other equipment.	
Exposure Concentration	
Inhalation, local, long-term	0.023 µg/m³ (modelled with ART 1.5)
Inhalation, local, long-term (adjusted for frequency):	2.3E-3 µg/m³ (modelled with ART 1.5)

WCS 8: Sampling (PROC 8b)	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Small (1 - 5%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 15 min
▪ Frequency of activity	1 time/week (reduction factor of 0.2 applied)
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	Fixed capturing hood ⁵ (90.00 % reduction)
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Above room temperature
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Exposure Concentration	
Inhalation, local, long-term	5.7E-3 µg/m³ (modelled with ART 1.5)
Inhalation, local, long-term (adjusted for frequency)	1.14E-3 µg/m³ (modelled with ART 1.5)

WCS 9: Surface treatment with Cr(VI) - by rolling and brushing (PROC 10)	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Very small (0.5 - 1%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Low
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 30 min
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	No localized controls
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Room temperature
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Exposure Concentration	
Inhalation, local, long-term	0.29 µg/m³ (modelled with ART 1.5)

WCS 10: Surface treatment with Cr(VI) - by touch-up pen application (PROC 10)	
Product (article) characteristics	
▪ Substance product type	Liquid
▪ Concentration of Cr(VI) in mixture	Extremely small (0.1 – 0.5%)
▪ Vapour pressure of substance	< 0.01 Pa
▪ Viscosity	Medium
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 30 min
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	No localized controls
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process temperature	Room temperature (indoors) / Ambient (outdoors)
▪ Process fully enclosed?	No

WCS 10: Surface treatment with Cr(VI) - by touch-up pen application (PROC 10)	
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors/outdoors
▪ Room size	Any size workroom
Exposure Concentration	
Inhalation, local, long-term	3.5E-3 µg/m ³ (modelled with ART 1.5)

WCS 11: Machining operations on small to medium sized parts containing Cr(VI) on an extracted bench/extraction booth including cleaning (PROC 21, 24)	
Product (article) characteristics	
▪ Substance product type	Solid object
▪ Solid weight fraction	< 0.1 % ⁹
▪ Moisture content	Dry product (<5 % moisture content)
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity:	< 60 min ¹⁰
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	Fixed capturing hood /Vacuum cleaner ⁵ (HEPA filter with at least 99.00 % reduction)
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ Respiratory Protection	Yes, at least half mask with P3 filter <i>(At least half mask with P3 filter is worn if workplace monitoring data do not confirm negligible exposure clearly below 1 µg/m³ (e.g. < 0.1 µg/m³)</i>
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Equipment level	Any size workroom
Specific Condition(s) imposed by the granted authorisation	
The area in which machining is conducted shall be restricted either physically by means of barriers/signage or through strict procedure during the activity and for a specified time after the operation.	
Effective cleaning practices shall be implemented to prevent surface contamination in the vicinity where machining activities take place.	

⁹ The Cr(VI) weight fraction of the part is assumed to be < 0.1 %. In case of lower or higher Cr(VI) content, estimated exposure would be reduced or increased in a linear way (i.e. 0.5 % concentration in the product would lead to an increase of the exposure estimate by a factor of 5). If needed, OCs and RMMs could be adjusted for that different situation.

¹⁰ This scenario covers also machining operations with a longer duration of activity but with a higher level of respiratory protection, e.g. by using a full face mask with P3 filter (e.g. APF 400 according to the German BG rule 190).

WCS 11: Machining operations on small to medium sized parts containing Cr(VI) on an extracted bench/extraction booth including cleaning (PROC 21, 24)

Exposure Concentration	
Inhalation, local, long-term	0.38 µg/m ³ (modelled with ART 1.5)
Inhalation, local, long-term (adjusted for RPE ¹¹)	0.013 µg/m ³ (modelled with ART 1.5)

WCS 12: Machining operations in large work areas on parts containing Cr(VI) including cleaning (PROC 21, 24)

Product (article) characteristics	
▪ Substance product type	Solid object
▪ Solid weight fraction	< 0.1 % ⁹
▪ Moisture content	Dry product (< 5 % moisture content)
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 30 min ¹⁰
Technical and organisational conditions and measures	
▪ General ventilation	10 air changes per hour (ACH)
▪ Local exhaust ventilation	Wetting at the point of release/on-tool extraction/vacuum cleaning ⁵ (90.00 % reduction)
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ Respiratory Protection	Yes, at least half mask with P3 filter <i>(At least half mask with P3 filter is worn if workplace monitoring data do not confirm negligible exposure clearly below 1 µg/m³ (e.g. < 0.1 µg/m³)</i>
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Large workrooms only
Specific Condition(s) imposed by the granted authorisation	
The area in which machining is conducted shall be restricted either physically by means of barriers/signage or through strict procedure during the activity and for a specified time after the operation.	
Effective cleaning practices shall be implemented to prevent surface contamination in the vicinity where machining activities take place.	
Exposure Concentration	
Inhalation, local, long-term	0.83 µg/m ³ (modelled with ART 1.5)
Inhalation, local, long-term (adjusted for RPE ¹¹)	0.028 µg/m ³ (modelled with ART 1.5)

¹¹ A factor of 30 was applied, based on an APF 30 assigned for this RPE according to the German BG rule 190

WCS 13: Machining operations on parts containing Cr(VI) in small work areas including cleaning (PROC 21, 24)	
Product (article) characteristics	
▪ Substance product type	Solid object
▪ Solid weight fraction	< 0.1 % ⁹
▪ Moisture content	Dry product (< 5 % moisture content)
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 30 min
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Local exhaust ventilation	No localized controls
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ Respiratory Protection	Yes, Full face mask with P3 filter <i>Full face mask with P3 filter is worn if workplace monitoring data do not confirm negligible exposure clearly below 1 µg/m³ (e.g. < 0.1 µg/m³)</i>
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Small workrooms only
Specific Condition(s) imposed by the granted authorisation	
The area in which machining is conducted shall be restricted either physically by means of barriers/signage or through strict procedure during the activity and for a specified time after the operation.	
Mechanical ventilation shall be used for machining activities in small work areas, except in cases where mechanical ventilation would create risks (e.g. local spark risk) or would otherwise not be technically and practically possible.	
Effective cleaning practices shall be implemented to prevent surface contamination in the vicinity where machining activities take place.	
Exposure Concentration	
Inhalation, local, long-term	32 µg/m³ (modelled with ART 1.5)
Inhalation, local, long-term (adjusted for RPE ¹²)	0.08 µg/m³ (modelled with ART 1.5)

WCS 14: Storage of articles (PROC 1)	
Product (article) characteristics	
▪ Concentration of substance Cr(VI) in article	Non detectable or very low
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 8 hours
Technical and organisational conditions and measures	
▪ General ventilation	Basic general ventilation (1-3 air changes per hour)

¹² A factor of 400 was applied, based on an APF 400 assigned for this RPE according to the German BG rule 190

WCS 14: Storage of articles (PROC 1)	
▪ Local exhaust ventilation	No localized controls
▪ Occupational Health and Safety Management System	Advanced ³
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	Not required
Other conditions affecting workers exposure	
▪ Place of use	Indoor/outdoors
▪ Process temperature (for solids)	Ambient
Exposure Concentration	
Inhalation, local, long-term	0 µg/m³ – no potential for worker exposure

WCS 15: Waste management (PROC 8b) (e.g. transfer of solid waste (e.g. empty containers, canisters, pencils, touch-up pens) to the waste storage area)	
Product (article) characteristics	
▪ Substance product type	Powders, granules or pelletised material
▪ Powder weight fraction [Cr(VI)]	Small (1 – 5%)
▪ Dustiness	Firm granules, flakes or pellets
▪ Moisture content	Dry product (< 5 % moisture content)
Amount used (or contained in articles), frequency and duration of use/exposure	
▪ Duration of activity	< 15 min
Technical and organisational conditions and measures	
▪ General ventilation	Good natural ventilation (0 – 2 air changes per hour)
▪ Primary	No localized controls
Conditions and measures related to personal protection, hygiene and health evaluation	
▪ PPE	PPE is not specified according to this Authorisation. Section 8 of the applicable SDS contains supplier advice to inform PPE selection for this task, which may include additional considerations.
Other conditions affecting workers exposure	
▪ Process fully enclosed?	No
▪ Effective housekeeping practices in place?	Yes
▪ Work area	Indoors
▪ Room size	Any size workroom
Exposure Concentration	
Inhalation, local, long-term	0.037 µg/m³ (modelled with ART 1.5)

2.2.1. Risk characterization related to combined exposure

Workers in the surface treatment process could conduct some combinations of tasks (sub-scenarios). The core activities will be the application of dichromium tris(chromate) by small brush or touch-up pen.

A possible combination of sub-scenarios is the combination of WCS 2-5 and 8, activities in relation to the CCC application in baths. The combined exposure estimates (as the 90th percentile value of model-based exposure distribution) of these activities would be 0.07 µg/m³.

Another possibility would be the combination of brush and touch-up pen application (WCS 2 and 3, WCS 9 and 10), resulting in a combined exposure estimate of 0.33 µg/m³.

A further possible combination of activities would be the machining activities (WCS 11-13). The combined exposure estimate (as the 90th percentile value of model-based exposure distribution) of these activities would be 0.12 µg/m³.

2.2.2. Other Specific Conditions of REACH authorisation [C\(2020\) 2056](#) (Article 2, points 6, 12, 13(a), 14, 16, 17 and 18)

- Downstream users shall implement best practices to reduce workplace exposure to dichromium tris(chromate) and emissions to the environment to as low a level as technically and practically feasible, including the use of closed systems and automation, whenever possible. Where this is not possible, the downstream users shall use local exhaust ventilation (LEV) systems that are appropriately designed, dimensioned, located and maintained to capture and remove potassium dichromate.
- Where closed systems and automation are not used, the non-use of LEV shall only be permitted in exceptional circumstances where the use of LEV is technically impossible and subject to the provision of appropriate justification. Information on LEV systems put in place in the installations where the authorised use takes place, as well as on their maintenance, shall be made available for inspection by the competent authority of the Member States.
- LEV and personal respiratory equipment (RPE) shall be checked and tested periodically (including fit testing of RPE) and records of these periodical checks and tests shall be kept and made available for the competent authorities of the Member State where the use takes place.
- Workers shall be supervised and trained on the adequate use of personal protective equipment (PPE) and RPE and their medical fitness shall be examined annually.
- Implement at least annual air monitoring programmes on occupational exposure to chromium (VI) in accordance with Article 5(5)(e) of Directive 2004/37/EC. The first measurements taken as part of these monitoring programmes shall be performed without delay and at the latest on 8 October 2020. Those programmes shall be based on relevant standard methodologies or protocols and be representative of:
 - the range of tasks undertaken where exposure to chromium is possible, including tasks involving process and maintenance workers;
 - the operational conditions and risk management measures typical for each of these tasks;
 - the number of workers potentially exposed
- The information gathered via the measurements and related contextual information shall be used by the authorisation holder and its downstream users to regularly review the appropriateness and effectiveness of the risk management measures and operational conditions in place and to introduce measures to further reduce exposure and emissions.
- The results of those measurements as well as of any action taken following the review shall be documented and be made available by the authorisation holder and its downstream users, upon request, to the competent authorities of the Member State where the authorised uses take place.
- The downstream users shall make available to the Agency the information from the monitoring programmes, including the contextual information associated to each set of measurements, for the first time by 8 April 2021, for transmission to the authorisation holder for the purpose of verifying and validating the specific exposure scenarios and afterwards for the preparation of the review report according to Article 61(1) of Regulation (EC) No 1907/2006.
- Continuation of monitoring requirements
 - Downstream users may reduce the frequency of measurements once they can clearly demonstrate to the competent authority of the Member State where the use takes place that exposure to humans and releases to the environment have been reduced to as low a level as technically and practically possible and that the risk management measures and operational conditions correspond to the exposure scenarios and function appropriately.
 - Where the frequency of the monitoring programme has been reduced, any subsequent changes to the operational conditions or risk management measures that may affect the exposure at the site where the use takes place shall be documented. The authorisation holder and its downstream users shall

assess the impact of such changes by monitoring, to demonstrate that exposure of workers and emissions to the environment continue to be reduced to as low a level as technically and practically possible.

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure

Local releases to the environment

Release	Release factor estimation method	Explanation / Justification
Air	Release factor	Initial release factor: 0.1% Final release factor: 0.001% Local release rate: 6E-7 kg/day

Exposure and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk characterisation
Freshwater	Not relevant	-
Sediment (freshwater)	Not relevant	-
Marine water	Not relevant	-
Sediment (marine water)	Not relevant	-
Predator (freshwater)	Not relevant	-
Predator (marine water)	Not relevant	-
Top predator (marine water)	Not relevant	-
Sewage treatment plant	Not relevant	-
Air	Local PEC: 4.57E-11 mg/m ³	-
Agricultural soil	Not relevant	-
Predator (terrestrial)	Not relevant	-
Man via Environment – Inhalation	Local PEC: 4.57E-11 mg/m ³	Based on the dose-response relationship derived by the RAC, considering a 70 year exposure time (24h/day, 7d/week), the following excess lifetime risk up to age 89 is derived for the general population based on the estimated exposure: 1.33E-6 per 1000 exposed
Man via Environment - Oral	Not relevant	-

2.3.2. Worker exposure

Exposure concentrations and risks for worker

Worker Contributing Scenario	Route of exposure and type of effects	Exposure Concentration	Risk Characterisation ¹³
WCS 1: Delivery and storage of raw material	Inhalation, local, long-term (qualitative)	0 µg/m ³ – no worker exposure	Not applicable
WCS 2: Decanting of liquids	Inhalation, local, long-term, further adjusted for frequency (90 th percentile, ART 1.5)	0.03 µg/m ³	0.12 per 1000 exposed workers
WCS 3: Mixing - liquids	Inhalation, local, long-term, further adjusted for frequency (90 th percentile, ART 1.5)	0.022 µg/m ³	0.09 per 1000 exposed workers
WCS 4: Re-filling of baths for concentration adjustment	Inhalation, local, long-term, adjusted for frequency (90 th percentile, ART 1.5)	6.8E-3 µg/m ³	0.027 per 1000 exposed workers
WCS 5: Chemical conversion coating – bath application	Inhalation, local, long-term (90 th percentile, ART 1.5)	0.023 µg/m ³	0.092 per 1000 exposed workers
WCS 6: Chemical conversion coating – filling of parts	Inhalation, local, long-term (90 th percentile, ART 1.5)	0.036 µg/m ³	0.144 per 1000 exposed workers
WCS 7: Maintenance of equipment	Inhalation, local, long-term, further adjusted for frequency (90 th percentile, ART 1.5)	2.3E-3 µg/m ³	9.2E-3 per 1000 exposed workers
WCS 8: Sampling	Inhalation, local, long-term, further adjusted for frequency (90 th percentile, ART 1.5)	1.14E-3 µg/m ³	4.56E-3 per 1000 exposed workers
WCS 9: Surface treatment with Cr(VI) - by rolling and brushing	Inhalation, local, long-term (90 th percentile, ART 1.5)	0.29 µg/m ³	1.16 per 1000 exposed workers
WCS 10: Surface treatment with Cr(VI) - by touch-up pen application	Inhalation, local, long-term (90 th percentile, ART 1.5)	3.5E-3 µg/m ³	0.014 per 1000 exposed workers
WCS 11: Machining operations on small to medium sized parts containing Cr(VI) on an extracted bench/extraction booth including cleaning	Inhalation, local, long-term, further adjusted for RPE (90 th percentile, ART 1.5)	0.013 µg/m ³	0.05 per 1000 exposed workers
WCS 12: Machining operations in large work areas on parts containing Cr(VI) including cleaning	Inhalation, local, long-term, further adjusted for RPE (90 th percentile, ART 1.5)	0.028 µg/m ³	0.11 per 1000 exposed workers
WCS 13: Machining operations on parts containing Cr(VI) in small work areas including cleaning	Inhalation, local, long-term, further adjusted for RPE (90 th percentile, ART 1.5)	0.08 µg/m ³	0.32 per 1000 exposed workers
WCS 14: Storage of articles	Inhalation, local, long-term (qualitative)	0 µg/m ³ – no worker exposure	Not applicable
WCS 15: Waste management	Inhalation, local, long-term (90 th percentile, ART 1.5)	0.037 µg/m ³	0.15 per 1000 exposed workers
WCS 16: End of Life	Not applicable	Not applicable	Not applicable

¹³ Based on the dose-response relationship for lung cancer mortality derived by the RAC, considering a 40-year working life (8h/day, 5d/week), the excess lifetime lung cancer mortality risk up to age 89 is derived based on the estimated exposure.