

Scheda di sicurezza del 21/4/2023, revisione 12

SEZIONE 1: identificazione della sostanza/miscela e della società/impresa

1.1. Identificatore del prodotto

Identificazione della sostanza:

Nome commerciale: B103 - SILVER NITRATE WM
Codice commerciale: B103
Numero CAS: 7761-88-8
Numero EC: 231-853-9
Index 67/548/EEC: 047-001-00-2
Numero REACH: 01-2119513705-43

1.2. Usi identificati pertinenti della sostanza o della miscela e usi sconsigliati

Uso raccomandato:

Galvanica, chimica di base e di laboratorio
Produzione di Argento Nitrato
Industria del vetro
Produzione industriale di catalizzatori
Produzione industriale di materiali di contatto
Produzione industriale di materiale fotografico
Usi industriali risultanti nella inclusione in o su una matrice
Uso del nitrato d'argento come agente di dissoluzione sulle piattaforme petrolifere
Uso professionale del nitrato d'argento nel settore fotografico
Uso dei consumatori di carta fotografica non trattata contenente argento nello strato di emulsione

1.3. Informazioni sul fornitore della scheda di dati di sicurezza

Fornitore:
CABRO SPA - AREZZO
Via Setteponti 141
52100 - Italia
CABRO SPA
Tel +39 0575 984442
Orari d'ufficio: 9-13 / 14.30-17.30

Persona competente responsabile della scheda di dati di sicurezza:
info@cabro.it

1.4. Numero telefonico di emergenza

CABRO SPA
Tel +39 0575 984442
Orari d'ufficio: 9-13 / 14.30-17.30
Centro antiveleni - 24/24 ore Ospedale Careggi (FI) Tel. +39 055 7947819
Centro Antiveleni - 24/24 ore Ospedale di Foggia Tel +39 0881-732326
Centro Antiveleni - 24/24 ore Ospedale Bergamo - Numero verde +39 800 883300

SEZIONE 2: identificazione dei pericoli

2.1. Classificazione della sostanza o della miscela

Criteri Regolamento CE 1272/2008 (CLP):

- ⚠ Pericolo, Repr. 1B, Può nuocere al feto.
- ⚠ Pericolo, Ox. Sol. 1, Può provocare un incendio o un'esplosione; molto comburente.
- ⚠ Attenzione, Met. Corr. 1, Può essere corrosivo per i metalli.
- ⚠ Pericolo, Skin Corr. 1A, Provoca gravi ustioni cutanee e gravi lesioni oculari.
- ⚠ Attenzione, Aquatic Acute 1, Molto tossico per gli organismi acquatici.
- ⚠ Attenzione, Aquatic Chronic 1, Molto tossico per gli organismi acquatici con effetti di lunga

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durata.

Effetti fisico-chimici dannosi alla salute umana e all'ambiente:

Nessun altro pericolo

2.2. Elementi dell'etichetta

Pittogrammi di pericolo:



Pericolo

Indicazioni di pericolo:

H360D Può nuocere al feto.

H271 Può provocare un incendio o un'esplosione; molto comburente.

H290 Può essere corrosivo per i metalli.

H314 Provoca gravi ustioni cutanee e gravi lesioni oculari.

H410 Molto tossico per gli organismi acquatici con effetti di lunga durata.

Consigli di prudenza:

P201 Procurarsi istruzioni specifiche prima dell'uso.

P202 Non manipolare prima di avere letto e compreso tutte le avvertenze.

P210 Tenere lontano da fonti di calore, superfici calde, scintille, fiamme libere o altre fonti di accensione. Non fumare.

P220 Tenere lontano da indumenti e altri materiali combustibili.

P273 Non disperdere nell'ambiente.

P280 Indossare guanti/indumenti protettivi e proteggere gli occhi/il viso.

P303+P361+P353 IN CASO DI CONTATTO CON LA PELLE (o con i capelli): togliersi di dosso immediatamente tutti gli indumenti contaminati. Sciacquare la pelle o fare una doccia.

P305+P351+P338 IN CASO DI CONTATTO CON GLI OCCHI: sciacquare accuratamente per parecchi minuti. Togliere le eventuali lenti a contatto se è agevole farlo. Continuare a sciacquare.

P308+P313 IN CASO di esposizione o di possibile esposizione, consultare un medico.

P310 Contattare immediatamente un CENTRO ANTIVELENI/un medico.

P370+P378 In caso d'incendio: utilizzare estintore a polvere per estinguere.

P371+P380+P375 In caso di incendio grave e di grandi quantità: evacuare la zona. Rischio di esplosione. Utilizzare i mezzi estinguenti a grande distanza.

P391 Raccogliere il materiale fuoriuscito.

Disposizioni speciali:

Nessuna

Disposizioni speciali in base all'Allegato XVII del REACH e successivi adeguamenti:

Nessuna

2.3. Altri pericoli

Nessuna sostanza PBT, vPvB o interferente endocrino presente in concentrazione $\geq 0.1\%$

Altri pericoli:

Nessun altro pericolo

SEZIONE 3: composizione/informazioni sugli ingredienti

3.1. Sostanze

Identificazione della sostanza:

Caratterizzazione chimica: nitrato di argento

Codice commerciale: B103

Numero CAS: 7761-88-8

Numero EC: 231-853-9

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Numero REACH: 01-2119513705-43

Qtà	Nome	Numero d'identif.	Classificazione
100 %	nitrate di argento	Numero 047-001-00-2 Index: CAS: 7761-88-8 EC: 231-853-9 REACH No.: 01-2119513705-43	3.7/1B Repr. 1B H360D 2.14/1 Ox. Sol. 1 H271 2.16/1 Met. Corr. 1 H290 3.2/1A Skin Corr. 1A H314 4.1/A1 Aquatic Acute 1 H400 M=1000. 4.1/C1 Aquatic Chronic 1 H410 M=100.

Fattore M

M: 1000

M (cronico): 100

3.2. Miscela

N.A.

SEZIONE 4: misure di primo soccorso

4.1. Descrizione delle misure di primo soccorso

In caso di contatto con la pelle:

Togliere di dosso immediatamente gli indumenti contaminati.

CONSULTARE IMMEDIATAMENTE UN MEDICO.

Togliere immediatamente gli indumenti contaminati ed eliminarli in modo sicuro.

In caso di contatto con la pelle lavare immediatamente con acqua abbondante e sapone.

In caso di contatto con gli occhi:

In caso di contatto con gli occhi risciacquarli con acqua per un intervallo di tempo adeguato e tenendo aperte le palpebre, quindi consultare immediatamente un oftalmologo.

Proteggere l'occhio illeso.

In caso di ingestione:

Non provocare assolutamente vomito. RICORRERE IMMEDIATAMENTE A VISITA MEDICA.

In caso di inalazione:

Portare l'infortunato all'aria aperta e tenerlo al caldo e a riposo.

4.2. Principali sintomi ed effetti, sia acuti che ritardati

Nessuno

4.3. Indicazione dell'eventuale necessità di consultare immediatamente un medico e di trattamenti speciali

In caso d'incidente o malessere consultare immediatamente un medico (se possibile mostrare le istruzioni per l'uso o la scheda di sicurezza).

Trattamento:

Nessuno

SEZIONE 5: misure di lotta antincendio

5.1. Mezzi di estinzione

Mezzi di estinzione idonei:

In caso d'incendio: utilizzare estintore a polvere per estinguere.

Mezzi di estinzione che non devono essere utilizzati per ragioni di sicurezza:

Nessuno in particolare.

5.2. Pericoli speciali derivanti dalla sostanza o dalla miscela

Non inalare i gas prodotti dalla combustione

La combustione produce fumo pesante.

5.3. Raccomandazioni per gli addetti all'estinzione degli incendi

Impiegare apparecchiature respiratorie adeguate.

Raccogliere separatamente l'acqua contaminata utilizzata per estinguere l'incendio. Non

scaricarla nella rete fognaria.

Se fattibile sotto il profilo della sicurezza, spostare dall'area di immediato pericolo i contenitori non danneggiati.

SEZIONE 6: misure in caso di rilascio accidentale

6.1. Precauzioni personali, dispositivi di protezione e procedure in caso di emergenza

Per chi non interviene direttamente:

Indossare i dispositivi di protezione individuale.

Spostare le persone in luogo sicuro.

Consultare le misure protettive esposte al punto 7 e 8.

Per chi interviene direttamente:

Indossare i dispositivi di protezione individuale.

6.2. Precauzioni ambientali

Impedire la penetrazione nel suolo/sottosuolo. Impedire il deflusso nelle acque superficiali o nella rete fognaria.

Trattenere l'acqua di lavaggio contaminata ed eliminarla.

In caso di fuga di gas o penetrazione in corsi d'acqua, suolo o sistema fognario informare le autorità responsabili.

Materiale idoneo alla raccolta: materiale assorbente, organico, sabbia

6.3. Metodi e materiali per il contenimento e per la bonifica

Lavare con abbondante acqua.

6.4. Riferimento ad altre sezioni

Vedi anche paragrafo 8 e 13

SEZIONE 7: manipolazione e immagazzinamento

7.1. Precauzioni per la manipolazione sicura

Evitare il contatto con la pelle e gli occhi, l'inalazione di vapori e nebbie.

Usare la massima cautela nel manipolare o aprire il contenitore.

Non utilizzare contenitori vuoti prima che siano stati puliti.

Prima delle operazioni di trasferimento assicurarsi che nei contenitori non vi siano materiali incompatibili residui.

Si rimanda anche al paragrafo 8 per i dispositivi di protezione raccomandati.

Raccomandazioni generali sull'igiene del lavoro:

Gli indumenti contaminati devono essere sostituiti prima di accedere alle aree da pranzo.

Durante il lavoro non mangiare né bere.

7.2. Condizioni per lo stoccaggio sicuro, comprese eventuali incompatibilità

Stoccare a temperature inferiori a 20 °C. Tenere lontano da fiamme libere e sorgenti di calore.

Evitare l'esposizione diretta al sole.

Tenere lontano da fiamme libere, scintille e sorgenti di calore. Evitare l'esposizione diretta al sole.

Tenere lontano da cibi, bevande e mangimi.

Materie incompatibili:

Mantenere lontano da materiali combustibili.

Indicazione per i locali:

Freschi ed adeguatamente areati.

7.3. Usi finali particolari

Nessun uso particolare

SEZIONE 8: controlli dell'esposizione/della protezione individuale

8.1. Parametri di controllo

nitrato di argento - CAS: 7761-88-8

TLV - TWA: 0.01 mg/m3 - Note: as Ag

Valori limite di esposizione DNEL

nitrato di argento - CAS: 7761-88-8

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Esposizione: Inalazione Umana
nitrato di argento - CAS: 7761-88-8
Lavoratore industriale: 600 µg/m³ - Consumatore: 150 µg/m³ - Esposizione: Inalazione Umana - Frequenza: Lungo termine, effetti sistemici
Lavoratore industriale: 220 mg/kg pc/giorno - Consumatore: 110 mg/kg pc/giorno - Esposizione: Cutanea Umana - Frequenza: Lungo termine, effetti sistemici
Consumatore: 110 mg/kg pc/giorno - Esposizione: Orale Umana - Frequenza: Lungo termine, effetti sistemici
Valori limite di esposizione PNEC
nitrato di argento - CAS: 7761-88-8
Bersaglio: Acqua dolce - Valore: 46 ng/L
Bersaglio: Acqua di mare - Valore: 860 ng/L
Bersaglio: Impianto di depurazione - Valore: 25 µg/l
Bersaglio: Sedimenti d'acqua dolce - Valore: 438.13 mg/kg dwt
Bersaglio: Sedimenti d'acqua di mare - Valore: 438.13 mg/kg dwt
Bersaglio: Terreno (agricolo) - Valore: 1.05 mg/kg dwt

8.2. Controlli dell'esposizione
Protezione degli occhi:
Utilizzare visiere di sicurezza chiuse, non usare lenti oculari.
Protezione della pelle:
Indossare indumenti che garantiscano una protezione totale per la pelle, es. in cotone, gomma, PVC o viton.
Protezione delle mani:
Utilizzare guanti protettivi che garantiscano una protezione totale, es. in PVC, neoprene o gomma.
Protezione respiratoria:
Non necessaria per l'utilizzo normale.
Rischi termici:
Nessuno
Controlli dell'esposizione ambientale:
Nessuno
Controlli tecnici idonei:
Nessuno

SEZIONE 9: proprietà fisiche e chimiche

9.1. Informazioni sulle proprietà fisiche e chimiche fondamentali

Proprietà	Valore	Metodo:	Note
Stato fisico:	Solido	--	--
Colore:	biancastro	--	--
Odore:	Inodore	--	--
Punto di fusione/punto di congelamento:	212 °C	--	--
Punto di ebollizione o punto iniziale di ebollizione e intervallo di ebollizione:	N.A.	--	--
Infiammabilità:	Materiale in grado di prendere	--	--

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	fuoco o essere incendiato		
Limite inferiore e superiore di esplosività:	N.A.	--	--
Punto di infiammabilità:	N.A.	--	--
Temperatura di autoaccensione:	N.A.	--	--
Temperatura di decomposizione:	N.A.	--	--
pH:	3.8-6.0	--	--
Viscosità cinematica:	N.A.	--	--
Idrosolubilità:	Solubile	--	--
Solubilità in olio:	N.A.	--	--
Coefficiente di ripartizione n-ottanolo/acqua (valore logaritmico):	N.A.	--	--
Pressione di vapore:	N.A.	--	--
Densità e/o densità relativa:	N.A.	--	--
Densità di vapore relativa:	N.A.	--	--
Caratteristiche delle particelle:			
Dimensione delle particelle:	N.A.	--	--

9.2. Altre informazioni

Proprietà	Valore	Metodo:	Note
Miscibilità:	N.A.	--	--

SEZIONE 10: stabilità e reattività

10.1. Reattività

Stabile in condizioni normali

10.2. Stabilità chimica

Stabile in condizioni normali

10.3. Possibilità di reazioni pericolose

Nessuno

10.4. Condizioni da evitare

Stabile in condizioni normali.

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10.5. Materiali incompatibili

Evitare il contatto con materie combustibili: il prodotto potrebbe esplodere.

10.6. Prodotti di decomposizione pericolosi

Nessuno.

SEZIONE 11: informazioni tossicologiche

11.1. Informazioni sulle classi di pericolo definite nel regolamento (CE) n. 1272/2008

Informazioni tossicologiche riguardanti la sostanza:

nitrate di argento - CAS: 7761-88-8

a) Tossicità acuta

Non classificato

Sulla base dei dati disponibili, i criteri di classificazione non sono soddisfatti.

b) corrosione/irritazione cutanea

Il prodotto è classificato: Skin Corr. 1A H314

c) lesioni oculari gravi/irritazioni oculari gravi

Non classificato

Sulla base dei dati disponibili, i criteri di classificazione non sono soddisfatti.

d) sensibilizzazione respiratoria o cutanea

Non classificato

Sulla base dei dati disponibili, i criteri di classificazione non sono soddisfatti.

e) mutagenicità delle cellule germinali

Non classificato

Sulla base dei dati disponibili, i criteri di classificazione non sono soddisfatti.

f) cancerogenicità

Non classificato

Sulla base dei dati disponibili, i criteri di classificazione non sono soddisfatti.

g) tossicità per la riproduzione

Il prodotto è classificato: Repr. 1B H360D

h) tossicità specifica per organi bersaglio (STOT) — esposizione singola

Non classificato

Sulla base dei dati disponibili, i criteri di classificazione non sono soddisfatti.

i) tossicità specifica per organi bersaglio (STOT) — esposizione ripetuta

Non classificato

Sulla base dei dati disponibili, i criteri di classificazione non sono soddisfatti.

j) pericolo in caso di aspirazione

Non classificato

Sulla base dei dati disponibili, i criteri di classificazione non sono soddisfatti.

11.2. Informazioni su altri pericoli

Proprietà di interferenza con il sistema endocrino:

Nessun interferente endocrino presente in concentrazione $\geq 0.1\%$

SEZIONE 12: informazioni ecologiche

12.1. Tossicità

Utilizzare secondo le buone pratiche lavorative, evitando di disperdere il prodotto nell'ambiente.

nitrate di argento - CAS: 7761-88-8

Il prodotto è classificato: Aquatic Acute 1 - H400; Aquatic Chronic 1 - H410

nitrate di argento - CAS: 7761-88-8

a) Tossicità acquatica acuta:

Endpoint: LC50 - Specie: Pesci = 1.2 µg/l - Durata h: 96

Endpoint: LC50 - Specie: Invertebrati = 220 ng/L - Durata h: 48

b) Tossicità acquatica cronica:

Endpoint: EC10 - Specie: Pesci = 440 ng/L - Durata h: 768

Endpoint: EC10 - Specie: Pesci = 50-590 ng/L - Durata h: 792

- Endpoint: EC10 - Specie: Pesci = 950-1410 ng/L - Durata h: 816
Endpoint: NOEC - Specie: Invertebrati = 310 ng/L - Durata h: 480
e) Tossicità per le piante:
Endpoint: EC10 - Specie: Piante = 6.4-16.67 µg/l - Durata h: 168
- 12.2. Persistenza e degradabilità
N.A.
- 12.3. Potenziale di bioaccumulo
N.A.
- 12.4. Mobilità nel suolo
N.A.
- 12.5. Risultati della valutazione PBT e vPvB
Sostanze vPvB: Nessuna - Sostanze PBT: Nessuna
- 12.6. Proprietà di interferenza con il sistema endocrino
Nessun interferente endocrino presente in concentrazione $\geq 0.1\%$
- 12.7. Altri effetti avversi
Nessuno

SEZIONE 13: considerazioni sullo smaltimento

13.1. Metodi di trattamento dei rifiuti

Recuperare se possibile. Inviare ad impianti di smaltimento autorizzati o ad incenerimento in condizioni controllate. Operare secondo le vigenti disposizioni locali e nazionali.

SEZIONE 14: informazioni sul trasporto



14.1. Numero ONU o numero ID

ADR-UN Number: 1493
IATA-UN Number: 1493
IMDG-UN Number: 1493

14.2. Designazione ufficiale ONU di trasporto

ADR-Shipping Name: NITRATO DI ARGENTO
IATA-Shipping Name: NITRATO DI ARGENTO
IMDG-Shipping Name: NITRATO DI ARGENTO

14.3. Classi di pericolo connesso al trasporto

ADR-Class: 5.1
ADR - Numero di identificazione del pericolo: 50
IATA-Class: 5.1
IATA-Label: 5.1
IMDG-Class: 5.1

14.4. Gruppo d'imballaggio

ADR-Packing Group: II
IATA-Packing group: II
IMDG-Packing group: II

14.5. Pericoli per l'ambiente

ADR-Inquinante ambientale: Si
IMDG-Marine pollutant: Marine Pollutant
IMDG-EMS: F-A , S-Q

14.6. Precauzioni speciali per gli utilizzatori

ADR-Subsidiary hazards: -
ADR-S.P.: -
ADR-Categoria di trasporto (Codice di restrizione in galleria):
IATA-Passenger Aircraft: 558

2 (E)

IATA-Subsidiary hazards: -
IATA-Cargo Aircraft: 562
IATA-S.P.: -
IATA-ERG: 5L
IMDG-Subsidiary hazards: -
IMDG-Stowage and handling: Category A
IMDG-Segregation: -

14.7. Trasporto marittimo alla rinfusa conformemente agli atti dell'IMO
N.A.

SEZIONE 15: informazioni sulla regolamentazione

15.1. Disposizioni legislative e regolamentari su salute, sicurezza e ambiente specifiche per la sostanza o la miscela

D.Lgs. 9/4/2008 n. 81
D.M. Lavoro 26/02/2004 (Limiti di esposizione professionali)
Regolamento (CE) n. 1907/2006 (REACH)
Regolamento (CE) n. 1272/2008 (CLP)
Regolamento (CE) n. 790/2009 (ATP 1 CLP) e (UE) n. 758/2013
Regolamento (UE) n. 2020/878
Regolamento (UE) n. 286/2011 (ATP 2 CLP)
Regolamento (UE) n. 618/2012 (ATP 3 CLP)
Regolamento (UE) n. 487/2013 (ATP 4 CLP)
Regolamento (UE) n. 944/2013 (ATP 5 CLP)
Regolamento (UE) n. 605/2014 (ATP 6 CLP)
Regolamento (UE) n. 2015/1221 (ATP 7 CLP)
Regolamento (UE) n. 2016/918 (ATP 8 CLP)
Regolamento (UE) n. 2016/1179 (ATP 9 CLP)
Regolamento (UE) n. 2017/776 (ATP 10 CLP)
Regolamento (UE) n. 2018/669 (ATP 11 CLP)
Regolamento (UE) n. 2018/1480 (ATP 13 CLP)
Regolamento (UE) n. 2019/521 (ATP 12 CLP)
Regolamento (UE) n. 2020/217 (ATP 14 CLP)
Regolamento (UE) n. 2020/1182 (ATP 15 CLP)
Regolamento (UE) n. 2021/643 (ATP 16 CLP)
Regolamento (UE) n. 2021/849 (ATP 17 CLP)

Restrizioni relative al prodotto o alle sostanze contenute in base all'Allegato XVII del Regolamento (CE) 1907/2006 (REACH) e successivi adeguamenti:

Restrizioni relative al prodotto:

Nessuna restrizione.

Restrizioni relative alle sostanze contenute:

Restrizione 75

Ove applicabili, si faccia riferimento alle seguenti normative:

Circolari ministeriali 46 e 61 (Ammine aromatiche).
Direttiva 2012/18/EU (Seveso III)
Regolamento 648/2004/CE (Detergenti).
D.L. 3/4/2006 n. 152 Norme in materia ambientale
Dir. 2004/42/CE (Direttiva COV)

Disposizioni relative alla direttiva EU 2012/18 (Seveso III):

Categoria Seveso III in accordo all'Allegato 1, parte 1

Il prodotto appartiene alle categorie: P8, E1

15.2. Valutazione della sicurezza chimica

È stata effettuata una valutazione della sicurezza chimica per la sostanza

SEZIONE 16: altre informazioni

Testo delle frasi utilizzate nel paragrafo 3:

H360D Può nuocere al feto.

H271 Può provocare un incendio o un'esplosione; molto comburente.

H290 Può essere corrosivo per i metalli.

H314 Provoca gravi ustioni cutanee e gravi lesioni oculari.

H400 Molto tossico per gli organismi acquatici.

H410 Molto tossico per gli organismi acquatici con effetti di lunga durata.

Classe e categoria di pericolo	Codice	Descrizione
Ox. Sol. 1	2.14/1	Solido comburente, Categoria 1
Met. Corr. 1	2.16/1	Sostanza o miscela corrosiva per i metalli, Categoria 1
Skin Corr. 1A	3.2/1A	Corrosione cutanea, Categoria 1A
Repr. 1B	3.7/1B	Tossicità per la riproduzione, Categoria 1B
Aquatic Acute 1	4.1/A1	Pericolo acuto per l'ambiente acquatico, Categoria 1
Aquatic Chronic 1	4.1/C1	Pericolo cronico (a lungo termine) per l'ambiente acquatico, Categoria 1

Paragrafi modificati rispetto alla precedente revisione:

SEZIONE 2: identificazione dei pericoli

SEZIONE 3: composizione/informazioni sugli ingredienti

SEZIONE 7: manipolazione e immagazzinamento

SEZIONE 8: controlli dell'esposizione/della protezione individuale

SEZIONE 11: informazioni tossicologiche

SEZIONE 15: informazioni sulla regolamentazione

SEZIONE 16: altre informazioni

Questo documento e' stato redatto da un tecnico competente in materia di SDS e che ha ricevuto formazione adeguata.

Principali fonti bibliografiche:

ECDIN - Environmental Chemicals Data and Information Network - Joint Research Centre, Commission of the European Communities

SAX's DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS - Eight Edition - Van Nostrand Reinold

CCNL - Allegato 1

Istituto Superiore di Sanità - Inventario Nazionale Sostanze Chimiche

Le informazioni ivi contenute si basano sulle nostre conoscenze alla data sopra riportata. Sono riferite unicamente al prodotto indicato e non costituiscono garanzia di particolari qualità.

L'utilizzatore è tenuto ad assicurarsi della idoneità e completezza di tali informazioni in relazione all'utilizzo specifico che ne deve fare.

Questa scheda annulla e sostituisce ogni edizione precedente.

Exposure scenario 3: Use at industrial sites - Use of silver nitrate in coating

Product category used: PC 7: Base metals and alloys; PC 14: Metal surface treatment products; PC 15: Non-metal-surface treatment products; PC 20: Products such as ph-regulators, flocculants, precipitants, neutralization agents

Sector of use: SU 13: Manufacture of other non-metallic mineral products, e.g. plasters, cement; SU 16: Manufacture of computer, electronic and optical products, electrical equipment; SU 24: Scientific research and development

Environment contributing scenario(s):			SPERC
CS 1	Use of silver nitrate in coating	ERC 5	Eurometaux SPERC 5.1.v3
CS 2	Use of silver nitrate in coating - no emissions to water	ERC 5	
Worker contributing scenario(s):			SWED
CS 3	Chemical production where opportunity for exposure arises	PROC 4	
CS 4	Mixing or blending in batch processes	PROC 5	
CS 5	Industrial spraying	PROC 7	
CS 6	Transfer of substance or mixture into small containers (dedicated filling line, including weighing)	PROC 9	
CS 7	Roller application or brushing	PROC 10	
CS 8	Treatment of articles by dipping and pouring	PROC 13	
CS 9	Production of metal powders (wet processes)	PROC 27b	
CS 10	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	PROC 2	
CS 11	Transfer of substance or mixture (charging/discharging) at dedicated facilities	PROC 8b	
CS 12	Manual activities involving hand contact	PROC 19	
CS 13	Manual maintenance (cleaning and repair) of machinery	PROC 28	

Subsequent service life exposure scenario(s):

ES10: Service life (consumers) - Service life of articles coated with metallic silver

3.1. Env CS 1: Use of silver nitrate in coating (ERC 5)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

3.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Annual use amount at site: ≤ 0.5 tonnes/year <i>All the amounts are expressed as Ag as this is the driver for the environmental risk assessment.</i> Daily use amount at site: $\leq 2.3E-3$ tonnes/day <i>220 days per year is the 10th percentile of reported site-specific number of emission days for 97 sites. Default number of emission days are derived from a multi-metal background database of measured site-specific release factors collected under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> On site treatment of off-air: Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter according to the BAT Reference Document in the Non-Ferrous Metals Industry

<p><i>Direct air emissions should be reduced by implementing one or more of the following RMMs (air concentration range for which the RMM is suitable is specified in parenthesis):</i></p> <ul style="list-style-type: none"> • <i>Electrostatic precipitators using wide electrode spacing: 5 – 15 mg/Nm³</i> • <i>Wet electrostatic precipitators: < 5 mg/Nm³</i> • <i>Cyclones, but as primary collector: < 50 mg/Nm³</i> • <i>Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values < 5mg/Nm³. Membrane filtration techniques can achieve < 1 mg/Nm³</i> • <i>Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm³</i> <p><i>Wet scrubbers: < 4 mg/Nm³</i></p>
<ul style="list-style-type: none"> • On site treatment of wastewater: Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange according to the BAT Reference Document in the Non-Ferrous Metals Industry (2017) applying minimum xx% removal efficiency <p><i>Direct water emissions should be reduced by implementing one or more of the following RMMs:</i></p> <ul style="list-style-type: none"> • <i>Chemical precipitation: used primarily to remove the metal ions (e.g. the use of Ca(OH)₂ to a pH 11: >99% removal efficiency; the use of Fe(OH)₃ to a pH 11: 96% removal efficiency)</i> • <i>Sedimentation (e.g. Na₂S, pH 11, >99% removal efficiency) • Filtration: used as final clarification step (e.g. ultrafiltration, pH 5.1: 93% removal efficiency, nanofiltration: 97% removal efficiency, reverse osmosis, pH 4-11: 99% removal efficiency)</i> • <i>Electrolysis: for low metal concentration at about 2 g/L (e.g. electrodialysis: 13% removal efficiency within 2 hours, membrane electrolysis, electrochemical precipitation, pH 4-10, >99% removal efficiency) • Reverse osmosis: extensively used for the removal of dissolved metals; Ion exchange: final cleaning step in the removal of heavy metal from process wastewater (e.g. 90% removal efficiency for clinoptinolite and 100% removal efficiency for synthetic zeolite)</i> <p><i>Following the Integrated Pollution Prevention and Control – BAT Reference note document, the treatment methods are very much dependent on the specific processes and the metals involved. More information can be found in the BAT Reference Document for the Non-Ferrous Metals Industry (2017).</i></p>
Conditions and measures related to biological sewage treatment plant
<ul style="list-style-type: none"> • Biological STP: Site specific [Effectiveness Water: 80.1%]
<ul style="list-style-type: none"> • Discharge rate of STP: >= 2E3 m3/day
<ul style="list-style-type: none"> • Application of the STP sludge on agricultural soil: No
Conditions and measures related to external treatment of waste (including article waste)
<ul style="list-style-type: none"> • Particular considerations on the waste treatment operations: No (low concentration) <p><i>Particular risks from waste treatment unlikely due low concentration of substance in waste stream. Waste disposal according to national/local legislation is sufficient. If the metal content of the waste is elevated enough, internal or external recovery/recycling is considered.</i></p>

Fate (release percentage) in the biological sewage treatment plant

The biological STP is site specific and the releases to the various compartments have been set by the assessor for some assessment entities. They are distributed in the following way:

Assessment entities	Ag dissolved
Release to water	19.9%
Release to air	0%
Release to sludge	80.1%
Release degraded	0%

Explanation for Ag dissolved:

Based on available monitoring data and values cited in the literature.

3.1.2. Releases

The releases have been estimated on the basis of SPERC Eurometaux SPERC 5.1.v3: Industrial use of metals and metal compounds in metallic coating

Modification date: 09/09/2021

Description of activities/processes covered by the SPERC

Since metal SPERCs are based on measured data at end-of-pipe on-site, all indicated PROCs are integrated in the release fractions from raw materials handling to cleaning and maintenance. A distinction can be made between hot dip batch process, continuous hot dip process and continuous electroplating process. Electroplating is a plating process that uses electrical current to reduce cations of a desired material from a solution and coat a conductive object with a thin layer of the material, such as a metal. Mechanical milling to remove oxide layers. Pickling. Chemical treatment or blasting of internal tube surfaces. Cleaning and stain removal. Polishing. Pre-patination. Raw materials handling and storing of produced substances are also included in this SPERC. Release defaults are derived from measured emissions.

Product/substance domain:

Scope of the SPERC

User groups: Industrial use of metals and metal compounds in plating, galvanising.

Substance groups or functions:

Metal (compounds). Included in the metal definition (Eurometaux SPERCs): alkali metals, alkaline earth metals, transition metals, post-transition metals, metalloids and their compounds

Excluded from the metal definition: non-metals, halogens, noble gases and metallo-organic compounds.

SPERC valid for metals with solid water partition coefficient for suspended matter between 25,000 L/kg and 400,000 L/kg.

Types of products: Metal and/or metal compounds (solid, powder, salts in solution)

Sub-SPERC Eurometaux SPERC 5.1.v3 is used for Ag dissolved:

Explanation for the release factor to water:

release after STP

Default release factors are derived from a multi-metal background database of measured site-specific release factors collected from peer-reviewed EU Risk Assessment Reports under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.

The 90th percentile of reported site-specific release factors to wastewater for 114 sites.

Explanation for the release factor to air:

release after RMM

Default release factors are derived from a multi-metal background database of measured site-specific release factors collected from peer-reviewed EU Risk Assessment Reports under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.

The 90th percentile of reported site-specific release factors to air for 97 sites.

Explanation for the release factor to soil:

ERC default

The local releases to the environment are reported in the following table.

Table 36. Local releases to the environment

Release	Assessment entity	Release factor	Local release rate
Water	Ag dissolved	0.5%	0.011 kg/day
Air	Ag dissolved	0.2%	4.6E-3 kg/day
Non agricultural soil	Ag dissolved	1%	- kg/day

Releases to waste

Release factor to external waste: 1 %

Default release factors are derived from a multi-metal background database of measured site-specific release factors collected from peer-reviewed EU Risk Assessment Reports under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.

The 90th percentile of reported site-specific release factors to solid waste for 32 downstream user sites covering zinc, nickel, lead, antimony

3.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 37. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 3.57E-5 mg/L RCR = 0.776	Final RCR = 0.776
Sediment (freshwater)	Ag dissolved	Local PEC: 6.806 mg/kg dw RCR = 0.016	Final RCR = 0.016
Marine water	Ag dissolved	Local PEC: 4.88E-6 mg/L RCR = 5.67E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.929 mg/kg dw RCR = 2.12E-3	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 1.14E-3 mg/L RCR = 0.046	Final RCR = 0.046
Agricultural soil	Ag dissolved	Local PEC: 0.096 mg/kg dw RCR = 0.092	Final RCR = 0.092
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 8.47E-7 mg/m ³ RCR = 5.65E-6	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

3.2. Env CS 2: Use of silver nitrate in coating - no emissions to water (ERC 5)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

3.2.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Annual use amount at site: ≤ 200 tonnes/year <i>All the amounts are expressed as Ag as this is the driver for the environmental risk assessment.</i> Daily use amount at site: ≤ 0.909 tonnes/day <i>220 days per year is the 10th percentile of reported site-specific number of emission days for 97 sites. Default number of emission days are derived from a multi-metal background database of measured site-specific release factors collected under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> On site treatment of off-air: Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter according to the BAT Reference Document in the Non-Ferrous Metals Industry <i>Direct air emissions should be reduced by implementing one or more of the following RMMs (air concentration range for which the RMM is suitable is specified in parenthesis):</i> <ul style="list-style-type: none"> Electrostatic precipitators using wide electrode spacing: 5 – 15 mg/Nm³ Wet electrostatic precipitators: < 5 mg/Nm³

<ul style="list-style-type: none"> • Cyclones, but as primary collector: < 50 mg/Nm³ • Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values < 5mg/Nm³. Membrane filtration techniques can achieve < 1 mg/Nm³ • Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm³ Wet scrubbers: < 4 mg/Nm ³
<ul style="list-style-type: none"> • The substance should not be released to water <i>Emissions to surface water or to the sewage system are not allowed in this scenario</i>
Conditions and measures related to biological sewage treatment plant
<ul style="list-style-type: none"> • Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
<ul style="list-style-type: none"> • Particular considerations on the waste treatment operations: No (low concentration) <i>Particular risks from waste treatment unlikely due low concentration of substance in waste stream. Waste disposal according to national/local legislation is sufficient. If the metal content of the waste is elevated enough, internal or external recovery/recycling is considered.</i>
Other conditions affecting environmental exposure
<ul style="list-style-type: none"> • Discharge rate of effluent: >= 2E3 m³/day

3.2.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 38. Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release factor	Release factor before on site RMM: 0% Release factor after on site RMM: 0% Local release rate: 0 kg/day Explanation: Based on questionnaire responses some companies have no emissions to water so a scenario without emissions has been included as well.
Air	Ag dissolved	Estimated release factor (based on SPERC Eurometaux SPERC 5.1.v3)	Release factor before on site RMM: 0.2% Release factor after on site RMM: 0.2% Local release rate: 1.818 kg/day Explanation: release after RMM Default release factors are derived from a multi-metal background database of measured site-specific release factors collected from peer-reviewed EU Risk Assessment Reports under the former Directive of New and Existing Substances and REACH 2010 registration dossiers. The 90th percentile of reported site-specific release factors to air for 97 sites.
Non agricultural soil	Ag dissolved	Estimated release factor	Release factor after on site RMM: 0% Explanation: No direct emissions to soil.

Releases to waste

Release factor to external waste: 1 %

Default release factors are derived from a multi-metal background database of measured site-specific release factors collected from peer-reviewed EU Risk Assessment Reports under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.

The 90th percentile of reported site-specific release factors to solid waste for 32 downstream user sites covering zinc, nickel, lead, antimony

3.2.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 39. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 6.06E-6 mg/L RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	Local PEC: 1.155 mg/kg dw RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	Local PEC: 1.91E-6 mg/L RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.364 mg/kg dw RCR = 8.31E-4	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 0 mg/L RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	Local PEC: 0.179 mg/kg dw RCR = 0.171	Final RCR = 0.171
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 3.05E-4 mg/m ³ RCR = 2.03E-3	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.037

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

3.3. Worker CS 3: Chemical production where opportunity for exposure arises (PROC 4)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.3.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	

	Method
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

3.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 40. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.052	Final RCR = 0.052
Inhalation, local, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.153

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.4. Worker CS 4: Mixing or blending in batch processes (PROC 5)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.4.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

3.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 41. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.052	Final RCR = 0.052
Inhalation, local, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.153

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.5. Worker CS 5: Industrial spraying (PROC 7)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.5.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
• Generic local exhaust ventilation: Lower confidence limit (industrial use) [Effectiveness Inhalation: 78%] <i>Standard efficiency</i> Inhalation explanation: <i>Efficiency for industrial use</i>	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protection: Yes (APF >= 10)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

3.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 42. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.44 mg/m ³ (MEASE 1.02.01) RCR = 0.458	Final RCR = 0.458
Inhalation, local, long term	Silver nitrate	0.44 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.559

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local)

3.6. Worker CS 6: Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC 9)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.6.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes	

	Method
<i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

3.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 43. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01) RCR = 0.01	Final RCR = 0.01
Inhalation, local, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.111

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.7. Worker CS 7: Roller application or brushing (PROC 10)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.7.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting	

	Method
from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
<ul style="list-style-type: none"> Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i> 	
<ul style="list-style-type: none"> Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i> 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> Place of use: Indoor 	

3.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 44. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.052	Final RCR = 0.052
Inhalation, local, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.153

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.8. Worker CS 8: Treatment of articles by dipping and pouring (PROC 13)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.8.1. Conditions of use

	Method
Product (article) characteristics	
<ul style="list-style-type: none"> Percentage (w/w) of substance in mixture/article: <= 100 % 	MEASE 1.02.01
<ul style="list-style-type: none"> Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i> 	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration of activity: <= 8 h/day 	MEASE 1.02.01

	Method
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

3.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 45. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01) RCR = 0.01	Final RCR = 0.01
Inhalation, local, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.111

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.9. Worker CS 9: Production of metal powders (wet processes) (PROC 27b)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.9.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

3.9.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 46. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.205

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.10. Worker CS 10: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC 2)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.10.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Incidental	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

3.10.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 47. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01) RCR = 0.01	Final RCR = 0.01

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, local, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.111

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.11. Worker CS 11: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC 8b)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.11.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

3.11.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 48. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.205

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.12. Worker CS 12: Manual activities involving hand contact (PROC 19)

Assessment entity group used for the assessment of this contributing scenario: HH RA

3.12.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	

	Method
<ul style="list-style-type: none"> Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i> 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> Place of use: Indoor 	

3.12.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 49. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01) RCR = 0.521	Final RCR = 0.521
Inhalation, local, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.141 mg/kg bw/day (MEASE 1.02.01) RCR = 0.415	Final RCR = 0.415
Combined routes, systemic, long-term			Final RCR = 0.936

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

3.13. Worker CS 13: Manual maintenance (cleaning and repair) of machinery (PROC 28)

Assessment entity group used for the assessment of this contributing scenario: HH RA
Covers maintenance of both the solid (low dustiness) and liquid form (aqueous solution)

3.13.1. Conditions of use

	Method
Product (article) characteristics	
<ul style="list-style-type: none"> Percentage (w/w) of substance in mixture/article: <= 100 % 	MEASE 1.02.01
<ul style="list-style-type: none"> Physical form of the used product: Solid (material with low dustiness) 	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration of activity: <= 8 h/day 	MEASE 1.02.01
Technical and organisational conditions and measures	
<ul style="list-style-type: none"> Occupational Health and Safety Management System: Advanced 	MEASE 1.02.01
<ul style="list-style-type: none"> Pattern of use: Non-dispersive use 	MEASE 1.02.01
<ul style="list-style-type: none"> Pattern of exposure control: Direct handling 	MEASE 1.02.01
<ul style="list-style-type: none"> Contact level: Extensive 	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
<ul style="list-style-type: none"> Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%) 	MEASE 1.02.01

	Method
<ul style="list-style-type: none"> Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i> 	
<ul style="list-style-type: none"> Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i> 	
<ul style="list-style-type: none"> Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i> 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> Place of use: Indoor 	

3.13.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 50. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01) RCR = 0.521	Final RCR = 0.521
Inhalation, local, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.069 mg/kg bw/day (MEASE 1.02.01) RCR = 0.202	Final RCR = 0.202
Combined routes, systemic, long-term			Final RCR = 0.723

Remarks on exposure data from external estimation tools:

MEASE 1.02.01 for Silver nitrate:

Explanation:

As the MEASE 1.02.01 exposure estimation tool for workers does not provide exposure estimates for PROC 28, PROC 8a has been used instead as the input parameter assuming that there are similarities in the exposure.

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

Exposure scenario 4: Use at industrial sites - Use of silver nitrate in the production of catalysts

Product category used: PC 7: Base metals and alloys

Sector of use: SU 8: Manufacture of bulk, large scale chemicals (including petroleum products); SU 9: Manufacture of fine chemicals

Environment contributing scenario(s):		
CS 1	Industrial production of catalysts	ERC 5
Worker contributing scenario(s):		
CS 2	Mixing or blending in batch processes	PROC 5
CS 3	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities	PROC 8a
CS 4	Transfer of substance or mixture into small containers (dedicated filling line, including weighing)	PROC 9

Subsequent service life exposure scenario(s):

ES10: Service life (consumers) - Service life of articles coated with metallic silver

4.1. Env CS 1: Industrial production of catalysts (ERC 5)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

4.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none">Annual use amount at site: ≤ 3 tonnes/year <i>All the amounts are expressed as Ag as this is the driver for the environmental risk assessment.</i>
<ul style="list-style-type: none">Daily use amount at site: $\leq 8.8E-3$ tonnes/day <i>The number of release days is taken from the SpERC. Values for emission days per year were provided by 13 sites across Europe producing catalysts. The median value of 340 days per year was selected.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none">Direct emissions to air should be mitigated by application of one or more of the following RMMs:<ul style="list-style-type: none">HEPA filtration, Fabric filters and Bag or Ceramic FiltersWet ScrubbersDry or semi-dry ScrubbersMetallic Grids <i>Data on removal efficiency were provided by Catalysts Europe member companies. One or more of these RMMs (of which HEPA/bag filtration and wet scrubbers are the most common) were reported to be present in more than 88% of sites. RMM efficiency (RE_{sperc}) was reported to be $\geq 99\%$.</i>
<ul style="list-style-type: none">Direct emissions to water should be mitigated by application of one or more of the following RMMs:<ul style="list-style-type: none">PrecipitationSedimentationFiltrationDistillationIon Exchange <i>Data on removal efficiency were provided by Catalysts Europe member companies. One or more of these RMMs (of which chemical precipitation is the most common) were reported to be present in more than 70% of sites. RMM efficiency was reported as 95-99.9%. RE_{sperc} is taken to be 99% (50th percentile of reported site-specific RE).</i>
Conditions and measures related to biological sewage treatment plant
<ul style="list-style-type: none">Biological STP: Standard [Effectiveness Water: 80.1%]
<ul style="list-style-type: none">Discharge rate of STP: $\geq 2E3$ m³/day
<ul style="list-style-type: none">Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to external treatment of waste (including article waste)

<ul style="list-style-type: none"> Particular considerations on the waste treatment operations: No (low concentration) <i>Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the silver content of the waste is elevated enough, internal or external recovery/recycling might be considered.</i> <i>Appropriate waste codes: 06 05 02*, 08 01 11, 08 03 12*, 09 01 01*, 09 01 03*, 09 01 04*, 09 01 05*, 09 01 06*, 09 01 13*, 10 06 06*, 10 07 01, 10 07 02, 10 07 03, 10 07 04, 10 07 05, 11 01 09*, 15 01 10*, 15 02 02*, 16 01 18, 16 03 03*, 16 08 01, 16 11 04</i> <i>Suitable disposal: Hazardous waste produced during the manufacture and downstream use is sent to a recycler only marginal amounts are sent to a landfill or an incinerator. Waste containing silver is recycled for almost a 100%</i> <i>A detailed assessment has been performed on modelled and measured data and is reported in the Waste report (ARCHE, 2013)</i>
Other conditions affecting environmental exposure
<ul style="list-style-type: none"> Receiving surface water flow rate: $\geq 1.8E4$ m³/day

4.1.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 51. Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release factor (Catalysts Europe SPERC 2,1 v1.0)	Release factor before on site RMM: 0.04% Release factor after on site RMM: 0.04% Local release rate: 3.52E-3 kg/day Explanation: The release factor to water is derived from measured wastewater emission data from catalyst manufacturers in various EU member states between 2012-2016. The release factor is calculated as a realistic worst-case value based on metal-specific 90th percentile site-specific release factors from 13 sites for production of metal-containing catalysts.
Air	Ag dissolved	Estimated release factor (Catalysts Europe SPERC 2,1 v1.0)	Release factor before on site RMM: 0.018% Release factor after on site RMM: 0.018% Local release rate: 1.58E-3 kg/day Explanation: The release factor to air is derived from measured stack emission data from catalyst manufacturers in various EU member states between 2012-2016. The release factor is calculated as a realistic worst-case value based on metal-specific 90th percentile site specific release factors from 13 sites for production of metal-containing catalysts.
Non agricultural soil	Ag dissolved	Estimated release factor (Catalysts Europe SPERC 2,1 v1.0)	Release factor after on site RMM: 0% Explanation: There are no emissions to soil during manufacture or regeneration of catalysts.

4.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 52. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 1.51E-5 mg/L RCR = 0.329	Final RCR = 0.329
Sediment (freshwater)	Ag dissolved	Local PEC: 2.885 mg/kg dw RCR = 6.58E-3	Final RCR < 0.01
Marine water	Ag dissolved	Local PEC: 2.82E-6 mg/L RCR = 3.28E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.537 mg/kg dw RCR = 1.23E-3	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 3.5E-4 mg/L RCR = 0.014	Final RCR = 0.014
Agricultural soil	Ag dissolved	Local PEC: 0.155 mg/kg dw RCR = 0.148	Final RCR = 0.148
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 4.97E-7 mg/m ³ RCR = 3.31E-6	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

4.2. Worker CS 2: Mixing or blending in batch processes (PROC 5)

Assessment entity group used for the assessment of this contributing scenario: HH RA

Includes mixing of impregnation solution with inert carrier

4.2.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	

	Method
<ul style="list-style-type: none"> • Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%) 	MEASE 1.02.01
<ul style="list-style-type: none"> • Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i> 	
<ul style="list-style-type: none"> • Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i> 	
<ul style="list-style-type: none"> • Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i> 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> • Place of use: Indoor 	

4.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 53. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.052	Final RCR = 0.052
Inhalation, local, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.153

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

4.3. Worker CS 3: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities (PROC 8a)

Assessment entity group used for the assessment of this contributing scenario: HH RA

Includes moving of wet, impregnated carrier in the plant

4.3.1. Conditions of use

	Method
Product (article) characteristics	
<ul style="list-style-type: none"> • Percentage (w/w) of substance in mixture/article: <= 100 % 	MEASE 1.02.01
<ul style="list-style-type: none"> • Physical form of the used product: Solid (material with low dustiness) 	MEASE 1.02.01

	Method
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

4.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 54. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01) RCR = 0.521	Final RCR = 0.521
Inhalation, local, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.069 mg/kg bw/day (MEASE 1.02.01) RCR = 0.202	Final RCR = 0.202
Combined routes, systemic, long-term			Final RCR = 0.723

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

4.4. Worker CS 4: Transfer of substance or mixture into small containers

(dedicated filling line, including weighing) (PROC 9)

Assessment entity group used for the assessment of this contributing scenario: HH RA
Includes automated filling and weighing of drums

4.4.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

4.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 55. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Combined routes, systemic, long-term			Final RCR = 0.205

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

Exposure scenario 5: Use at industrial sites - Use of silver nitrate as intermediate in the production of silver or silver compounds

Product category used: PC 7: Base metals and alloys

Sector of use: SU 5: Manufacture of textiles, leather, fur; SU 6b: Manufacture of pulp, paper and paper products; SU 9: Manufacture of fine chemicals; SU 13: Manufacture of other non-metallic mineral products, e.g. plasters, cement; SU 16: Manufacture of computer, electronic and optical products, electrical equipment; SU 19: Building and construction work; SU 20: Health services; SU 23: Electricity, steam, gas water supply and sewage treatment

Environment contributing scenario(s):			SPERC
CS 1	Use of silver nitrate as intermediate in the production of silver or silver compounds	ERC 6a	Eurometaux SPERC 6a.1.v3
CS 2	Use of silver nitrate as intermediate in the production of silver or silver compounds - no emissions to water	ERC 6a	
Worker contributing scenario(s):			SWED
CS 3	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions	PROC 1	
CS 4	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	PROC 2	
CS 5	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition	PROC 3	
CS 6	Chemical production where opportunity for exposure arises	PROC 4	
CS 7	Mixing or blending in batch processes	PROC 5	
CS 8	Transfer of substance or mixture (charging/discharging) at dedicated facilities	PROC 8a	
CS 9	Transfer of substance or mixture (charging/discharging) at dedicated facilities	PROC 8b	
CS 10	Transfer of substance or mixture into small containers (dedicated filling line, including weighing)	PROC 9	
CS 11	Use as laboratory agent	PROC 15	
CS 12	Manual activities involving hand contact	PROC 19	
CS 13	Handling of solid inorganic substances at ambient temperature	PROC 26	
CS 14	Production of metal powders (wet processes)	PROC 27a	
CS 15	Manual maintenance (cleaning and repair) of machinery	PROC 28	
CS 16	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition	PROC 3	
CS 17	Chemical production where opportunity for exposure arises	PROC 4	
CS 18	Mixing or blending in batch processes	PROC 5	
CS 19	Transfer of substance or mixture (charging/discharging) at dedicated facilities	PROC 8a	

CS 20	Transfer of substance or mixture (charging/discharging) at dedicated facilities	PROC 8b
CS 21	Production of metal powders (wet processes)	PROC 27b
CS 22	Manual maintenance (cleaning and repair) of machinery	PROC 28

5.1. Env CS 1: Use of silver nitrate as intermediate in the production of silver or silver compounds (ERC 6a)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

5.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Annual use amount at site: ≤ 25 tonnes/year <i>All the amounts are expressed as Ag as this is the driver for the environmental risk assessment.</i> Daily use amount at site: ≤ 0.137 tonnes/day <i>Default number of emission days are derived from a multi-metal background database of measured site-specific release factors collected under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.</i> <i>182 days/year is the 10th percentile of reported site-specific number of emission days for 168 sites from production of metal compounds.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> On site treatment of off-air: Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter according to the BAT Reference Document in the Non-Ferrous Metals Industry <i>Direct air emissions should be reduced by implementing one or more of the following RMMs (air concentration range for which the RMM is suitable is specified in parenthesis):</i> <ul style="list-style-type: none"> Electrostatic precipitators using wide electrode spacing: $5 - 15 \text{ mg/Nm}^3$ Wet electrostatic precipitators: $< 5 \text{ mg/Nm}^3$ Cyclones, but as primary collector: $< 50 \text{ mg/Nm}^3$ Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values $< 5 \text{ mg/Nm}^3$. Membrane filtration techniques can achieve $< 1 \text{ mg/Nm}^3$ Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm^3 Wet scrubbers: $< 4 \text{ mg/Nm}^3$ On site treatment of wastewater: Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange according to the BAT Reference Document in the Non-Ferrous Metals Industry (2017) applying minimum xx% removal efficiency <i>Direct water emissions should be reduced by implementing one or more of the following RMMs:</i> <ul style="list-style-type: none"> Chemical precipitation: used primarily to remove the metal ions (e.g. the use of Ca(OH)_2 to a pH 11: $>99\%$ removal efficiency; the use of Fe(OH)_3 to a pH 11: 96% removal efficiency) Sedimentation (e.g. Na_2S, pH 11, $>99\%$ removal efficiency) • Filtration: used as final clarification step (e.g. ultrafiltration, pH 5.1: 93% removal efficiency, nanofiltration: 97% removal efficiency, reverse osmosis, pH 4-11: 99% removal efficiency) Electrolysis: for low metal concentration at about 2 g/L (e.g. electrodialysis: 13% removal efficiency within 2 hours, membrane electrolysis, electrochemical precipitation, pH 4-10, $>99\%$ removal efficiency) • Reverse osmosis: extensively used for the removal of dissolved metals; Ion exchange: final cleaning step in the removal of heavy metal from process wastewater (e.g. 90% removal efficiency for clinoptinolite and 100% removal efficiency for synthetic zeolite) <p><i>Following the Integrated Pollution Prevention and Control – BAT Reference note document, the treatment methods are very much dependent on the specific processes and the metals involved. More information can be found in the BAT Reference Document for the Non-Ferrous Metals Industry (2017).</i></p>
Conditions and measures related to biological sewage treatment plant
<ul style="list-style-type: none"> Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
<ul style="list-style-type: none"> Particular considerations on the waste treatment operations: No (low concentration)

Waste includes sludge, filter cakes and solid waste. waste shall be handled according to the Waste Framework Directive and disposed of according to national/local legislation. If the metal content of the waste is elevated, internal or external recovery/recycling is considered.

Other conditions affecting environmental exposure

- Discharge rate of effluent: $\geq 2\text{E}3$ m³/day

5.1.2. Releases

The releases have been estimated on the basis of SPERC Eurometaux SPERC 6a.1.v3: Intermediate use of metal compounds

Modification date: 09/09/2021

Description of activities/processes covered by the SPERC

Since this metal SPERC is based on measured data at end-of-pipe on-site, all indicated PROCs are integrated in the release fractions from raw materials handling to cleaning and maintenance.

Product/substance domain:

Substance groups or functions:

SPERC valid for metals with solid water partition coefficient for suspended matter between 1,000 L/kg and 400,000 L/kg.

Included in the metal definition (Eurometaux SPERCs): alkali metals, alkaline earth metals, transition metals, post-transition metals, metalloids and their compounds

Excluded from the metal definition: non-metals, halogens, noble gases and metallo-organic compounds.

Explanation for the release factor to soil:

ERC default

Sub-SPERC Eurometaux SPERC 6a.1g.v3 is used for Ag dissolved:

Explanation for the release factor to water:

After on-site STP.

Realistic worst-case regression line ($RF = 10^{(1.59 - 1.14 \times \log(Kd))}$) of the metal-specific 90th percentile reported site-specific release factors to wastewater for 201 sites from the production of massive metal and metal powder.

A relationship between solid-water partitioning coefficient for suspended matter K_d and the release factor to water can be justified because the K_d expresses the distribution between aqueous phase and suspended matter. K_d is an important parameter impacting the removal efficiency especially in sedimentation and precipitation RMMs but also in on-site runoff, cleaning operations, wet processes, etc

Explanation for the release factor to air:

Release after RMM. The 90th percentile of reported site-specific release factors to air for 145 sites from the production of massive metal and metal powder

The local releases to the environment are reported in the following table.

Table 56. Local releases to the environment

Release	Assessment entity	Release factor	Local release rate
Water	Ag dissolved	2E-3%	2.74E-3 kg/day
Air	Ag dissolved	0.03%	0.041 kg/day
Non agricultural soil	Ag dissolved	0.01%	- kg/day

Releases to waste

Release factor to external waste: 2.3 %

The 90th percentile of reported site-specific release factors to solid waste for 62 manufacturing sites covering zinc, nickel, lead, cobalt, cadmium, antimony

5.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 57. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 4.16E-5 mg/L RCR = 0.904	Final RCR = 0.904
Sediment (freshwater)	Ag dissolved	Local PEC: 7.921 mg/kg dw RCR = 0.018	Final RCR = 0.018
Marine water	Ag dissolved	Local PEC: 5.46E-6 mg/L RCR = 6.35E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 1.041 mg/kg dw RCR = 2.38E-3	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 0 mg/L RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	Local PEC: 0.098 mg/kg dw RCR = 0.093	Final RCR = 0.093
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 5.8E-6 mg/m ³ RCR = 3.87E-5	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

5.2. Env CS 2: Use of silver nitrate as intermediate in the production of silver or silver compounds - no emissions to water (ERC 6a)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

5.2.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Annual use amount at site: ≤ 1E3 tonnes/year <i>All the amounts are expressed as Ag as this is the driver for the environmental risk assessment.</i> Daily use amount at site: ≤ 5.5 tonnes/day <i>Default number of emission days are derived from a multi-metal background database of measured site-specific release factors collected under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.</i> <i>182 days/year is the 10th percentile of reported site-specific number of emission days for 168 sites from production of metal compounds.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> On site treatment of off-air: Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter according to the BAT Reference Document in the Non-Ferrous

<p>Metals Industry</p> <p><i>Direct air emissions should be reduced by implementing one or more of the following RMMs (air concentration range for which the RMM is suitable is specified in parenthesis):</i></p> <ul style="list-style-type: none"> • <i>Electrostatic precipitators using wide electrode spacing: 5 – 15 mg/Nm³</i> • <i>Wet electrostatic precipitators: < 5 mg/Nm³</i> • <i>Cyclones, but as primary collector: < 50 mg/Nm³</i> • <i>Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values < 5mg/Nm³. Membrane filtration techniques can achieve < 1 mg/Nm³</i> • <i>Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm³</i> <p><i>Wet scrubbers: < 4 mg/Nm³</i></p>
<ul style="list-style-type: none"> • The substance should not be released to water <p><i>Emissions to surface water or to the sewage system are not allowed in this scenario</i></p>
Conditions and measures related to biological sewage treatment plant
<ul style="list-style-type: none"> • Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
<ul style="list-style-type: none"> • Particular considerations on the waste treatment operations: No (low concentration) <p><i>Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the silver content of the waste is elevated enough, internal or external recovery/recycling might be considered.</i></p> <p><i>Appropriate waste codes: 06 05 02*, 08 01 11, 08 03 12*, 09 01 01*, 09 01 03*, 09 01 04*, 09 01 05*, 09 01 06*, 09 01 13*, 10 06 06*, 10 07 01, 10 07 02, 10 07 03, 10 07 04, 10 07 05, 11 01 09*, 15 01 10*, 15 02 02*, 16 01 18, 16 03 03*, 16 08 01, 16 11 04</i></p> <p><i>Suitable disposal: Hazardous waste produced during the manufacture and downstream use is sent to a recycler only marginal amounts are sent to a landfill or an incinerator. Waste containing silver is recycled for almost a 100%</i></p> <p><i>A detailed assessment has been performed on modelled and measured data and is reported in the Waste report (ARCHE, 2013)</i></p>
Other conditions affecting environmental exposure
<ul style="list-style-type: none"> • Receiving surface water flow rate: $\geq 1.8E4$ m³/day
<ul style="list-style-type: none"> • Discharge rate of effluent: $\geq 2E3$ m³/day

5.2.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 58. Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release factor	<p>Release factor before on site RMM: 0%</p> <p>Release factor after on site RMM: 0%</p> <p>Local release rate: 0 kg/day</p> <p>Explanation:</p> <p>Several companies have reported that they do not have emissions to water.</p>
Air	Ag dissolved	Estimated release factor (based on SPERC Eurometaux SPERC 6a.1.v3)	<p>Release factor before on site RMM: 0.026%</p> <p>Release factor after on site RMM: 0.026%</p> <p>Local release rate: 1.441 kg/day</p> <p>Explanation:</p> <p>Release after RMM. The 90th percentile of reported site-specific release factors to air for 145 sites from the production of massive metal and metal powder</p>
Non agricultural	Ag dissolved	Estimated release	Release factor after on site RMM: 0%

Release	Assessment entity	Release estimation method	Explanations
soil		factor	Explanation: No direct release to soil.

5.2.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 59. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 6.06E-6 mg/L RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	Local PEC: 1.155 mg/kg dw RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	Local PEC: 1.91E-6 mg/L RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.364 mg/kg dw RCR = 8.31E-4	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 0 mg/L RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	Local PEC: 0.15 mg/kg dw RCR = 0.143	Final RCR = 0.143
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 2E-4 mg/m ³ RCR = 1.33E-3	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.036

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

5.3. Worker CS 3: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC 1)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.3.1. Conditions of use

	Method
Product (article) characteristics	

	Method
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Closed system without breaches	MEASE 1.02.01
• Pattern of exposure control: Non-direct handling	MEASE 1.02.01
• Contact level: None	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 60. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01) RCR = 0.01	Final RCR = 0.01
Inhalation, local, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	1.71E-3 mg/kg bw/day (MEASE 1.02.01) RCR = 5.03E-3	Final RCR < 0.01
Combined routes, systemic, long-term			Final RCR = 0.015

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.4. Worker CS 4: Chemical production or refinery in closed continuous

process with occasional controlled exposure or processes with equivalent containment conditions (PROC 2)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.4.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Incidental	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 61. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01) RCR = 0.01	Final RCR = 0.01
Inhalation, local, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.111

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.5. Worker CS 5: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC 3)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.5.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Incidental	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 62. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.017 mg/kg bw/day (MEASE 1.02.01) RCR = 0.05	Final RCR = 0.05
Combined routes, systemic, long-term			Final RCR = 0.154

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.6. Worker CS 6: Chemical production where opportunity for exposure arises (PROC 4)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.6.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 63. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01) RCR = 0.521	Final RCR = 0.521
Inhalation, local, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.622

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.7. Worker CS 7: Mixing or blending in batch processes (PROC 5)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.7.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes	

	Method
<i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 64. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01) RCR = 0.521	Final RCR = 0.521
Inhalation, local, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.622

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.8. Worker CS 8: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC 8a)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.8.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation	

	Method
<i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
<ul style="list-style-type: none"> Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i> 	
<ul style="list-style-type: none"> Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i> 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> Place of use: Indoor 	

5.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 65. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01) RCR = 0.521	Final RCR = 0.521
Inhalation, local, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.069 mg/kg bw/day (MEASE 1.02.01) RCR = 0.202	Final RCR = 0.202
Combined routes, systemic, long-term			Final RCR = 0.723

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.9. Worker CS 9: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC 8b)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.9.1. Conditions of use

	Method
Product (article) characteristics	
<ul style="list-style-type: none"> Percentage (w/w) of substance in mixture/article: <= 100 % 	MEASE 1.02.01
<ul style="list-style-type: none"> Physical form of the used product: Solid (material with low dustiness) 	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration of activity: <= 8 h/day 	MEASE 1.02.01
Technical and organisational conditions and measures	
<ul style="list-style-type: none"> Occupational Health and Safety Management System: Advanced 	MEASE 1.02.01

	Method
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.9.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 66. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.205

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.10. Worker CS 10: Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC 9)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.10.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.10.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 67. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.205

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.11. Worker CS 11: Use as laboratory agent (PROC 15)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.11.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.11.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 68. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic,	Silver nitrate	0.017 mg/kg bw/day (MEASE 1.02.01)	Final RCR = 0.05

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
long term		RCR = 0.05	
Combined routes, systemic, long-term			Final RCR = 0.154

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.12. Worker CS 12: Manual activities involving hand contact (PROC 19)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.12.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.12.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 69. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01) RCR = 0.521	Final RCR = 0.521
Inhalation, local, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.141 mg/kg bw/day (MEASE 1.02.01) RCR = 0.415	Final RCR = 0.415
Combined routes, systemic, long-term			Final RCR = 0.936

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.13. Worker CS 13: Handling of solid inorganic substances at ambient temperature (PROC 26)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.13.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
• Generic local exhaust ventilation: Lower confidence limit (industrial use) [Effectiveness Inhalation: 78%] <i>Standard efficiency</i> Inhalation explanation: <i>Efficiency for industrial use</i>	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to</i>	

	Method
<i>the substance can be excluded.</i>	
<ul style="list-style-type: none"> Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i> 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> Place of use: Indoor 	

5.13.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 70. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.33 mg/m ³ (MEASE 1.02.01) RCR = 0.344	Final RCR = 0.344
Inhalation, local, long term	Silver nitrate	0.33 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.141 mg/kg bw/day (MEASE 1.02.01) RCR = 0.415	Final RCR = 0.415
Combined routes, systemic, long-term			Final RCR = 0.758

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.14. Worker CS 14: Production of metal powders (wet processes) (PROC 27a)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.14.1. Conditions of use

	Method
Product (article) characteristics	
<ul style="list-style-type: none"> Percentage (w/w) of substance in mixture/article: <= 100 % 	MEASE 1.02.01
<ul style="list-style-type: none"> Physical form of the used product: Solid (material with low dustiness) 	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration of activity: <= 8 h/day 	MEASE 1.02.01
Technical and organisational conditions and measures	
<ul style="list-style-type: none"> Occupational Health and Safety Management System: Advanced 	MEASE 1.02.01
<ul style="list-style-type: none"> Pattern of use: Non-dispersive use 	MEASE 1.02.01
<ul style="list-style-type: none"> Pattern of exposure control: Direct handling 	MEASE 1.02.01
<ul style="list-style-type: none"> Contact level: Extensive 	MEASE 1.02.01
<ul style="list-style-type: none"> Generic local exhaust ventilation: Lower confidence limit (industrial use) [Effectiveness Inhalation: 78%] <i>Standard efficiency</i> 	MEASE 1.02.01

	Method
Inhalation explanation: <i>Efficiency for industrial use</i>	
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protection: Yes (APF >= 10)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.14.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 71. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.11 mg/m ³ (MEASE 1.02.01) RCR = 0.115	Final RCR = 0.115
Inhalation, local, long term	Silver nitrate	0.11 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.141 mg/kg bw/day (MEASE 1.02.01) RCR = 0.415	Final RCR = 0.415
Combined routes, systemic, long-term			Final RCR = 0.529

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.15. Worker CS 15: Manual maintenance (cleaning and repair) of machinery (PROC 28)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.15.1. Conditions of use

	Method
Product (article) characteristics	

	Method
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.15.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 72. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01) RCR = 0.521	Final RCR = 0.521
Inhalation, local, long term	Silver nitrate	0.5 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.069 mg/kg bw/day (MEASE 1.02.01) RCR = 0.202	Final RCR = 0.202
Combined routes, systemic, long-term			Final RCR = 0.723

Remarks on exposure data from external estimation tools:

MEASE 1.02.01 for Silver nitrate:

Explanation:

As the MEASE 1.02.01 exposure estimation tool for workers does not provide exposure estimates for PROC 28, PROC 8a has been used instead as the input parameter assuming that there are similarities in the exposure.

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.16. Worker CS 16: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC 3)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.16.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Incidental	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.16.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 73. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01) RCR = 0.01	Final RCR = 0.01
Inhalation, local, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.017 mg/kg bw/day (MEASE 1.02.01) RCR = 0.05	Final RCR = 0.05
Combined routes, systemic, long-term			Final RCR = 0.061

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.17. Worker CS 17: Chemical production where opportunity for exposure arises (PROC 4)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.17.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must</i>	

	Method
<i>be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.17.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 74. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.052	Final RCR = 0.052
Inhalation, local, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.153

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.18. Worker CS 18: Mixing or blending in batch processes (PROC 5)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.18.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to</i>	

	Method
<i>the substance can be excluded.</i>	
<ul style="list-style-type: none"> Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i> 	
<ul style="list-style-type: none"> Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i> 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> Place of use: Indoor 	

5.18.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 75. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.052	Final RCR = 0.052
Inhalation, local, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.153

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.19. Worker CS 19: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC 8a)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.19.1. Conditions of use

	Method
Product (article) characteristics	
<ul style="list-style-type: none"> Percentage (w/w) of substance in mixture/article: <= 100 % 	MEASE 1.02.01
<ul style="list-style-type: none"> Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i> 	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration of activity: <= 8 h/day 	MEASE 1.02.01
Technical and organisational conditions and measures	
<ul style="list-style-type: none"> Occupational Health and Safety Management System: Advanced 	MEASE 1.02.01

	Method
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.19.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 76. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.052	Final RCR = 0.052
Inhalation, local, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.153

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.20. Worker CS 20: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC 8b)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.20.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.20.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 77. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01) RCR = 0.01	Final RCR = 0.01
Inhalation, local, long term	Silver nitrate	0.01 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.111

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.21. Worker CS 21: Production of metal powders (wet processes) (PROC 27b)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.21.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.21.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 78. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic,	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Final RCR = 0.104

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
long term		RCR = 0.104	
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.205

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

5.22. Worker CS 22: Manual maintenance (cleaning and repair) of machinery (PROC 28)

Assessment entity group used for the assessment of this contributing scenario: HH RA

5.22.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>Note that 'aqueous solution' was selected in MEASE to reflect the very low emission potential of the substance.</i>	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	

	Method
Other conditions affecting workers exposure	
• Place of use: Indoor	

5.22.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 79. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.052	Final RCR = 0.052
Inhalation, local, long term	Silver nitrate	0.05 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.101	Final RCR = 0.101
Combined routes, systemic, long-term			Final RCR = 0.153

Remarks on exposure data from external estimation tools:

MEASE 1.02.01 for Silver nitrate:

Explanation:

As the MEASE 1.02.01 exposure estimation tool for workers does not provide exposure estimates for PROC 28, PROC 8a has been used instead as the input parameter assuming that there are similarities in the exposure.

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

Exposure scenario 6: Use at industrial sites - Use of silver nitrate as non-reactive laboratory reagent

Product category used: PC 20: Products such as ph-regulators, flocculants, precipitants, neutralization agents; PC 21: Laboratory Chemicals; PC 25: Metal Working Fluids

Sector of use: SU 9: Manufacture of fine chemicals; SU 16: Manufacture of computer, electronic and optical products, electrical equipment; SU 20: Health services; SU 24: Scientific research and development

Environment contributing scenario(s):		
CS 1	Use of silver nitrate as non-reactive laboratory reagent	ERC 4
Worker contributing scenario(s):		
CS 2	Use as laboratory reagent	PROC 15

6.1. Env CS 1: Use of silver nitrate as non-reactive laboratory reagent (ERC 4)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

6.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Annual use amount at site: <= 1 tonnes/year
• Daily use amount at site: <= 0.05 tonnes/day
Technical and organisational conditions and measures
• The substance should not be released to water <i>Emissions to surface water or to the sewage system are not allowed in this scenario</i>
• The substance should not be released to air <i>Emissions to air are not allowed in this scenario</i>
Conditions and measures related to biological sewage treatment plant
• Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
<p>• Particular considerations on the waste treatment operations: No (low concentration) <i>Particular risks from waste treatment unlikely due low concentration of substance in waste stream. Waste disposal according to national/local legislation is Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the silver content of the waste is elevated enough, internal or external recovery/recycling might be considered.</i> <i>Appropriate waste codes: 06 05 02*, 08 01 11, 08 03 12*, 09 01 01*, 09 01 03*, 09 01 04*, 09 01 05*, 09 01 06*, 09 01 13*, 10 06 06*, 10 07 01, 10 07 02, 10 07 03, 10 07 04, 10 07 05, 11 01 09*, 15 01 10*, 15 02 02*, 16 01 18, 16 03 03*, 16 08 01, 16 11 04</i> <i>Suitable disposal: Hazardous waste produced during the manufacture and downstream use is sent to a recycler only marginal amounts are sent to a landfill or an incinerator. Waste containing silver is recycled for almost a 100%</i> <i>A detailed assessment has been performed on modelled and measured data and is reported in the Waste report (ARCHE, 2013)</i></p>
Other conditions affecting environmental exposure
• Receiving surface water flow rate: >= 1.8E4 m3/day
• Discharge rate of effluent: >= 2E3 m3/day

6.1.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 80. Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release factor	Release factor before on site RMM: 0% Release factor after on site RMM: 0% Local release rate: 0 kg/day Explanation: Liquid waste from laboratories is collected and treated separately and not poured down the drain.
Air	Ag dissolved	Estimated release factor	Release factor before on site RMM: 0% Release factor after on site RMM: 0% Local release rate: 0 kg/day Explanation: Small quantities are handled in solutions, due to the low vapour pressure of silver emissions to air are not considered relevant.
Non agricultural soil	Ag dissolved	Estimated release factor	Release factor after on site RMM: 0% Explanation: No direct release to soil.

6.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 81. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 6.06E-6 mg/L RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	Local PEC: 1.155 mg/kg dw RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	Local PEC: 1.91E-6 mg/L RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.364 mg/kg dw RCR = 8.31E-4	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 0 mg/L RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	Local PEC: 0.096 mg/kg dw RCR = 0.091	Final RCR = 0.091
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 8.53E-8 mg/m ³ RCR = 5.69E-7	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

6.2. Worker CS 2: Use as laboratory reagent (PROC 15)

Assessment entity group used for the assessment of this contributing scenario: HH RA

Covers laboratory use both as liquid and solid substance

6.2.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

6.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 82. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104

Exposure scenario 7: Use at industrial sites - Use of silver nitrate as reactive laboratory reagent

Product category used: PC 20: Products such as ph-regulators, flocculants, precipitants, neutralization agents; PC 21: Laboratory Chemicals

Sector of use: SU 9: Manufacture of fine chemicals; SU 20: Health services; SU 24: Scientific research and development

Environment contributing scenario(s):		
CS 1	Use of silver nitrate as reactive laboratory reagent	ERC 6a
CS 2	Use of silver nitrate as reactive laboratory reagent	ERC 6b
Worker contributing scenario(s):		
CS 3	Use as laboratory reagent	PROC 15

7.1. Env CS 1: Use of silver nitrate as reactive laboratory reagent (ERC 6a)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

7.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Annual use amount at site: <= 1 tonnes/year
• Daily use amount at site: <= 0.05 tonnes/day
Technical and organisational conditions and measures
• The substance should not be released to water <i>Emissions to surface water or to the sewage system are not allowed in this scenario</i>
• The substance should not be released to air <i>Emissions to air are not allowed in this scenario</i>
Conditions and measures related to biological sewage treatment plant
• Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
<p>• Particular considerations on the waste treatment operations: No (low concentration) <i>Particular risks from waste treatment unlikely due low concentration of substance in waste stream. Waste disposal according to national/local legislation is Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the silver content of the waste is elevated enough, internal or external recovery/recycling might be considered.</i></p> <p><i>Appropriate waste codes: 06 05 02*, 08 01 11, 08 03 12*, 09 01 01*, 09 01 03*, 09 01 04*, 09 01 05*, 09 01 06*, 09 01 13*, 10 06 06*, 10 07 01, 10 07 02, 10 07 03, 10 07 04, 10 07 05, 11 01 09*, 15 01 10*, 15 02 02*, 16 01 18, 16 03 03*, 16 08 01, 16 11 04</i></p> <p><i>Suitable disposal: Hazardous waste produced during the manufacture and downstream use is sent to a recycler only marginal amounts are sent to a landfill or an incinerator. Waste containing silver is recycled for almost a 100%</i></p> <p><i>A detailed assessment has been performed on modelled and measured data and is reported in the Waste report (ARCHE, 2013)</i></p>
Other conditions affecting environmental exposure
• Receiving surface water flow rate: >= 1.8E4 m3/day
• Discharge rate of effluent: >= 2E3 m3/day

7.1.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 83. Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release factor	Release factor before on site RMM: 0% Release factor after on site RMM: 0% Local release rate: 0 kg/day Explanation: Liquid waste from laboratories is collected and treated separately and not poured down the drain.
Air	Ag dissolved	Estimated release factor	Release factor before on site RMM: 0% Release factor after on site RMM: 0% Local release rate: 0 kg/day Explanation: Small quantities are handled in solutions, due to the low vapour pressure of silver emissions to air are not considered relevant.
Non agricultural soil	Ag dissolved	Estimated release factor	Release factor after on site RMM: 0% Explanation: No direct release to soil.

7.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 84. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 6.06E-6 mg/L RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	Local PEC: 1.155 mg/kg dw RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	Local PEC: 1.91E-6 mg/L RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.364 mg/kg dw RCR = 8.31E-4	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 0 mg/L RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	Local PEC: 0.096 mg/kg dw RCR = 0.091	Final RCR = 0.091
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 8.53E-8 mg/m ³ RCR = 5.69E-7	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

7.2. Env CS 2: Use of silver nitrate as reactive laboratory reagent (ERC 6b)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

7.2.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Annual use amount at site: <= 1 tonnes/year
• Daily use amount at site: <= 0.05 tonnes/day
Technical and organisational conditions and measures
• The substance should not be released to water <i>Emissions to surface water or to the sewage system are not allowed in this scenario</i>
• The substance should not be released to air <i>Emissions to air are not allowed in this scenario</i>
Conditions and measures related to biological sewage treatment plant
• Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: No (low concentration) <i>Particular risks from waste treatment unlikely due low concentration of substance in waste stream. Waste disposal according to national/local legislation is Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the silver content of the waste is elevated enough, internal or external recovery/recycling might be considered.</i> <i>Appropriate waste codes: 06 05 02*, 08 01 11, 08 03 12*, 09 01 01*, 09 01 03*, 09 01 04*, 09 01 05*, 09 01 06*, 09 01 13*, 10 06 06*, 10 07 01, 10 07 02, 10 07 03, 10 07 04, 10 07 05, 11 01 09*, 15 01 10*, 15 02 02*, 16 01 18, 16 03 03*, 16 08 01, 16 11 04</i> <i>Suitable disposal: Hazardous waste produced during the manufacture and downstream use is sent to a recycler only marginal amounts are sent to a landfill or an incinerator. Waste containing silver is recycled for almost a 100%</i> <i>A detailed assessment has been performed on modelled and measured data and is reported in the Waste report (ARCHE, 2013)</i>
Other conditions affecting environmental exposure
• Receiving surface water flow rate: >= 1.8E4 m3/day
• Discharge rate of effluent: >= 2E3 m3/day

7.2.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 85. Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release	Release factor before on site RMM: 0%

Release	Assessment entity	Release estimation method	Explanations
		factor	Release factor after on site RMM: 0% Local release rate: 0 kg/day Explanation: Liquid waste from laboratories is collected and treated separately and not poured down the drain.
Air	Ag dissolved	Estimated release factor	Release factor before on site RMM: 0% Release factor after on site RMM: 0% Local release rate: 0 kg/day Explanation: Small quantities are handled in solutions, due to the low vapour pressure of silver emissions to air are not considered relevant.
Non agricultural soil	Ag dissolved	Estimated release factor	Release factor after on site RMM: 0% Explanation: No direct release to soil.

7.2.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 86. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 6.06E-6 mg/L RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	Local PEC: 1.155 mg/kg dw RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	Local PEC: 1.91E-6 mg/L RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.364 mg/kg dw RCR = 8.31E-4	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 0 mg/L RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	Local PEC: 0.096 mg/kg dw RCR = 0.091	Final RCR = 0.091
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 8.53E-8 mg/m ³ RCR = 5.69E-7	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

7.3. Worker CS 3: Use as laboratory reagent (PROC 15)

Assessment entity group used for the assessment of this contributing scenario: HH RA
Covers laboratory use both as liquid and solid substance

7.3.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

7.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 87. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Dermal, systemic, long term	Silver nitrate	0.017 mg/kg bw/day (MEASE 1.02.01) RCR = 0.05	Final RCR = 0.05
Combined routes, systemic, long-term			Final RCR = 0.154

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

Exposure scenario 8: Widespread use by professional workers - Use of silver nitrate as non-reactive laboratory reagent

Product category used: PC 20: Products such as ph-regulators, flocculants, precipitants, neutralization agents;
PC 21: Laboratory Chemicals

Sector of use: SU 20: Health services; SU 24: Scientific research and development

Environment contributing scenario(s):		
CS 1	Use of silver nitrate as non-reactive laboratory reagent	ERC 8a
Worker contributing scenario(s):		
CS 2	Use as laboratory reagent	PROC 15

8.1. Env CS 1: Use of silver nitrate as non-reactive laboratory reagent (ERC 8a)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

8.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Daily local widespread use amount: $\leq 5.5E-6$ tonnes/day
Conditions and measures related to biological sewage treatment plant
• Biological STP: Standard [Effectiveness Water: 80.1%]
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations

8.1.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 88. Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	ERC	Release factor before on site RMM: 100% Release factor after on site RMM: 100% Local release rate: $5.5E-3$ kg/day
Air	Ag dissolved	ERC	Release factor before on site RMM: 100% Release factor after on site RMM: 100%
Non agricultural soil	Ag dissolved	ERC	Release factor after on site RMM: 0%

8.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 89. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: $2.02E-5$ mg/L RCR = 0.44	Final RCR = 0.44
Sediment	Ag dissolved	Local PEC: 3.858 mg/kg dw	Final RCR < 0.01

Protection target	Assessment entity	Exposure concentration	Risk quantification
(freshwater)		RCR = 8.8E-3	
Marine water	Ag dissolved	Local PEC: 3.33E-6 mg/L RCR = 3.87E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.634 mg/kg dw RCR = 1.45E-3	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	Local PEC: 5.47E-4 mg/L RCR = 0.022	Final RCR = 0.022
Agricultural soil	Ag dissolved	Local PEC: 0.189 mg/kg dw RCR = 0.18	Final RCR = 0.18
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 8.53E-8 mg/m ³ RCR = 5.69E-7	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

8.2. Worker CS 2: Use as laboratory reagent (PROC 15)

Assessment entity group used for the assessment of this contributing scenario: HH RA

Covers laboratory use both as liquid and solid substance

8.2.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Basic	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation	

	Method
<i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
<ul style="list-style-type: none"> Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i> 	
<ul style="list-style-type: none"> Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i> 	
Other conditions affecting workers exposure	
<ul style="list-style-type: none"> Place of use: Indoor 	

8.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 90. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m ³ (MEASE 1.02.01)	Qualitative risk
Dermal, systemic, long term	Silver nitrate	0.017 mg/kg bw/day (MEASE 1.02.01) RCR = 0.05	Final RCR = 0.05
Combined routes, systemic, long-term			Final RCR = 0.154

Risk characterisation

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

Exposure scenario 10: Service life (consumers) - Service life of articles coated with metallic silver

Environment contributing scenario(s):			SPERC
CS 1	Service life of articles coated with metallic silver	ERC 11a	Eurometaux SPERC 11A.3.v1
Consumer contributing scenario(s):			SCED
CS 2	Electrical/electronics articles coated with metallic silver	AC 2	
CS 3	Glass articles coated with metallic silver	AC 4	
CS 4	Metal articles coated with metallic silver	AC 7	

Exposure scenario(s) of the uses leading to the inclusion of the substance into the article(s):

ES3: Use at industrial sites - Use of silver nitrate in coating

ES4: Use at industrial sites - Use of silver nitrate in the production of catalysts

Further description of the use:

After metal surface treatment the treated articles are not expected to contain silver nitrate since the substance is transformed to silver metal during deposition on the article.

Explanation on the approach taken for the ES:

The treated articles contain silver in metallic form with > 99.9% purity, as a result the articles don't contain residual silver nitrate in concentrations above those triggering classification.

Silver metal (EC 231-131-3) is registered in the > 1000 T/y tonnage band. Massive silver has no classification and silver powder is classified for environment. As a worst case approach the PNECs for silver powder have been used. Both massive silver and silver powder don't have DNELs. No hazards have been identified.

10.1. Env CS 1: Service life of articles coated with metallic silver (ERC 11a)

Assessment entity group used for the assessment of this contributing scenario: ENV RA

This service life step is not relevant for silver nitrate anymore since the substance transformed to silver metal.

10.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Daily local widespread use amount: <= 1.1E-4 tonnes/day
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: Dedicated recollection infrastructure required
Other conditions affecting environmental exposure
• Place of use: Indoor
• Water contact during use: No
• Biological STP: Standard [Effectiveness Water: 80.1%]

10.1.2. Releases

The releases have been estimated on the basis of SPERC Eurometaux SPERC 11A.3.v1: Service life of metallic articles with no emission

Modification date: 09/09/2021

Description of activities/processes covered by the SPERC

Service life of metallic articles with no emission

Service life covers foreseen use of articles by consumers.

The service life covers only uses with no water-contact (either by using the article away from water or if the metal in the article is encapsulated or coated to avoid water-contact) and uses with no emissions from the article. Processes such as sanding, polishing, machining etc. are not covered.

Product/substance domain:

Scope of the SPERC

Substance groups or function:

Included in the metal definition (Eurometaux SPERCs): alkali metals, alkaline earth metals, transition metals, post-transition metals, metalloids Excluded from the metal definition: non-metals, halogens, noble gases and metallo-organic compounds.

Type of products: Products are metallic articles where the metal is either encapsulated / there is a mechanical barrier (to avoid direct contact with water) or there is no intended contact with water because incompatible with water (because this would lead to disfunctioning of the article): electronic and electric devices such as screens, monitors, IT and telecommunication equipment (e.g. mobile phone), large household appliances, small household appliances, photovoltaic cells, vehicles, etc..

Excluded type of products: brake pads, tyres, monitoring instruments.

Explanation for the release factor to water:

Metal in either encapsulated / there is a mechanical barrier (to avoid direct contact with water) or there is no intended contact with water because incompatible with water (because this would lead to disfunctioning of the article) AND there is no abrasion of the article

Explanation for the release factor to air:

Metals and metal compounds do not volatilise. Due to the massive physical state in service life, there is no dust formation that can become air-borne.

Explanation for the release factor to soil:

ERC default: not applicable

Sub-SPERC Eurometaux SPERC 11A.3.v2 is used for Ag dissolved:

The local releases to the environment are reported in the following table.

Table 94. Local releases to the environment

Release	Assessment entity	Release factor	Local release rate
Water	Ag dissolved	0%	0 kg/day
Air	Ag dissolved	0%	- kg/day
Non agricultural soil	Ag dissolved	0%	- kg/day

Releases to waste

Release factor to external waste: 54 %

Recycling rates for WEEE in the EU was in 2016 46% (range between 30% and 96%) (Eurostat). Potential fraction for solid waste is then 54%.

10.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 95. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 6.06E-6 mg/L RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	Local PEC: 1.155 mg/kg dw RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	Local PEC: 1.91E-6 mg/L RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.364 mg/kg dw RCR = 8.31E-4	Final RCR < 0.01

Protection target	Assessment entity	Exposure concentration	Risk quantification
Sewage Treatment Plant	Ag dissolved	Local PEC: 0 mg/L RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	Local PEC: 0.096 mg/kg dw RCR = 0.091	Final RCR = 0.091
Man via environment - Inhalation (systemic effects)	Ag dissolved	Concentration in air: 8.53E-8 mg/m ³ RCR = 5.69E-7	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	Exposure via food consumption: 3.84 µg/kg bw/day RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

Remarks on measured exposure:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

10.2. Cons CS 2: Electrical/electronics articles coated with metallic silver (AC 2)

This service life step is not relevant for silver nitrate anymore since the substance transformed to silver metal. Silver metal (EC 231-131-3) is registered in the > 1000 T/y tonnage band. Massive silver has no classification and silver powder is only classified for environment. Both massive silver and silver powder don't have DNELs. No hazards have been identified.

10.3. Cons CS 3: Glass articles coated with metallic silver (AC 4)

This service life step is not relevant for silver nitrate anymore since the substance transformed to silver metal. Silver metal (EC 231-131-3) is registered in the > 1000 T/y tonnage band. Massive silver has no classification and silver powder is only classified for environment. Both massive silver and silver powder don't have DNELs. No hazards have been identified.

10.4. Cons CS 4: Metal articles coated with metallic silver (AC 7)

This service life step is not relevant for silver nitrate anymore since the substance transformed to silver metal. Silver metal (EC 231-131-3) is registered in the > 1000 T/y tonnage band. Massive silver has no classification and silver powder is only classified for environment. Both massive silver and silver powder don't have DNELs. No hazards have been identified.