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**SECTION1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING***1.1. Product identifier*

Substance name: (Di)antimony trioxide ('ATO')  
 Chemical formula: Sb<sub>2</sub>O<sub>3</sub>  
 Trade name: Twinkling Star  
 INDEX number: 051-005-00-X  
 CAS number: 1309-64-4  
 EINECS number: 215-175-0  
 REACH Registration number: 01-2119475613-35-0014

*1.2. Relevant identified uses of the substance or mixture and uses advised against**1.2.1. Relevant identified uses*

Scenario Number	Exposure scenario title as presented in Annex I
1	Use of (di)antimony trioxide in PET (films/fibres, resin) production
2	Industrial use of (di)antimony trioxide in the plastics and rubber industry
3	Industrial use of (di)antimony trioxide in the manufacture of flame retarded textiles
4	Industrial use of (di)antimony trioxide in the production of glass, enamels, functional ceramics and semi-conductors
5	Industrial use of (di)antimony trioxide in the production of pigments, paints, coatings, ceramics, brake pads and production and formulation of fine chemicals
6	Industrial use of (di)antimony trioxide in wood adhesives
7	Professional uses of (di)antimony trioxide preparations
8	Professional uses of (di)antimony trioxide contained in articles

The major use of (di)antimony trioxide (ATO) is as a flame retardant. However, it does not have flame retarding properties itself; instead, it is a synergist for halogenated flame retardants in plastics, paints, adhesives, sealants, rubber, and textile back-coatings. Other uses of ATO include: polymerization catalyst in PET resin manufacture, clarifying aid in certain glasses, and in pigments (see Annex I for more details).

*1.2.2. Uses advised against:*

There are no uses advised against.

*1.3. Details of the supplier of the safety data sheet*

Hsikwangshan Twinkling Star Co., Ltd.

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E-mail: lugq@minmetals.com

*1.4. Emergency telephone number*

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+1 714 5827563-7019(USA)

**SECTION2: HAZARDS IDENTIFICATION***2.1 Classification of the substance or mixture**2.1.1 Classification according to Regulation (EC) No. 1272/2008 (CLP)*

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Carcinogen Category 2; H351: Suspected of causing cancer by inhalation

**2.1.2 Classification according to Directive 67/548/EEC**

Harmful; Xn; Carcinogen Category 3; R40: Limited evidence of a carcinogenic effect

**2.2 Label elements****2.2.1 Labeling according to Regulation (EC) No 1272/2008 [CLP]**Signal word: WarningHazard pictogram:

GHS08: health hazard

Hazard statement:

H351: Suspected of causing cancer by inhalation

Precautionary statements:

P202: Do not handle until all safety precautions have been read and understood.

P280: Wear protective gloves/protective clothing/eye protection.

P308+P313: IF exposed or concerned: Get medical advice/attention.

P405: Store locked up

For more information on human health and environmental effects see sections 9 to 12 of this eSDS.

**2.3 Other hazards**

The substance does not meet the criteria for a PBT or vPvB substance.

No environmental or physico-chemical hazards identified according to Regulation (EC) 1907/2006.

**SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substance**

Ingredient name	Identifiers	% (w/w)	Classification	
			Directive 67/548/EEC	Regulation (EC) No. 1272/2008
<b>Main constituent</b>				
(di)antimony trioxide	REACH# 01-2119475613-35-0016 EC: 215-175-0 CAS: 1309-64-4 Index: 051-005-00-X	>98 - <100%	Xn; Carc. Cat. 3; R40	Carc.2; H351
<b>Impurity</b>				

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lead monoxide	EC: 215-267-0 CAS: 1317-36-8 Index: 082-001-00-6	<0.1%	Repr. Cat. 1; R61 Repr. Cat. 3; R62 (C ≥ 2.5%) Xn; R20/22 (C ≥ 1%) R33 (C ≥ 0.5%) N; R50/53	Acute Tox. 4; H302 Acute Tox. 4; H332 Repr.1A; H360Df STOT RE1; H372 (C ≥ 0.5%) Repr2; H361f (C ≥ 2.5%) Aquatic Acute 1; H400 (M-factor acute: 10) Aquatic Chronic 1; H410
(di)arsenic trioxide	CAS nr: 1327-53-3 EC nr: 215-481-4 Index: 033-003-00-0	<0.1%	<i>present at a level below that to be taken into account for classification</i>	
<b>Stabilizing additive</b>				
-				

The supplier has currently no knowledge on additional ingredients that are classified and that contribute to the classification of the substance.

See certificate of analysis for more information on impurity levels.

See Section 16 for the full text of the R- and H-phrases cited above.

## SECTION 4: FIRST AID MEASURES

### 4.1 Description of first aid measures

#### **General advice**

IF exposed or concerned: Get medical advice/attention.

Take off all contaminated clothing.

First-aiders should wear suitable personal protective equipment (see section 8) in case of insufficient ventilation or possible skin or eye contact.

#### **Following inhalation**

Move affected person to fresh air.

Seek medical attention.

#### **Following skin contact**

If normal occupational hygiene measures are maintained, there is no such foreseeable health hazard from ATO. Wash with water and remove clothes if necessary.

#### **Following eye contact**

If normal occupational hygiene measures are maintained, there is no such foreseeable health hazard from ATO. Flush eyes thoroughly with water, also under eyelids.

#### **After ingestion**

If normal occupational hygiene measures are maintained, there is no such foreseeable health hazard from ATO. Rinse mouth with water.

### 4.2 Most important symptoms and effects, both acute and delayed

Acute or delayed effects are not anticipated for ATO.

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#### *4.3 Indication of any immediate medical attention and special treatment needed*

Not appropriate (see 4.2).

### **SECTION 5: FIREFIGHTING MEASURES**

#### *5.1 Extinguishing media*

##### *5.1.1 Suitable extinguishing media*

Use firefighting measures that suit the environment.

The product is not combustible and does not support the combustion.

##### *5.1.2 Unsuitable extinguishing media*

None.

#### *5.2 Special hazards arising from the substance or mixture*

(Di)antimony trioxide dust.

#### *5.3 Advice for firefighters*

Wear a self-contained breathing apparatus and a fully protective suit and gloves. Dispose of fire debris and contaminated firefighting media in accordance with official regulations.

### **SECTION 6: ACCIDENTAL RELEASE MEASURES**

#### *6.1 Personal precautions, protective equipment and emergency procedures*

##### *6.1.1 For non-emergency personnel:*

Avoid formation of dust.

Ensure adequate ventilation.

Keep unprotected persons away.

Although the substance has no acute toxicity, it is advised to avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see section 8).

Avoid inhalation of dust – wear suitable protective equipment (see section 8).

##### *6.1.2 For emergency responders:*

Avoid formation of dust.

Ensure adequate ventilation.

Keep unprotected persons away.

Although the substance has no acute toxicity, it is advised to avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see section 8).

Avoid inhalation of dust – wear suitable protective equipment (see section 8).

#### *6.2 Environmental precautions*

Although the substance is not classified as dangerous to the environment, it is advised that in the event of an accidental release the product should be prevented from reaching the sewage system or any water course and penetrating the soil.

Dispose of spilled material in accordance with the relevant regulations.

See section 13 for disposal considerations.

#### *6.3 Methods and material for containment and cleaning up*

In any case avoid dust formation.

Sweep all spilled material or use an appropriate industrial vacuum cleaner.

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Collect spilled material in suitable containers or closed plastic bags for recovery or disposal.  
In case of disposal dispose spilled material or contaminated material as waste as described in section 13.

#### *6.4 Reference to other sections*

For more information on exposure controls/personal protection or disposal considerations, check section 8 and 13 of this safety data sheet.

### **SECTION 7: HANDLING AND STORAGE**

#### *7.1 Precautions for safe handling*

##### *7.1.1 Protective measures*

Do not handle until all safety precautions have been read and understood.

As a precautionary measure, the wearing of chemical resistant gloves, long sleeved overalls and closed footwear, designed to minimize skin contact is suggested for all (di)antimony trioxide powder handling workplaces. Use personal protective equipment as required.

Provide showers, eye-baths and self-contained breathing apparatus nearby.

For more information, see the relevant Exposure Scenario, Annex I and check section 2.1: Control of workers' exposure.

##### *7.1.2 Advice on general occupational hygiene*

Avoid inhalation or ingestion.

General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating, drinking and smoking at the workplace and wearing standard working clothes and shoes unless otherwise stated.

Wash hands after use.

Remove contaminated clothing and protective equipment before entering eating areas.

Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air.

##### *7.2 Conditions for safe storage, including any incompatibilities*

Store in well ventilated dry area.

Do not store in open inadequate mislabeled packaging.

For more information, see the relevant Exposure Scenario, Annex I and check section 2.1: Control of workers' exposure.

##### *7.3 Specific end use(s)*

Check the identified uses in section 1.2 of this safety data sheet.

For more information, see the relevant Exposure Scenario, Annex I and check section 2.1: Control of workers' exposure.

### **SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION**

An overview of the assigned protection factors (APFs) of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE ([www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)).

Any dust-tight material (e.g. rubber-dipped cotton/rubber/nitrile/leather) suitable for the type of work (e.g. considering mechanical stress) could be used as material for gloves protecting against ATO exposure (non-corrosive inorganic substance). Breakthrough times are not relevant because corrosion and diffusion are excluded by the nature of the substance. Change gloves when damaged or according to manufacturer's instructions.

#### *8.1 Control parameters*

##### *8.1.1 National limit values*

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The following national limit values for Antimony and Antimony compounds apply:

Country	Occupational exposure limit (expressed as Sb)	Maximum exposure time	Document number– Date	Title	Link to the legislation
UK	0.5 mg/m <sup>3</sup> (as Sb)	8h TWA	Second edition - 2011	Antimony and compounds	Health and Safety Executive- <a href="http://www.hse.gov.uk/pubns/priced/eh40.pdf">http://www.hse.gov.uk/pubns/priced/eh40.pdf</a>
German MAK- Commission	Not established		2009	Antimony and its inorganic compounds (inhalable fraction)	Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area <a href="http://www.dfg.de/en/dfg_profile/statutory_bodies/senate/health_hazards/index.html">http://www.dfg.de/en/dfg_profile/statutory_bodies/senate/health_hazards/index.html</a>
Finland	0.5 mg/m <sup>3</sup>	8h TWA	2009	Antimony and its compounds	The Ministry of Social Affairs and Health- <a href="http://pre20090115.stm.fi/hm1113394626349/passthru.pdf">http://pre20090115.stm.fi/hm1113394626349/passthru.pdf</a>
Belgium	0.5 mg/m <sup>3</sup> (as Sb)	8h TWA	2010	Antimony and its compounds	Service public fédéral Emploi, Travail et Concertation sociale- <a href="http://www.emploi.belgique.be/WorkArea/showcontent.aspx?id=23914">http://www.emploi.belgique.be/WorkArea/showcontent.aspx?id=23914</a>
France	0.5 mg/m <sup>3</sup> (as Sb)	8h TWA	2012	Antimony and its compounds	Institut National de Recherche et de Sécurité - <a href="http://www.inrs.fr/accueil/produits/mediatheque/doc/publications.html?refINRS=ED%20984">http://www.inrs.fr/accueil/produits/mediatheque/doc/publications.html?refINRS=ED%20984</a>
Spain	0.5 mg/m <sup>3</sup> (as Sb)	8h TWA	2010	Antimony and antimony compounds	<a href="http://www.insht.es/InshtWeb/Contenidos/Documentacion/TextosOnline/Valores_Limite/Limites2010/LEP%202010%20ActualizadoMayo(1).pdf">http://www.insht.es/InshtWeb/Contenidos/Documentacion/TextosOnline/Valores_Limite/Limites2010/LEP%202010%20ActualizadoMayo(1).pdf</a>
Austria	0.1 or 0.3 mg/m <sup>3</sup> (as Sb) depending on activity (cfr website)	8h TWA	2011	Antimony trioxide	<a href="http://www.arbeitsinspektion.gv.at/NR/rdonlyes/F173280B-D4FB-44D2-8269-8DB2CB1D2078/0/GKV2011.pdf">http://www.arbeitsinspektion.gv.at/NR/rdonlyes/F173280B-D4FB-44D2-8269-8DB2CB1D2078/0/GKV2011.pdf</a>

Further member states are not listed since they predominantly have adopted the same value in their respective national legislation, and existing evaluation reports can be provided upon request.

More information on currently recommended monitoring or observation methods for metals is provided in the HERAG Fact Sheets, available at <http://www.ebrc.de/industrial-chemicals-reach/projects-and-references/herag.php>.

### 8.1.2 PNECs and DNELs

Descriptor	Route of exposure/ Environmental protection target	DNEL / PNEC
DNEL (Derived No Effect Level)		

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	Dermal - Long-term/systemic effects	281 mg/kg bw/day
	Inhalation - Long-term/local effects	0.5 mg/m <sup>3</sup>
<b>PNEC (Predicted No Effect Concentration)</b>		
	Freshwater	0.113 mg Sb/L
	Marine water	0.0113 mg Sb/L
	Sediment freshwater	7.8 mg Sb/kg ww
	Sediment marine	1.56 mg Sb/kg ww
	Soil	37 mg Sb/kg dw (32.6 mg Sb/kg ww)
	STP (Sewage Treatment Plant)	2.55 mg Sb/L

### 8.2 Exposure controls

See section 2.1 of the individual exposure scenarios in Annex I for a detailed description of the required exposure controls measures. Any control measures and associated efficiency values are generally based on the MEASE tool for occupational exposure assessment ([www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)). This also applies to scenarios for which measured data were used for the exposure assessment but for which exact efficiency values of the implemented exposure control measures were not available.

The environmental assessment uses EUSES ([http://ihcp.jrc.ec.europa.eu/our\\_activities/health-env/risk\\_assessment\\_of\\_Biocides/euses](http://ihcp.jrc.ec.europa.eu/our_activities/health-env/risk_assessment_of_Biocides/euses)).

#### 8.2.1 Appropriate engineering controls

Prevent formation of dust where possible. Ensure appropriate ventilation/exhaustion at machinery and places where dust can be generated. Any deposit of dust which cannot be avoided must be regularly removed using preferably appropriate industrial vacuum cleaners or central vacuum systems.

Waste air is to be released into the atmosphere only when it has passed through suitable dust separators.

Waste water generated during the production process or cleaning operations should be collected and should preferably be treated in an on-site waste water treatment plant which ensures efficient removal of antimony.

#### 8.2.2 Individual protection measures, such as personal protective equipment

##### 8.2.2.1 Eye/face protection:

Although the substance has no acute toxicity, it is advised to wear suitable safety glasses. NBN EN 166:2002 is recommended.

##### 8.2.2.2 Skin protection:

Hand and body protection:

ATO is not classified as hazardous to skin (see section 11 for more details). However, industry is committed to adequately control the risks of any adverse effects to workers who are exposed in hot, sweaty conditions to fumes or dust containing ATO by following the occupational hygiene practices as described in the relevant exposure scenarios. As a precautionary measure, the wearing of chemical resistant gloves, long sleeved overalls and closed footwear, designed to minimize skin contact is suggested for all (di)antimony trioxide powder handling workplaces because of possible skin rashes when sweat ducts are blocked – see RAC discussion (ECHA/PR/09/09, 2009).

##### 8.2.2.3 Respiratory protection

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Use local ventilation to keep levels below established threshold values. A suitable particle filter mask is recommended.

#### 8.2.2.4 Thermal hazards

Not applicable. ATO does not have any self-heating or auto-flammable properties.

#### 8.2.3 Environmental exposure controls

Although the substance is not classified as dangerous to the environment, it is advised to avoid release to the environment.

### SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1. Information on basic physical and chemical properties

<b>(a) Appearance</b>	Crystalline white powder with particle size of 0.2 µm to 44 µm depending on the type of ATO
<b>(b) Odour</b>	Odourless.
<b>(c) Odour threshold</b>	Not applicable as odourless.
<b>(d) pH</b>	Not applicable to powders.
<b>(e) Melting point/ freezing point</b>	656 °C at 1013 hPa
<b>(f) Initial boiling point and boiling range</b>	1425 °C at 1013 hPa
<b>(g) Flash point</b>	Not applicable as only relevant for liquids or low melting point solids.
<b>(h) Evaporation rate</b>	Not applicable to powders.
<b>(i) Flammability (solid, gas)</b>	Non-flammable. This substance does not contain any chemical groups that might lead to spontaneous ignition a short time after coming in contact with air at room temperature (circa 20 °C). Furthermore, long-term industrial experience in handling shows that the substance does not ignite in contact with air (in accordance with section 1 of REACH Annex XI).
<b>(j) Upper/lower flammability or explosive limits</b>	Non-explosive. (Di)antimony trioxide exhibits no chemical groups indicating explosive properties (e.g. peroxide).
<b>(k) Vapour pressure</b>	~133 Pa at 574 °C
<b>(l) Vapour density</b>	Not applicable to powders.
<b>(m) Relative density</b>	5.897 at 20 °C
<b>(n) Solubility(ies)</b>	2.76 mg/l (T° 22.2°C - ISO 6341 medium - loading 100 mg Sb <sub>2</sub> O <sub>3</sub> /l - pH 8)
<b>(o) Partition coefficient n-octanol/water</b>	Not applicable to inorganic substances.
<b>(p) Auto-ignition temperature</b>	Not relevant since this would require heat to be developed either by reaction of this substance with oxygen or by exothermic decomposition and which is not lost rapidly enough to the surroundings.



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**(q) Decomposition temperature** Does not decompose if used as intended.

**(r) Viscosity** Not applicable to powders.

**(s) Explosive properties** Non-explosive.

**(t) Oxidising properties** Non-oxidising substance.

### 9.2 Other information

Not applicable.

## SECTION 10: STABILITY AND REACTIVITY

### 10.1 Reactivity

Not applicable. See section 9.

### 10.2 Chemical stability

Under normal conditions of use and storage, the product is stable.

### 10.3 Possibility of hazardous reactions

Reaction with H<sup>-</sup>-equivalents releases antimony hydride (stibine, SbH<sub>3</sub>).

Hazardous polymerization will not occur.

### 10.4 Conditions to avoid

Avoid dust formation. See section 7.2 Conditions for safe storage, including any incompatibilities.

### 10.5 Incompatible materials

Reaction with H<sup>-</sup>-equivalents releases antimony hydride (stibine, SbH<sub>3</sub>). Strong acids/bases. Reducing agents. See section 7.1 Precautions for safe handling.

### 10.6 Hazardous decomposition products

Does not decompose if used as intended.

## SECTION 11: TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

Toxicity endpoints	Description of effects
<b>Absorption</b>	Oral = 0.05-0.3% Dermal = 0.01-0.1% (negligible) Inhalation = <<1 % Bioaccumulation potential: no bioaccumulation potential
<b>Acute toxicity</b>	Based on available data, the classification criteria for acute toxicity are not met. <u>Oral</u> : LD <sub>50</sub> rat > 20,000 mg/kg bw (Fleming, 1938; Gross et al, 1955; Weil et al, 1978) <u>Dermal</u> : LD <sub>50</sub> rabbit > 8,300 mg/kg bw (Gross et al, 1955)

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		<u>Inhalation</u> : LC <sub>50</sub> rat > 5,200 mg/m <sup>3</sup> (Leuschner, 2006)
<b>Skin corrosion/irritation</b>		Based on available data, the classification criteria as skin irritant are not met. However, under conditions of substantial heat and sweating, high levels of dermal dust exposure may cause mechanical/physical blocking of sweat glands in the absence of any intrinsic substantial primary skin irritating potential of the substance and also in consideration of the poor solubility of ATO. The Committee for Risk Assessment (RAC) decided in July 2009 that a harmonised skin irritation classification was not supported (ECHA/PR/09/09, 2009). ATO is not a corrosive agent.
<b>Serious eye damage/irritation</b>	<b>eye</b>	Based on available data, the classification criteria for eye irritation are not met (Leuschner, 2005).
<b>Respiratory or skin sensitisation</b>	<b>skin</b>	Based on available data, the classification criteria for skin sensitisation (Chevalier, 2005; Moore, G.E, 1994) and for irritation to the respiratory system (Leuschner, 2006) are not met.
<b>Germ cell mutagenicity</b>	<b>cell</b>	ATO does not cause systemic mutagenicity <i>in vivo</i> after oral administration. Negative <i>in vivo</i> results on chromosome aberrations and micronuclei were obtained in two different species via oral application – mouse (Elliot et al., 1998) and rat (Whitwell, 2006), (Kirkland et al., 2007). An <i>in vivo</i> UDS assay in rats was also negative (Elliot et al., 1998). Based on available data, the classification criteria according to regulation (EC) 1272/2008 as germ cell mutagen are not met.
<b>Carcinogenicity</b>		(Di)antimony trioxide is classified as inhalation carcinogen category 2 (according to Regulation (EC) 1272/2008). Three chronic inhalation studies in rats are available for the carcinogenicity assessment of (di)antimony trioxide (Watt, 1983; Groth et al., 1986a, Newton et al., 1994). The exposure duration in all three animal studies is 12 months and thus all studies deviates from the OECD guideline on chronic toxicity/carcinogenicity, which prescribes an exposure period of 24 months for rats. The study by Newton et al., (1994) showed no (di)antimony trioxide-related lung tumours, neither in males nor females, at any dose level up to 4.5 mg/m <sup>3</sup> . The study shows that (di)antimony trioxide reduced the pulmonary clearance rate in a dose dependent manner. However, it is well known that reduced lung clearance rate at chronic exposure of rats to poorly soluble particles (PSPs) can result in pulmonary overload, subsequently followed by an inflammatory response, epithelial cell hypertrophy and/or hyperplasia and squamous metaplasia. The persistence of these tissue responses over chronic time periods can lead to secondary development of lung tumours (Hext, 1994). Due to the deviations from the OECD guidelines and the critical shortcoming in all three studies, US NTP ( <a href="#">National Toxicology Program</a> ) has embarked on a testing programme leading to a new, full 2-year bioassay; finalised end 2010 and reporting expected in 2014-2015. The overall expert judgement by TC NES was that the most likely mechanism for carcinogenicity appears to be impaired lung clearance and particle overload followed by an inflammatory response, fibrosis and tumours. Consequently, (di)antimony trioxide can be regarded as a threshold carcinogen and as a starting point for a quantitative risk characterisation the NOAEC of 0.51 mg/m <sup>3</sup> derived for local repeated dose toxicity is also used for carcinogenicity. However, in this context, it is questionable whether effects caused by pulmonary overload in the rat are also relevant for humans.  NOAEC: 0.51 mg/m <sup>3</sup> / Target organ: respiratory: lung
<b>Reproductive toxicity</b>		Based on the available long-term toxicity studies in rodents (Omura et al, 2002) and the relevant information on the toxicokinetic behaviour in rats, it is concluded that the classification criteria for reproductive toxicity are not met because of the lack of absorption and

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	<p>systemic distribution, and a correspondingly negligible exposure of reproductive organs in male and female mammalian species to ATO.</p> <p>The reference Schroeder R.E. (2003) was identified as key study for developmental toxicity and will be used for classification and labelling. This study suggests that the NOAEC for developmental toxicity is &gt;6.3 mg ATO/m<sup>3</sup>. Thus, based on available data, the classification criteria as developmental toxicant according to regulation (EC) 1272/2008 are not met.</p>
<b>STOT-single exposure</b>	Based on available data, the classification criteria as STOT-single exposure, oral and inhalation are not met since no reversible or irreversible adverse health effects were observed immediately or delayed after exposure.
<b>STOT-repeated exposure</b>	<p>NOAEC<sub>inhalation</sub> = 0.51 mg/m<sup>3</sup> (Newton et al, 1994) NOAEL<sub>oral</sub> = 1686 mg/kg/d (Hext et al, 1999)</p> <p>The NOAEC was determined in a study with a high background incidence of lung inflammation in controls, therefore there is considerable uncertainty regarding the reliability of this numerical value. The NOAEC is based on impaired lung clearance that was observed at 4.50 mg/m<sup>3</sup>.</p> <p>Based on available data, the classification criteria as STOT-repeated exposure, oral are not met since no reversible or irreversible adverse health effects were observed immediately or delayed after exposure (NOAEL is above the guidance value).</p> <p>Based on available data, the classification criteria as STOT-repeated exposure, inhalation are not met since there is an absence of consistent identifiable toxic effects other than the non-specific PSP overload, which is an adaptive response not triggering a STOT classification.</p>
<b>Aspiration hazards</b>	ATO as an inorganic metal oxide is void of a low surface tension effect and as a solid does have a very high viscosity, i.e. an aspiration hazard can safely be excluded. Based on available data, the classification criteria are not met.

## SECTION 12: ECOLOGICAL INFORMATION

### 12.1 Toxicity

Antimony metal and antimony containing compounds will dissolve and generate antimony ions (Vangheluwe et al., 2001). The environmental section will therefore discuss the fate of antimony in general.

Acute aquatic toxicity test results:		
Marine fish [ <i>Pagrus major</i> ]	96 h LC50	6.9 mg Sb/L (Takayanagi, 2001)
Freshwater fish [ <i>Pimephales promelas</i> ]	96 h LC50	14.4 mg Sb/L (Brooke et al, 1986)
Invertebrates [ <i>Chlorohydra viridissimus</i> ]	96 h LC50	1.77 mg Sb/L (TAI, 1990)
Algae [ <i>Pseudokirchneriella subcapitata</i> ]	72 h ErC50 (growth rate)	> 36.6 mg Sb/L (Heijerick et al, 2004)
Plants [ <i>Lemna minor</i> ]	4 d EC50	> 25.5 mg Sb/L (Brooke et al, 1986)
Chronic aquatic toxicity test results:		
Fish [ <i>Pimephales promelas</i> ]	28 d NOEC/LOEC (growth; length)	1.13/2.31 mg Sb/L (Kimball, 1978)
Invertebrates [ <i>Daphnia magna</i> ]	21 d NOEC/LOEC (reproduction)	1.74/3.13 mg Sb/L (Heijerick et al, 2003)
Algae [ <i>Pseudokirchneriella subcapitata</i> ]	72 h NOEC/LOEC (growth rate)	2.11/4.00 mg Sb/L (Heijerick et al, 2004)
Chronic sediment toxicity test results:		
Midge [ <i>Chironomus riparius</i> ]	14 d NOEC (growth)	78 mg Sb/kg ww (Heijerick et al, 2005)

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<b>Chronic terrestrial toxicity test results</b> (values were determined in a soil spiked with Sb <sub>2</sub> O <sub>3</sub> and aged for 31 weeks before testing):		
Soil invertebrates	NOEC	999 mg Sb/kg dw (Moser, 2007)
Plants	NOEC	999 mg Sb/kg dw (Smolders et al., 2007)
Soil microorganisms	NOEC	2930 mg Sb/kg dw (Smolders et al., 2007)
<b>Toxicity tests for microorganisms (for STP)</b>		
Aquatic microorganisms	NOEC	2.55 mg Sb/L (EPAS, 2005)
Inhibition of nitrification	EC50	27 mg Sb/L (EPAS, 2005)

For an overview of PNECs, check section 8.1.2 and for more information on how the environmental classification was derived, contact your supplier.

### 12.2 Persistence and degradability

Whereas antimony formally meets the criterion for persistence based on the absence of any degradation, this criterion is considered not to be applicable to inorganic elements. In addition, under conditions of a standard EUSES lake and the median partition coefficient for suspended matter, antimony meets the criteria for rapid removal from the water column.

### 12.3 Bioaccumulative potential

Antimony does not meet the criteria for bioaccumulation: a BCF for aquatic organisms of 40 and a BSAF of 1 for earthworms are derived, and are all much lower than the threshold of 2,000 l/kg. Also, there is evidence to support that antimony does not biomagnify in the food chain. Therefore, antimony is not considered bioaccumulative (B) or very bioaccumulative (vB) based on the definitive criteria.

### 12.4 Mobility in soil

A log Kp of 2.07 has been determined for soil.

### 12.5 Results of PBT and vPvB assessment

The PBT and vPvB criteria of Annex XIII to the Regulation do not apply to inorganic substances, such as antimony and its inorganic compounds. However, the available data have been compared to the criteria:

See 12.2 for (P) and 12.3 for (B). For (T): Chronic NOEC values are available for fish, invertebrates and algae (see Section 12). The lowest NOEC is 1.13 mg Sb/L for fish (Kimball, 1978). Antimony and antimony compounds do not meet any of the toxicity criteria based on carcinogenicity, mutagenicity or reprotoxicity (cfr section 11 of this eSDS) and there is no evidence of other chronic concerns. Therefore, antimony is not considered toxic (T) based on the definitive criteria.

Antimony, and therefore (di)antimony trioxide, is not PBT or vPvB.

### 12.6 Other adverse effects

(Di)antimony trioxide is not expected to contribute to ozone depletion, ozone formation, global warming or acidification.

## SECTION 13: DISPOSAL CONSIDERATIONS

### 13.1. Waste treatment methods

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. If the percentage of ATO in waste is greater than 1 % then the waste must be treated as hazardous under Directive 91/689/EEC. If the concentration is below 1 % ATO-containing waste shall be handled as nonhazardous waste. All waste should be removed by licensed waste removal company, incinerated or recycled. If only the total antimony concentration in waste is known then waste with greater than 1 % antimony should be treated as hazardous under

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Directive 91/689/EEC. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements. The used packing is only meant for packing this product. After usage, empty the packing completely.

Suitable disposal of hazardous waste for manufacturing and industrial use: Keep separate and dispose of to either

-Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006.

-Hazardous landfill operated under Directive 1999/31/EC.

Suitable disposal of non-hazardous waste for manufacturing and industrial use: Disposal of wastes is possible via incineration (operated according to Directive 2000/76/EC on the incineration of waste) or landfilling (operated according to Reference Document on the Best available Techniques for Waste Industries of August 2006 and Council Directive 1999/31/EC and Council Decision 19 December 2002).

Suitable disposal of waste for professional use: Waste from end-of-life articles can be disposed of as municipal waste, except when they are separately regulated, like electronic devices, batteries, vehicles, etc. Disposal of wastes is possible via incineration (operated according to Directive 2000/76/EC on the incineration of waste) or landfilling (operated according to Reference Document on the Best available Techniques for Waste Industries of August 2006 and Council Directive 1999/31/EC and Council Decision 19 December 2002).

#### SECTION 14: TRANSPORT INFORMATION

(Di)antimony oxide which does not contain more than 0.5% arsenic is considered not-dangerous and does not need to be classified for transportation.

RID/ADR: not restricted

ADNR/ADN: not restricted

IATA/ICAO: not restricted

IMO/IMDG: not restricted

##### 14.1 UN Number

Not applicable (see introduction section 14)

##### 14.2 UN proper shipping name

Not applicable (see introduction section 14)

##### 14.3 Transport hazard class(es)

Not applicable (see introduction section 14)

##### 14.4 Packaging group

Not applicable (see introduction section 14)

##### 14.5 Environmental hazards

No environmental hazard

##### 14.6 Special precautions for user

Not available

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*14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC code*

Not available

**SECTION 15: REGULATORY INFORMATION***15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**15.1.1 Worldwide Chemical Inventories*

EINECS (EU): conform

ENCS (Japan): 1-543

TSCA (USA): listed

ECL(Korea): KE/09846

DSL(Canada): listed

PICCS (Philippines): listed

AICS (Australia):listed

IECSC(China): listed

(Di)antimony trioxide is not a SEVESO substance, not an ozone depleting substance and not a persistent organic pollutant.

*15.1.2 Other regulatory information*

Water Hazard Class 1 VwVwS (**V**erwaltungs**V**orschrift **w**assergefährdende **S**toffe) from 27.07.2005 (German Regulation)

*15.2. Chemical safety assessment*

A chemical safety assessment has been carried out for the substance.

**SECTION 16: OTHER INFORMATION**

Data are based on our latest knowledge but do not constitute a guarantee for any specific product features and do not establish a legally valid contractual relationship.

Full text of the R- and H-phrases used in section 3:

*According directive 67/548/EEC:*

R20/22: Harmful by inhalation and if swallowed

R33: Danger of cumulative effects

R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

R61: May cause harm to the unborn child

R62: Possible risk of impaired fertility

*According Regulation (EC) No. 1272/2008:*

H302: Harmful if swallowed

H332: Harmful if inhaled

H360Df: May damage fertility. May damage the unborn child

H361f: Suspected of damaging fertility or the unborn child

H373: May cause damage to organs through prolonged or repeated exposure

H400: Very toxic to aquatic life

H410: Very toxic to aquatic life with long lasting effects

*References: Full list of used references can be provided on further request via your supplier.*

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Disclaimer:

China Minmetals Nonferrous Metals Co.,Ltd.provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. Furthermore, this safety data sheet (including its Annex) is made up based on the legal requirements as set by Regulation (EC) 1907/2006 (REACH) based on information as is available per August 1, 2010. Further information received following the time scale as foreseen by REACH and the guidance policies as described in the REACH Implementation Programs will be added when it becomes available.

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**i) Exposure Scenario N. 1**

<b>Use of (di)antimony trioxide in PET (films/fibres, resin) production</b>				
<b>Systematic title based on use descriptor</b>	SU3 (Industrial uses), SU10 (Formulation of preparations and/or re-packing), SU12 (Manufacture of plastic products, including compounding and conversion) PC32 (Polymer preparations and compounds) AC5, AC6, AC8 (TARIC 4818), AC13 (appropriate PROCs and ERCs are given in section 2 below)			
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.			
<b>Assessment Method</b>	For occupational assessment either measured data or MEASE was used. Environmental assessment uses EUSES.			
<b>2. Operational conditions and risk management measures</b>				
<b>Workplace</b>	<b>Involved tasks</b>	<b>Involved PROCs</b>	<b>Involved ERC</b>	
<b>Raw material handling</b>	Unloading, feeding of the mixing vessel, stirring, filtering	5, 8a, 8b, 9	5, 6b	
<b>Further processing</b>	Esterification, polymerisation, distillation, melting, cutting, spinning, extrusion	1, 3, 4, 14, 15, 22, 24, 25		
<b>Final processing</b>	Thermal reforming, moulding, cutting	6, 21		
<b>2.1 Control of workers exposure</b>				
<b>Product characteristic</b>				
<b>Workplace</b>	<b>Used in preparation</b>	<b>Content in preparation</b>	<b>Physical form</b>	<b>Emission potential</b>
<b>Raw material handling</b>	not restricted		powder, wetted powder	high - medium
<b>Further processing</b>	After polymerisation, (di)antimony trioxide is covalently bound in PET matrix, i.e. it is no longer bio-available as (di)antimony trioxide. Thus, an exposure assessment has been omitted for further processing steps.		liquid or chips	na
<b>Final processing</b>			final product	na
<b>Amounts used</b>				
Not restricted.				
<b>Frequency and duration of use/exposure</b>				
Duration of exposure is not restricted except for the workplace "Raw material handling" which is limited to 90 minutes.				
<b>Human factors not influenced by risk management</b>				
The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m <sup>3</sup> /shift (8 hours).				
<b>Other given operational conditions affecting workers exposure</b>				
Not restricted or not relevant.				
<b>Technical conditions and measures at process level (source) to prevent release</b>				
Further processing should be conducted in closed systems (reaction vessel). Containment of other workplaces is not required.				
<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
A standard local exhaust ventilation (efficiency of 78%) is required during connecting tasks of (di)antimony trioxide containers to the system. Localised controls for other workplaces are not required. Consider control rooms or other measures to separate workers from emission sources if a reduced exposure duration is given above.				
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Check section 7.1.2, section 8.2.2.2 and section 11 in the core MSDS for further information.				



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<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Respiratory equipment not required. Check section 8 in the core MSDS for further information.
<b>2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river</b>
<b>Amounts used</b>
250 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 300 days/year
<b>Environment factors not influenced by risk management</b>
Default data for receiving water and for the municipal sewage treatment plant are 18 000 m <sup>3</sup> /d and 2000 m <sup>3</sup> /d, respectively (resulting dilution factor 10).
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>
<p>This exposure scenario can contain different steps that occur at the same site. First there might be a formulation step followed by an industrial use step. These two steps are covered by 2 different spERCs. The first step is covered by the Eurometaux spERC 2.2a.v2.1. The second step is covered by the Eurometaux spERC 2.5-6a.v2.1. The worst case release factor from both spERCs is selected for each compartment.</p> <p><b>Release factor to air:</b> 0.005% Eurometaux spERC 2.2a.v2.1. in combination with on-site treatment. In order to obtain this release factor, direct air emissions should be reduced by implementing one or more of the following RMMs:</p> <ul style="list-style-type: none"> <li>- Electrostatic precipitators using wide electrode spacing: 5 – 15 mg/Nm<sup>3</sup></li> <li>- Wet electrostatic precipitators: &lt; 5 mg/Nm<sup>3</sup></li> <li>- Cyclones, but as primary collector: &lt; 50 mg/Nm<sup>3</sup></li> <li>- Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values &lt; 5mg/Nm<sup>3</sup>. Membrane filtration techniques can achieve &lt; 1 mg/Nm<sup>3</sup></li> <li>- Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm<sup>3</sup></li> <li>- Wet scrubbers: &lt; 4 mg/Nm<sup>3</sup></li> </ul> <p>(spERC factsheet).</p> <p><b>Release factor to water:</b> 0.001% Eurometaux spERC 2.5-6a.v2.1 in combination with on-site treatment. In order to obtain this release factor, direct water emissions should be reduced by implementing one or more of the following RMMs:</p> <ul style="list-style-type: none"> <li>- Chemical precipitation: used primarily to remove the metal ions (e.g. Ca(OH)<sub>2</sub>, pH 11 precipitation: &gt;99% removal efficiency; Fe(OH)<sub>3</sub>, pH 11: 96% removal efficiency)</li> <li>- Sedimentation (e.g. Na<sub>2</sub>S, pH 11, &gt;99% removal efficiency)</li> <li>- 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)</li> <li>- Electrolysis: for low metal concentration (e.g. electrodialysis: 13% removal efficiency within 2 hours at 2g/L, membrane electrolysis, electrochemical precipitation, pH 4-10, &gt;99% removal efficiency)</li> <li>- Reverse osmosis: extensively used for the removal of dissolved metals</li> <li>- 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)</li> </ul> <p>More information can be found in EC (2001), Integrated Pollution Prevention and Control (IPCC): reference document on Best Available Techniques in the Non Ferrous Metals Industries (spERC factsheet).</p> <p><b>Soil:</b> No direct emissions to soil.</p>
<b>Conditions and measures related to municipal sewage treatment plant</b>
EUSES default STP with primary settler with effluent discharge rate 2000000l/d, serving 10000 inhabitants. Zero degradation assumed. 79.1 % to sludge, 20.9 % to water calculated in EUSES based on partition coefficients. Sludge assumed to be spread to agricultural land.
<b>Conditions and measures related to external treatment of waste for disposal</b>

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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 antimony content of the waste is elevated enough, internal or external recovery/recycling might be considered.

Appropriate waste codes:

02 01 10\*, 06 05 02\*, 10 08 04, 10 08 08\*, 10 08 15\*, 15 01 10\*, 16 06 01\*, 19 02 05\*, 19 12 03\*

Suitable disposal: Keep separate and dispose of to either

- Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006.
- Hazardous landfill operated under Directive 1999/31/EC.

A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2012)

**2.2b Control of environmental exposure for scenarios discharging directly to a freshwater river**

**Amounts used**

250 tonnes Sb/year/site

**Frequency and duration of use**

Continuous use/release, 300 days/year

**Environment factors not influenced by risk management**

Default data for receiving water is 18 000 m<sup>3</sup>/d (resulting dilution factor 10).

**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil**

Release factor to air: 0.005%  
Release factor to water: 0.001%  
Soil: No direct emissions to soil.

**Cfr. section 'Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.**

**Conditions and measures related to municipal sewage treatment plant**

Waste water is not discharged to a municipal STP but treated on-site before discharge into a river.

**Conditions and measures related to external treatment of waste for disposal**

**Cfr. section 'Conditions and measures related to external treatment of waste for disposal' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river'**

**2.2c Control of environmental exposure for scenarios discharging into a marine environment**

**Amounts used**

250 tonnes Sb/year/site

**Frequency and duration of use**

Continuous use/release, 300 days/year

**Environment factors not influenced by risk management**

For marine assessments a default dilution of 100 is assumed.

**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil**

Release factor to air: 0.005%  
Release factor to water: 0.001%  
Soil: No direct emissions to soil.

**Cfr. section 'Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river' for more details on the selection of release factors to air and**

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**water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.**

**Conditions and measures related to municipal sewage treatment plant**

Waste water is not discharged to a municipal STP but treated on-site before discharge into a marine environment.

**Conditions and measures related to external treatment of waste for disposal**

**Cfr. section 'Conditions and measures related to external treatment of waste for disposal' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river'**

**3. Exposure estimation and reference to its source**

**Occupational exposure**

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for (di)antimony trioxide of 0.5 mg/m<sup>3</sup>.

Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Raw material handling	measured data (90 <sup>th</sup> percentile)	0.026 mg/m <sup>3</sup> (0.052)	Dermal exposure has to be minimised to an extent as technically feasible when working under certain conditions as described in above exposure scenario section 2 and in section 8 and section 11 of the core MSDS.	
Further processing	qualitative assessment	negligible (<1)		
Final processing	qualitative assessment	negligible (<1)		

**Environmental emissions**

Local PEC for scenario **a) discharging to an STP and freshwater river**

Air mg.m-3 (RCR)	Fresh water mg/l (RCR)	Marine water mg/l (RCR)	Sediment freshwater mg/kg wwt (RCR)	Sediment marine water mg/kg wwt (RCR)	Soil mg/kg wwt (RCR)	STP mg/l (RCR)
1.2E-05 (NA)	8.0E-04 (0.007)	No discharge to marine environment	0.73 (0.094)	No discharge to marine environment	1.64 (0.050)	0.001 (< 0.001)

Local PEC for scenario **b) discharging directly to a freshwater river**

1.2E-05 (NA)	1.11E-03 (0.010)	No discharge to marine environment	1.03 (0.132)	No discharge to marine environment	1.50 (0.046)	No discharge to STP
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Local PEC for scenario **c) discharging into a marine environment**

1.2E-05 (NA)	No discharge to freshwater environment	2.4E-04 (0.021)	No discharge to freshwater environment	0.69 (0.441)	1.50 (0.046)	No discharge to STP
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**4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Occupational exposure/ Environmental emissions**

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). If measured data are not available, scaling tool for human health part is: MEASE (free download via: [www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)). For environmental exposure: DU-Scaling tool (free download via: <http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool/>).

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**ii) Exposure Scenario N. 2**

**Use of (di)antimony trioxide in the plastics and rubber industry (flame retarded plastics, formulations, flame retarded rubber, polymer preparations and compounds, coating of textiles with flexible PVC, manufacture of fire proofing plastic films, manufacture of fire proofing cables, cable sheathing)**

<b>Systematic title based on use descriptor</b>	SU3 (Industrial use), SU5, SU10, SU11, SU12, SU16, SU17, SU18, SU20, SU23 PC19, PC21, PC24, PC26, PC32, PC33 AC1, AC2 (TARIC 8544), AC 3, AC5, AC10, AC13 (TARIC 3925) (appropriate PROCs and ERCs are given in section 2 below)
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.
<b>Assessment Method</b>	For occupational assessment either measured data or MEASE was used. Environmental assessment uses EUSES.

**2. Operational conditions and risk management measures**

Workplace	Involved tasks	Involved PROCs	Involved ERC
Powder handling	Powder handling, loading operations, mixing	5, 8a, 8b, 9, 26	5
Inclusion into matrix	Formulation of masterbatches, reaction	1, 2, 3, 4	
Further processing	Extrusion, calendaring, coating, gelling, thermal reforming, moulding, thermal joining, film blowing	6, 10, 13, 14, 15, 21, 24	

**2.1 Control of workers exposure**

**Product characteristic**

Workplace	Used in preparation	Content in preparation	Physical form	Emission potential
Powder handling	not restricted		powder	high
Inclusion into matrix	not restricted		masterbatch / massive	very low
Further processing	yes (article)	<25 %	massive	very low

**Amounts used**

Not restricted.

**Frequency and duration of use/exposure**

Duration of exposure is not restricted except for the workplace "Powder handling" which is limited to 180 minutes.

**Human factors not influenced by risk management**

The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m<sup>3</sup>/shift (8 hours).

**Other given operational conditions affecting workers exposure**

Not restricted or not relevant.

**Technical conditions and measures at process level (source) to prevent release**

Powder handling should be conducted in closed systems. Containment of other workplaces is not required.

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

A standard local exhaust ventilation (efficiency of 78%) is required during connecting tasks of (di)antimony trioxide containers to the system. Localised controls for other workplaces are not required. Consider control rooms or other measures to separate workers from emission sources if a reduced exposure duration is given above.

**Organisational measures to prevent /limit releases, dispersion and exposure**

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Check section 7.1.2, section 8.2.2.2 and section 11 in the core MSDS for further information.

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

Workplace	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
Powder handling	FFP1 mask	APF=4	protective gloves	standard working clothes (overall with long sleeves) and safety shoes
Inclusion into matrix	not required	not required	not required	
Further processing				

**2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river**

**Amounts used**

2500 tonnes Sb/year/site

**Frequency and duration of use**

Continuous use/release, 300 days/year

**Environment factors not influenced by risk management**

Default data for receiving water and for the municipal sewage treatment plant are 18 000 m<sup>3</sup>/d and 2000 m<sup>3</sup>/d, respectively (resulting dilution factor 10).

**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil**

This exposure scenario can contain different steps that occur at the same site. These two steps are covered by 2 different spERCs. The first step is covered by the Eurometaux spERC 2.2a.v2.1. The second step is covered by the Eurometaux spERC 2.5-6a.v2.1. The worst case release factor from both spERCs is selected for each compartment i.

**Release factor to air: 0.005%**

Eurometaux spERC 2.2a.v2.1. in combination with on-site treatment. In order to obtain this release factor, direct air emissions should be reduced by implementing one or more of the following RMMs:

- Electrostatic precipitators using wide electrode spacing: 5 – 15 mg/Nm<sup>3</sup>
- Wet electrostatic precipitators: < 5 mg/Nm<sup>3</sup>
- Cyclones, but as primary collector: < 50 mg/Nm<sup>3</sup>
- Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values < 5mg/Nm<sup>3</sup>. Membrane filtration techniques can achieve < 1 mg/Nm<sup>3</sup>
- Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm<sup>3</sup>
- Wet scrubbers: < 4 mg/Nm<sup>3</sup>

(spERC factsheet).

**Release factor to water: 0.001%**

Eurometaux spERC 2.5-6a.v2.1 in combination with on-site treatment. In order to obtain this release factor, direct water emissions should be reduced by implementing one or more of the following RMMs:

- Chemical precipitation: used primarily to remove the metal ions (e.g. Ca(OH)<sub>2</sub>, pH 11 precipitation: >99% removal efficiency; Fe(OH)<sub>3</sub>, pH 11: 96% removal efficiency)
- Sedimentation (e.g. Na<sub>2</sub>S, 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 (e.g. electrodialysis: 13% removal efficiency within 2 hours at 2g/L, 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)

More information can be found in EC (2001), Integrated Pollution Prevention and Control (IPCC): reference document on Best Available Techniques in the Non Ferrous Metals Industries (spERC factsheet).

**Soil:** No direct emissions to soil.

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<b>Conditions and measures related to municipal sewage treatment plant</b>
EUSES default STP with primary settler with effluent discharge rate 2000000l/d, serving 10000 inhabitants. Zero degradation assumed. 79.1 % to sludge, 20.9 % to water calculated in EUSES based on partition coefficients. Sludge assumed to be spread to agricultural land.
<b>Conditions and measures related to external treatment of waste for disposal</b>
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 antimony content of the waste is elevated enough, internal or external recovery/recycling might be considered.
Appropriate waste codes: 02 01 10*, 06 05 02*, 10 08 04, 10 08 08*, 10 08 15*, 15 01 10*, 16 06 01*, 19 02 05*, 19 12 03*
Suitable disposal: Keep separate and dispose of to either - Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006. - Hazardous landfill operated under Directive 1999/31/EC.
A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2012)
<b>2.2b Control of environmental exposure for scenarios discharging directly to a freshwater river</b>
<b>Amounts used</b>
2500 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 300 days/year
<b>Environment factors not influenced by risk management</b>
Default data for receiving water is 18 000 m <sup>3</sup> /d (resulting dilution factor 10).
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>
<b>Release factor to air:</b> 0.005% <b>Release factor to water:</b> 0.001% <b>Soil:</b> No direct emissions to soil.
<i>Cfr. section 'Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.</i>
<b>Conditions and measures related to municipal sewage treatment plant</b>
Waste water is not discharged to a municipal STP but treated on-site before discharge into a river.
<b>Conditions and measures related to external treatment of waste for disposal</b>
<i>Cfr. section 'Conditions and measures related to external treatment of waste for disposal' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river'</i>
<b>2.2c Control of environmental exposure for scenarios discharging into a marine environment</b>
<b>Amounts used</b>
2500 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 300 days/year
<b>Environment factors not influenced by risk management</b>
For marine assessments a default dilution of 100 is assumed.

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**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil**

Release factor to air: 0.005%  
Release factor to water: 0.001%  
Soil: No direct emissions to soil.

Cfr. section 'Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.

**Conditions and measures related to municipal sewage treatment plant**

Waste water is not discharged to a municipal STP but treated on-site before discharge into a marine environment.

**Conditions and measures related to external treatment of waste for disposal**

Cfr. section 'Conditions and measures related to external treatment of waste for disposal' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river'

**3. Exposure estimation and reference to its source**

**Occupational exposure**

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for (di)antimony trioxide of 0.5 mg/m<sup>3</sup>.

Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Powder handling	measured data (90 <sup>th</sup> percentile)	0.143 mg/m <sup>3</sup> (0.29)	Dermal exposure has to be minimised to an extent as technically feasible when working under certain conditions as described in this exposure scenario section 2 and in section 8 and section 11 of the core MSDS.	
Inclusion into matrix	MEASE (PROC 4 as worst case assumption)	0.05 mg/m <sup>3</sup> (0.10)		
Further processing	MEASE (PROC 21 as worst case assumption)	0.03 mg/m <sup>3</sup> (0.06)		

**Environmental emissions**

**Local PEC for scenario a) discharging to an STP and freshwater river**

Air mg.m-3 (RCR)	Fresh water mg/l (RCR)	Marine water mg/l (RCR)	Sediment freshwater mg/kg wwt (RCR)	Sediment marine water mg/kg wwt (RCR)	Soil mg/kg wwt (RCR)	STP mg/l (RCR)
9.8E-05 (NA)	1.54E-03 (0.014)	No discharge to marine environment	1.44 (0.185)	No discharge to marine environment	2.87 (0.088)	0.009 (0.003)

**Local PEC for scenario b) discharging directly to a freshwater river**

9.8E-05 (NA)	4.63E-03 (0.041)	No discharge to marine environment	4.45 (0.570)	No discharge to marine environment	1.54 (0.47)	No discharge to STP
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**Local PEC for scenario c) discharging into a marine environment**

9.8E-05 (NA)	No discharge to freshwater environment	5.9E-04 (0.052)	No discharge to freshwater environment	1.03 (0.660)	1.54 (0.47)	No discharge to STP
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**4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Occupational exposure/ Environmental emissions**

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). If measured data are not available, scaling tool for human health part is: MEASE (free download via: [www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)). For environmental exposure: DU-Scaling tool (free download via: <http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool/>).

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**iii) Exposure Scenario N. 3**

Use of (di)antimony trioxide in flame retarded textiles				
<b>Systematic title based on use descriptor</b>	SU3 (Industrial uses), SU5 (Manufacture of textiles, leather, fur), SU10 (Formulation of preparations and/or re-packing) PC23, PC32, PC34 AC6, AC5 (TARIC 59031090, 59032090) (appropriate PROCs and ERCs are given in section 2 below)			
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.			
<b>Assessment Method</b>	For occupational assessment either measured data or MEASE was used. Environmental assessment uses EUSES.			
2. Operational conditions and risk management measures				
Workplace	Involved tasks	Involved PROCs	Involved ERC	
<b>Powder handling</b>	Powder handling, formulation	5, 8a, 8b, 9, 26	5	
<b>Processing</b>	Mixing, rolling, foaming, back-coating, drying, unloading, cleaning	1, 6, 7, 10, 12, 13, 22		
<b>Further handling</b>	Joining of backings, rolling processes, cutting, sewing, upholstering, stuffing	21, 24		
2.1 Control of workers exposure				
Product characteristic				
Workplace	Used in preparation	Content in preparation	Physical form	Emission potential
<b>Powder handling</b>	not restricted		Powder	high
<b>Processing</b>	yes	not restricted (concentration in solution)	aqueous dispersion	very low (except for PROC 7)
<b>Further handling</b>	yes	<25 % (concentration on textile)	solid bound to object	very low
Amounts used				
Not restricted.				
Frequency and duration of use/exposure				
Duration of exposure is restricted for the workplace "Powder handling" to 120 minutes and for workplace "Processing" to 30 minutes for manual operations, but in the case of automated operations there is no time restriction. Duration of exposure is not restricted for the workplace "Further handling".				
Human factors not influenced by risk management				
The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m <sup>3</sup> /shift (8 hours).				
Other given operational conditions affecting workers exposure				
Not restricted or not relevant.				
Technical conditions and measures at process level (source) to prevent release				
Powder handling should be conducted in closed systems. Containment of other workplaces is not required.				
Technical conditions and measures to control dispersion from source towards the worker				
A standard local exhaust ventilation (efficiency of 78%) is required during connecting tasks of (di)antimony trioxide containers to the system. Localised controls for other workplaces are not required. Consider control rooms or other measures to separate workers from emission sources if a reduced exposure duration is given above.				
Organisational measures to prevent /limit releases, dispersion and exposure				
Check section 7.1.2, section 8.2.2.2 and section 11 in the core MSDS for further information.				

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<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
<b>Workplace</b>	<b>Specification of respiratory protective equipment (RPE)</b>	<b>RPE efficiency (assigned protection factor, APF)</b>	<b>Specification of gloves</b>	<b>Further personal protective equipment (PPE)</b>
<b>Powder handling</b>	FFP1 mask	APF=4	protective gloves	standard working clothes (overall with long sleeves) and safety shoes
<b>Processing</b>	not required	not required	protective gloves water resistant	
<b>Further handling</b>			not required	
<b>2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river</b>				
<b>Amounts used</b>				
280 tonnes Sb/year/site				
<b>Frequency and duration of use</b>				
Continuous use/release, 300 days/year				
<b>Environment factors not influenced by risk management</b>				
Default data for receiving water and for the municipal sewage treatment plant are 18 000 m <sup>3</sup> /d and 2000 m <sup>3</sup> /d, respectively (resulting dilution factor 10).				
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>				
<p>This exposure scenario is covered by the Eurometaux spERC 2.5-6b.v2.1 industrial use of metal (compounds) in textile.</p> <p><b>Release factor to air:</b> 0.001%</p> <p>In order to obtain this release factor, direct air emissions should be reduced by implementing one or more of the following RMMs:</p> <ul style="list-style-type: none"> <li>- Electrostatic precipitators using wide electrode spacing: 5 – 15 mg/Nm<sup>3</sup></li> <li>- Wet electrostatic precipitators: &lt; 5 mg/Nm<sup>3</sup></li> <li>- Cyclones, but as primary collector: &lt; 50 mg/Nm<sup>3</sup></li> <li>- Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values &lt; 5mg/Nm<sup>3</sup>. Membrane filtration techniques can achieve &lt; 1 mg/Nm<sup>3</sup></li> <li>- Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm<sup>3</sup></li> <li>- Wet scrubbers: &lt; 4 mg/Nm<sup>3</sup></li> </ul> <p>(spERC factsheet).</p> <p><b>Release factor to water:</b> 0.007%</p> <p>In order to obtain this release factor, direct water emissions should be reduced by implementing one or more of the following RMMs:</p> <ul style="list-style-type: none"> <li>- Chemical precipitation: used primarily to remove the metal ions (e.g. Ca(OH)<sub>2</sub>, pH 11 precipitation: &gt;99% removal efficiency; Fe(OH)<sub>3</sub>, pH 11: 96% removal efficiency)</li> <li>- Sedimentation (e.g. Na<sub>2</sub>S, pH 11, &gt;99% removal efficiency)</li> <li>- 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)</li> <li>- Electrolysis: for low metal concentration (e.g. electrodialysis: 13% removal efficiency within 2 hours at 2g/L, membrane electrolysis, electrochemical precipitation, pH 4-10, &gt;99% removal efficiency)</li> <li>- Reverse osmosis: extensively used for the removal of dissolved metals</li> <li>- 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)</li> </ul> <p>More information can be found in EC (2001), Integrated Pollution Prevention and Control (IPCC): reference document on Best Available Techniques in the Non Ferrous Metals Industries (spERC factsheet).</p> <p>Soil: No direct emissions to soil.</p>				
<b>Conditions and measures related to municipal sewage treatment plant</b>				
EUSES default STP with primary settler with effluent discharge rate 2000000l/d, serving 10000 inhabitants. Zero degradation assumed. 79.1 % to sludge, 20.9 % to water calculated in EUSES based on partition coefficients. Sludge assumed to be spread to agricultural land.				

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<b>Conditions and measures related to external treatment of waste for disposal</b>
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 antimony content of the waste is elevated enough, internal or external recovery/recycling might be considered.
Appropriate waste codes: 02 01 10*, 06 05 02*, 10 08 04, 10 08 08*, 10 08 15*, 15 01 10*, 16 06 01*, 19 02 05*, 19 12 03*
Suitable disposal: Keep separate and dispose of to either - Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006. - Hazardous landfill operated under Directive 1999/31/EC.
A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2012)
<b>2.2b Control of environmental exposure for scenarios discharging directly to a freshwater river</b>
<b>Amounts used</b>
280 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 300 days/year
<b>Environment factors not influenced by risk management</b>
Default data for receiving water is 18 000 m <sup>3</sup> /d (resulting dilution factor 10).
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>
Release factor to air: 0.001% Release factor to water: 0.007% Soil: No direct emissions to soil.
<i>Cfr. section 'Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.</i>
<b>Conditions and measures related to municipal sewage treatment plant</b>
Waste water is not discharged to a municipal STP but treated on-site before discharge into a river.
<b>Conditions and measures related to external treatment of waste for disposal</b>
<i>Cfr. section 'Conditions and measures related to external treatment of waste for disposal' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river'</i>
<b>2.2c Control of environmental exposure for scenarios discharging into a marine environment</b>
<b>Amounts used</b>
280 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 300 days/year
<b>Environment factors not influenced by risk management</b>
For marine assessments a default dilution of 100 is assumed.
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>
Release factor to air: 0.001% Release factor to water: 0.007% Soil: No direct emissions to soil.

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Cfr. section 'Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.

**Conditions and measures related to municipal sewage treatment plant**

Waste water is not discharged to a municipal STP but treated on-site before discharge into a marine environment.

**Conditions and measures related to external treatment of waste for disposal**

Cfr. section 'Conditions and measures related to external treatment of waste for disposal' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river'

**3. Exposure estimation and reference to its source**

**Occupational exposure**

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for (di)antimony trioxide of 0.5 mg/m<sup>3</sup>.

Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
<b>Powder handling</b>	analogous data from the handling of (di)antimony trioxide in plastics (90 <sup>th</sup> percentile)	0.143 mg/m <sup>3</sup> (0.29)	Dermal exposure has to be minimised to an extent as technically feasible when working under certain conditions as described in above exposure scenario section 2 and in section 8 and section 11 of the core MSDS.	
<b>Processing</b>	published data (maximum value, upholstery, lavicoli, 2002)	0.001 mg/m <sup>3</sup> (0.002)		
<b>Further handling</b>	MEASE (PROC 21 as worst case assumption)	0.03 mg/m <sup>3</sup> (0.06)		

**Environmental emissions**

Local PEC for scenario a) discharging to an STP and freshwater river

Air mg.m-3 (RCR)	Fresh water mg/l (RCR)	Marine water mg/l (RCR)	Sediment freshwater mg/kg wwt (RCR)	Sediment marine water mg/kg wwt (RCR)	Soil mg/kg wwt (RCR)	STP mg/l (RCR)
4.7E-06 (NA)	1.36E-03 (0.012)	No discharge to marine environment	1.27 (0.163)	No discharge to marine environment	2.55 (0.078)	0.007 (0.003)

Local PEC for scenario b) discharging directly to a freshwater river

4.7E-06 (NA)	3.78E-03 (0.033)	No discharge to marine environment	3.63 (0.465)	No discharge to marine environment	1.50 (0.046)	No discharge to STP
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Local PEC for scenario c) discharging into a marine environment

4.7E-06 (NA)	No discharge to freshwater environment	5.1E-04 (0.045)	No discharge to freshwater environment	0.95 (0.607)	1.50 (0.046)	No discharge to STP
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**4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Occupational exposure/ Environmental emissions**

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). If measured data are not available, scaling tool for human health part is: MEASE (free download via: [www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)). For environmental exposure: DU-Scaling tool (free download via: <http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool/>).

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**iv) Exposure Scenario N. 4**

<b>Use of (di)antimony trioxide in glass manufacturing, production of enamel chip, additive for functional ceramics, semi-conductors</b>				
<b>Systematic title based on use descriptor</b>	SU3 (Industrial uses), SU8, SU10, SU13, SU 15, SU16 PC9a, PC19, PC21, PC33, PC0 (glazing materials, C23.1, UCN-G15000/15100) AC1, AC 2 (TARIC8525), AC4 (TARIC 6909), AC7 (appropriate PROCs and ERCs are given in section 2 below)			
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.			
<b>Assessment Method</b>	For occupational assessment either measured data or MEASE was used. Environmental assessment uses EUSES.			
<b>2. Operational conditions and risk management measures</b>				
<b>Workplace</b>	<b>Involved tasks</b>	<b>Involved PROCs</b>	<b>Involved ERC</b>	
<b>Raw material handling</b>	Raw material handling, mixing, melting	5, 8b, 9, 15, 22, 26	5, 6a	
<b>Further processing</b>	Forming, pressing, blowing, drawing, rolling, cutting	1, 2, 3, 4, 14, 21, 23, 24		
<b>Application of enamel</b>	Spraying, brushing, dipping	7, 10, 13		
<b>2.1 Control of workers exposure</b>				
<b>Product characteristic</b>				
<b>Workplace</b>	<b>Used in preparation</b>	<b>Content in preparation</b>	<b>Physical form</b>	<b>Emission potential</b>
<b>Raw material handling</b>	not restricted		powder	high
<b>Further processing</b>	(di)antimony trioxide is no longer present after raw material handling (furnace feeding)		massive object	na
<b>Application of enamel</b>	(it has been transformed into another substance which is tightly bound into the matrix)			
<b>Amounts used</b>				
Not restricted.				
<b>Frequency and duration of use/exposure</b>				
Duration of exposure is not restricted except for the workplace "Raw material handling" which is limited to 180 minutes.				
<b>Human factors not influenced by risk management</b>				
The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m <sup>3</sup> /shift (8 hours).				
<b>Other given operational conditions affecting workers exposure</b>				
Not restricted or not relevant.				
<b>Technical conditions and measures at process level (source) to prevent release</b>				
Raw material handling should be conducted in closed systems. Containments of other workplaces is not required.				
<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
A standard local exhaust ventilation (efficiency of 78%) is required during connecting tasks of (di)antimony trioxide containers to the system. Localised controls other workplaces are not required. Consider control rooms or other measures to separate workers from emission sources if a reduced exposure duration is given above.				
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Check section 7.1.2, section 8.2.2.2 and section 11 in the core MSDS for further information.				
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
<b>Workplace</b>	<b>Specification of respiratory protective equipment (RPE)</b>	<b>RPE efficiency (assigned protection factor, APF)</b>	<b>Specification of gloves</b>	<b>Further personal protective equipment (PPE)</b>
<b>Raw material handling</b>	FFP1 mask	APF=4	protective gloves	standard working clothes (overall with long sleeves) and safety
<b>Further processing</b>	not required	na	not required	

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Application of enamel	not required	na	not required	shoes
<b>2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river</b>				
<b>Amounts used</b>				
75 tonnes Sb/year/site				
<b>Frequency and duration of use</b>				
Continuous use/release, 300 days/year				
<b>Environment factors not influenced by risk management</b>				
Default data for receiving water and for the municipal sewage treatment plant are 18 000 m <sup>3</sup> /d and 2000 m <sup>3</sup> /d, respectively (resulting dilution factor 10).				
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>				
This exposure scenario is covered by the Eurometaux spERC 2.5-6c.v2.1 industrial use of metal (compounds) in glass.				
<b>Release factor to air: 0.2%</b>				
In order to obtain this release factor, direct air emissions should be reduced by implementing one or more of the following RMMs:				
<ul style="list-style-type: none"> <li>- Electrostatic precipitators using wide electrode spacing: 5 – 15 mg/Nm<sup>3</sup></li> <li>- Wet electrostatic precipitators: &lt; 5 mg/Nm<sup>3</sup></li> <li>- Cyclones, but as primary collector: &lt; 50 mg/Nm<sup>3</sup></li> <li>- Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values &lt; 5mg/Nm<sup>3</sup>. Membrane filtration techniques can achieve &lt; 1 mg/Nm<sup>3</sup></li> <li>- Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm<sup>3</sup></li> <li>- Wet scrubbers: &lt; 4 mg/Nm<sup>3</sup></li> </ul>				
(spERC factsheet).				
<b>Release factor to water: 0.05%</b>				
In order to obtain this release factor, direct water emissions should be reduced by implementing one or more of the following RMMs:				
<ul style="list-style-type: none"> <li>- Chemical precipitation: used primarily to remove the metal ions (e.g. Ca(OH)<sub>2</sub>, pH 11 precipitation: &gt;99% removal efficiency; Fe(OH)<sub>3</sub>, pH 11: 96% removal efficiency)</li> <li>- Sedimentation (e.g. Na<sub>2</sub>S, pH 11, &gt;99% removal efficiency)</li> <li>- 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)</li> <li>- Electrolysis: for low metal concentration (e.g. electrodialysis: 13% removal efficiency within 2 hours at 2g/L, membrane electrolysis, electrochemical precipitation, pH 4-10, &gt;99% removal efficiency)</li> <li>- Reverse osmosis: extensively used for the removal of dissolved metals</li> <li>- 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)</li> </ul>				
More information can be found in EC (2001), Integrated Pollution Prevention and Control (IPCC): reference document on Best Available Techniques in the Non Ferrous Metals Industries (spERC factsheet).				
<b>Soil: No direct emissions to soil.</b>				
<b>Conditions and measures related to municipal sewage treatment plant</b>				
EUSES default STP with primary settler with effluent discharge rate 2000000/d, serving 10000 inhabitants. Zero degradation assumed. 79.1 % to sludge, 20.9 % to water calculated in EUSES based on partition coefficients. Sludge assumed to be spread to agricultural land.				
<b>Conditions and measures related to external treatment of waste for disposal</b>				
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 antimony content of the waste is elevated enough, internal or external recovery/recycling might be considered.				
Appropriate waste codes: 02 01 10*, 06 05 02*, 10 08 04, 10 08 08*, 10 08 15*, 15 01 10*, 16 06 01*, 19 02 05*, 19 12 03*				
Suitable disposal: Keep separate and dispose of to either				
<ul style="list-style-type: none"> <li>- Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006.</li> </ul>				

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- Hazardous landfill operated under Directive 1999/31/EC.
A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2012)
<b>2.2b Control of environmental exposure for scenarios discharging directly to a freshwater river</b>
<b>Amounts used</b>
75 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 300 days/year
<b>Environment factors not influenced by risk management</b>
Default data for receiving water is 18 000 m <sup>3</sup> /d (resulting dilution factor 10).
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>
Release factor to air: 0.2% Release factor to water: 0.05% Soil: No direct emissions to soil.
Cfr. section ' <i>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</i> ' of ' <i>2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river</i> ' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.
<b>Conditions and measures related to municipal sewage treatment plant</b>
Waste water is not discharged to a municipal STP but treated on-site before discharge into a river.
<b>Conditions and measures related to external treatment of waste for disposal</b>
Cfr. section ' <i>Conditions and measures related to external treatment of waste for disposal</i> ' of ' <i>2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river</i> '
<b>2.2c Control of environmental exposure for scenarios discharging into a marine environment</b>
<b>Amounts used</b>
75 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 300 days/year
<b>Environment factors not influenced by risk management</b>
For marine assessments a default dilution of 100 is assumed.
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>
Release factor to air: 0.2% Release factor to water: 0.05% Soil: No direct emissions to soil.
Cfr. section ' <i>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</i> ' of ' <i>2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river</i> ' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.
<b>Conditions and measures related to municipal sewage treatment plant</b>
Waste water is not discharged to a municipal STP but treated on-site before discharge into a marine environment.
<b>Conditions and measures related to external treatment of waste for disposal</b>
Cfr. section ' <i>Conditions and measures related to external treatment of waste for disposal</i> ' of ' <i>2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river</i> '

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**3. Exposure estimation and reference to its source**

**Occupational exposure**

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for (di)antimony trioxide of 0.5 mg/m<sup>3</sup>.

Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Raw material handling	analogous data from the handling of (di)antimony trioxide in plastics (90 <sup>th</sup> percentile)	0.143 mg/m <sup>3</sup> (0.29)	Dermal exposure has to be minimised to an extent as technically feasible when working under certain conditions as described in above exposure scenario section 2 and in section 8 and section 11 of the core MSDS.	
Further processing	qualitative assessment	negligible (<1)		
Application of enamel	qualitative assessment	negligible (<1)		

**Environmental emissions**

Local PEC for scenario a) discharging to an STP and freshwater river

Air mg.m-3 (RCR)	Fresh water mg/l (RCR)	Marine water mg/l (RCR)	Sediment freshwater mg/kg wwt (RCR)	Sediment marine water mg/kg wwt (RCR)	Soil mg/kg wwt (RCR)	STP mg/l (RCR)
1.2E-04 (NA)	1.94E-03 (0.017)	No discharge to marine environment	1.84 (0.236)	No discharge to marine environment	3.55 (0.109)	0.013 (0.005)

Local PEC for scenario b) discharging directly to a freshwater river

1.2E-04 (NA)	6.58E-03 (0.058)	No discharge to marine environment	6.34 (0.813)	No discharge to marine environment	1.54 (0.048)	No discharge to STP
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Local PEC for scenario c) discharging into a marine environment

1.2E-04 (NA)	No discharge to freshwater environment	7.9E-04 (0.070)	No discharge to freshwater environment	1.22 (0.782)	1.54 (0.048)	No discharge to STP
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**4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Occupational exposure/ Environmental emissions**

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier. If measured data are not available, scaling tool for human health part is: [www.ebrc.de/mease.html](http://www.ebrc.de/mease.html) and for environment: <http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool/> to estimate the associated exposure.



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**v) Exposure Scenario N. 5**

**Use of (di)antimony trioxide in ceramics production, coatings, flame retarded paints, pigments, manufacture of coatings and inks, production of brake pads, formulation of suspensions, production of fine chemicals, industrial application of paints and coatings**

<b>Systematic title based on use descriptor</b>	SU3 (Industrial uses), SU8, SU9, SU10, SU13, SU17, SU19, SU23 PC9a, PC9b, PC9c, PC18, PC19, PC20, PC32 AC1, AC4, AC7 (appropriate PROCs and ERCs are given in section 2 below)
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.
<b>Assessment Method</b>	For occupational assessment either measured data or MEASE was used. Environmental assessment uses EUSES.

**2. Operational conditions and risk management measures**

Workplace	Involved tasks	Involved PROCs	Involved ERC
Loading & mixing	Loading, mixing	5, 8a, 8b, 9, 26	5, 6a
Preparation	Powder compression, pelletisation	14	
Processing	Calcination, sintering, reaction, curing	1, 2, 3, 4, 22, 23	
Final handling	Milling, bagging, quality control	6, 15, 21, 24	
Application and mixing of paints	Mixing, brushing	10, 13, 19	
Spraying of paints and coatings	Spraying of paints and coatings	7	

**2.1 Control of workers exposure**

**Product characteristic**

Workplace	Used in preparation	Content in preparation	Physical form	Emission potential
Loading & Mixing	not restricted		powder	high
Preparation	yes	1 - 15 %	powder	high
Processing	yes	1 - 15 %	granular-type blend	low
Final handling	After calcination, (di)antimony trioxide is incorporated in the pigment structures, i.e. it is no longer bio-available as (di)antimony trioxide. Thus, an exposure assessment has been omitted for further processing steps.		final pigment product	na
Application and mixing of paints	not restricted		aqueous solution	very low
Spraying of paints and coatings	yes	<25 %	aqueous solution	medium

**Amounts used**

Not restricted.

**Frequency and duration of use/exposure**

Duration of exposure is not restricted except for the workplace "Loading&Mixing" and "Preparation" (for manual operation) which is limited to 60 minutes and for workplace "Spraying of paints and coatings" (for manual operations) limited to 240 minutes.

**Human factors not influenced by risk management**

The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m<sup>3</sup>/shift (8 hours).

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<b>Other given operational conditions affecting workers exposure</b>				
Not restricted or not relevant.				
<b>Technical conditions and measures at process level (source) to prevent release</b>				
"Loading&Mixing", "Preparation" and "Spraying of paints and coatings" should be conducted in closed systems. Containment of other workplaces is not required.				
<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
A standard local exhaust ventilation (efficiency of 78%) is required during tasks in "Loading&Mixing" and "Preparation" workplace. An integrated local exhaust ventilation (efficiency of 84%) is required during tasks in "Spraying of paints and coatings" workplace. Localised controls for other workplaces are not required. Consider control rooms or other measures to separate workers from emission sources if a reduced exposure duration is given above.				
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Check section 7.1.2, section 8.2.2.2 and section 11 in the core MSDS for further information.				
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
<b>Workplace</b>	<b>Specification of respiratory protective equipment (RPE)</b>	<b>RPE efficiency (assigned protection factor, APF)</b>	<b>Specification of gloves</b>	<b>Further personal protective equipment (PPE)</b>
Loading & Mixing	not required	na	protective gloves	standard working clothes (overall with long sleeves) and safety shoes
Preparation	not required	na	protective gloves	
Processing	not required	na	not required	
Final handling	not required	na	not required	
Application and mixing of paints	not required	na	not required	
Spraying of paints and coatings	FFP2 mask	APF=10	water resistant gloves	
<b>2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river</b>				
<b>Amounts used</b>				
500 tonnes Sb/year/site				
<b>Frequency and duration of use</b>				
Continuous use/release, 330 days/year				
<b>Environment factors not influenced by risk management</b>				
Default data for receiving water and for the municipal sewage treatment plant are 18 000 m <sup>3</sup> /d and 2000 m <sup>3</sup> /d, respectively (resulting dilution factor 10).				
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>				
This exposure scenario is covered using measured data for emissions to water and is covered by the worst case Eurometaux spERC 2.5-6c.v2.1. Release factor to air: 0.2% Eurometaux spERC 2.5-6c.v2.1. in combination with on-site treatment. In order to obtain this release factor, direct air emissions should be reduced by implementing one or more of the following RMMs: <ul style="list-style-type: none"> <li>- Electrostatic precipitators using wide electrode spacing: 5 – 15 mg/Nm<sup>3</sup></li> <li>- Wet electrostatic precipitators: &lt; 5 mg/Nm<sup>3</sup></li> <li>- Cyclones, but as primary collector: &lt; 50 mg/Nm<sup>3</sup></li> <li>- Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values &lt; 5mg/Nm<sup>3</sup>. Membrane filtration techniques can achieve &lt; 1 mg/Nm<sup>3</sup></li> <li>- Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm<sup>3</sup></li> <li>- Wet scrubbers: &lt; 4 mg/Nm<sup>3</sup></li> </ul> (spERC factsheet).				
Release factor to water: 0.012%: This release factor is based on the median value from 3 companies submitting data. One additional company reported no emissions of waste water to the environment. Waste water should be treated in order to obtain this kind of release factor.				
Soil: No direct emissions to soil.				

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<b>Conditions and measures related to municipal sewage treatment plant</b>
EUSES default STP with primary settler with effluent discharge rate 2000000l/d, serving 10000 inhabitants. Zero degradation assumed. 79.1 % to sludge, 20.9 % to water calculated in EUSES based on partition coefficients. Sludge assumed to be spread to agricultural land.
<b>Conditions and measures related to external treatment of waste for disposal</b>
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 antimony content of the waste is elevated enough, internal or external recovery/recycling might be considered.
Appropriate waste codes: 02 01 10*, 06 05 02*, 10 08 04, 10 08 08*, 10 08 15*, 15 01 10*, 16 06 01*, 19 02 05*, 19 12 03*
Suitable disposal: Keep separate and dispose of to either <ul style="list-style-type: none"> <li>- Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006.</li> <li>- Hazardous landfill operated under Directive 1999/31/EC.</li> </ul>
A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2012)
<b>2.2b Control of environmental exposure for scenarios discharging directly to a freshwater river</b>
<b>Amounts used</b>
500 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 330 days/year
<b>Environment factors not influenced by risk management</b>
Data on dilution was available for 3 different companies, the median value of 16 has been used for this scenario.
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>
Release factor to air: 0.2% Release factor to water: 0.012% Soil: No direct emissions to soil.
<i>Cfr. section 'Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.</i>
<b>Conditions and measures related to municipal sewage treatment plant</b>
Waste water is not discharged to a municipal STP but treated on-site before discharge into a river.
<b>Conditions and measures related to external treatment of waste for disposal</b>
<i>Cfr. section 'Conditions and measures related to external treatment of waste for disposal' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river'</i>
<b>2.2 Control 2.2c Control of environmental exposure for scenarios discharging into a marine environment</b>
<b>Amounts used</b>
500 tonnes Sb/year/site
<b>Frequency and duration of use</b>
Continuous use/release, 330 days/year
<b>Environment factors not influenced by risk management</b>
For marine assessments a default dilution of 100 is assumed.

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**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil**

Release factor to air: 0.2%  
Release factor to water: 0.012%  
Soil: No direct emissions to soil.

Cfr. section 'Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river' for more details on the selection of release factors to air and water and how these release factors can be obtained by reducing direct emissions to air and water via implementation of RMMs.

**Conditions and measures related to municipal sewage treatment plant**

Waste water is not discharged to a municipal STP but treated on-site before discharge into a marine environment.

**Conditions and measures related to external treatment of waste for disposal**

Cfr. section 'Conditions and measures related to external treatment of waste for disposal' of '2.2a Control of environmental exposure for scenarios discharging to an STP and freshwater river'

**3. Exposure estimation and reference to its source**

**Occupational exposure**

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for (di)antimony trioxide of 0.5 mg/m<sup>3</sup>.

Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Loading & Mixing	analogous data from the handling of (di)antimony trioxide in the production of plastics (90 <sup>th</sup> percentile)	0.19 mg/m <sup>3</sup> (0.38)	Dermal exposure has to be minimised to an extent as technically feasible when working under certain conditions as described in above exposure scenario section 2 and in section 8 and section 11 of the core MSDS.	
Preparation	analogous data from the handling of (di)antimony trioxide in the production of plastics (90 <sup>th</sup> percentile)	0.19 mg/m <sup>3</sup> (0.38)		
Processing	qualitative assessment	negligible (<1)		
Final handling	qualitative assessment	negligible (<1)		
Application and mixing of paints	MEASE	0.05 mg/m <sup>3</sup> (0.1)		
Spraying of paints and coatings	MEASE	0.115 mg/m <sup>3</sup> (0.23)		

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<b>Environmental emissions</b>						
Local PEC for scenario a) discharging to an STP and freshwater river						
Air mg.m-3 (RCR)	Fresh water mg/l (RCR)	Marine water mg/l (RCR)	Sediment freshwater mg/kg wwt (RCR)	Sediment marine water mg/kg wwt (RCR)	Soil mg/kg wwt (RCR)	STP mg/l (RCR)
7.6E-04 (NA)	2.5E-03 (0.022)	No discharge to marine environment	2.38 (0.31)	No discharge to marine environment	4.70 (0.144)	0.019 (0.007)
Local PEC for scenario b) discharging directly to a freshwater river						
7.6E-04 (NA)	6.5E-03 (0.053)	No discharge to marine environment	5.83 (0.747)	No discharge to marine environment	1.79 (0.055)	No discharge to STP
Local PEC for scenario c) discharging into a marine environment						
7.6E-04 (NA)	No discharge to freshwater environment	1.1E-03 (0.093)	No discharge to freshwater environment	1.48 (0.947)	1.79 (0.055)	No discharge to STP
<b>4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES</b>						
<b>Occupational exposure/ Environmental emissions</b>						
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). If measured data are not available, scaling tool for human health part is: MEASE (free download via: <a href="http://www.ebrc.de/mease.html">www.ebrc.de/mease.html</a> ). For environmental exposure: DU-Scaling tool (free download via: <a href="http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool/">http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool/</a> ).						

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**vi) Exposure Scenario N. 6**

<b>Use of (di)antimony trioxide in the production and use of wood adhesives</b>				
<b>Systematic title based on use descriptor</b>	SU3 (Industrial uses), SU6a (Manufacture of wood and wood products) PC1 AC11 (appropriate PROCs and ERCs are given in section 2 below)			
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.			
<b>Assessment Method</b>	For occupational assessment either measured data or MEASE was used. Environmental assessment uses EUSES.			
<b>2. Operational conditions and risk management measures</b>				
<b>Workplace</b>	<b>Involved tasks</b>	<b>Involved PROCs</b>	<b>Involved ERC</b>	
<b>Powder handling</b>	Powder handling, mixing, formulation	5, 26	5	
<b>Further processing</b>	Press-loading, pressing, rolling, sawing	8b, 14, 21, 24		
<b>2.1 Control of workers exposure</b>				
<b>Product characteristic</b>				
<b>Workplace</b>	<b>Used in preparation</b>	<b>Content in preparation</b>	<b>Physical form</b>	<b>Emission potential</b>
<b>Powder handling</b>	not restricted		powder	high
<b>Further processing</b>	yes	<5 %	sticky mixture	high
<b>Amounts used</b>				
Not restricted.				
<b>Frequency and duration of use/exposure</b>				
Duration of exposure is not restricted except for the workplace "Powder handling" which is limited to 180 minutes.				
<b>Human factors not influenced by risk management</b>				
The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m <sup>3</sup> /shift (8 hours).				
<b>Other given operational conditions affecting workers exposure</b>				
Not restricted or not relevant.				
<b>Technical conditions and measures at process level (source) to prevent release</b>				
Powder handling should be conducted in closed systems. Containment of other workplaces is not required.				
<b>Technical conditions and measures to control dispersion from source towards the worker</b>				
A standard local exhaust ventilation (efficiency of 78%) is required during connecting tasks of (di)antimony trioxide containers to the system. Localised controls for other workplaces are not required. Consider control rooms or other measures to separate workers from emission sources if a reduced exposure duration is given above.				
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>				
Check section 7.1.2, section 8.2.2.2 and section 11 in the core MSDS for further information.				

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<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
<b>Workplace</b>	<b>Specification of respiratory protective equipment (RPE)</b>	<b>RPE efficiency (assigned protection factor, APF)</b>	<b>Specification of gloves</b>	<b>Further personal protective equipment (PPE)</b>
<b>Powder handling</b>	FFP1 mask	APF=4	protective gloves	standard working clothes (overall with long sleeves) and safety shoes
<b>Further processing</b>	FFP1 mask	APF=4	protective gloves	
<b>2.2 Control of environmental exposure</b>				
<b>Amounts used</b>				
15 tonnes Sb/year/site				
<b>Frequency and duration of use</b>				
Continuous use/release, 300 days/year				
<b>Environment factors not influenced by risk management</b>				
Not relevant				
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>				
<p>This exposure scenario is covered by the FEICA spERCs 2.1a.v2, 2.2b.v2, 5.1a.v2, 5.1c.v2.                      The most worst case release factor from the spERCs is selected for the air compartment (FEICA spERC 5.1a.v2).                      There are no releases of waste water so the release factor to water is considered 0%.                      Release factor to air: 1.7% - No onsite RMM considered as there is a very small release to air.                      Release factor to water: 0%                      Soil: No direct emissions to soil.</p>				
<b>Conditions and measures related to municipal sewage treatment plant</b>				
There is no release to waste water therefore no STP is required				
<b>Conditions and measures related to external treatment of waste for disposal</b>				
<p>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 antimony content of the waste is elevated enough, internal or external recovery/recycling might be considered.</p> <p>Appropriate waste codes: 02 01 10*, 06 05 02*, 10 08 04, 10 08 08*, 10 08 15*, 15 01 10*, 16 06 01*, 19 02 05*, 19 12 03*</p> <p>Suitable disposal: Keep separate and dispose of to either</p> <ul style="list-style-type: none"> <li>- Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006.</li> <li>- Hazardous landfill operated under Directive 1999/31/EC.</li> </ul> <p>A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2012)</p>				
<b>3. Exposure estimation and reference to its source</b>				
<b>Occupational exposure</b>				
The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for (di)antimony trioxide of 0.5 mg/m <sup>3</sup> .				
<b>Workplace</b>	<b>Method used for inhalation exposure assessment</b>	<b>Inhalation exposure estimate (RCR)</b>	<b>Method used for dermal exposure assessment</b>	<b>Dermal exposure estimate (RCR)</b>
<b>Powder handling</b>	analogous data from the handling of (di)antimony trioxide in plastics (90 <sup>th</sup> percentile)	0.143 mg/m <sup>3</sup> (0.29)	Dermal exposure has to be minimised to an extent as technically feasible when working under certain conditions as described in above exposure scenario section 2 and in section 8 and section 11 of the core MSDS.	
<b>Further processing</b>	MEASE (PROC 24 as worst case assumption)	0.275 (0.55)		

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<b>Environmental emissions</b>						
Local PEC						
<b>Air mg.m-3 (RCR)</b>	<b>Fresh water mg/l (RCR)</b>	<b>Marine water mg/l (RCR)</b>	<b>Sediment freshwater mg/kg wwt (RCR)</b>	<b>Sediment marine water mg/kg wwt (RCR)</b>	<b>Soil mg/kg wwt (RCR)</b>	<b>STP mg/l (RCR)</b>
2.0E-04 (NA)	No discharge to waste water	No discharge to waste water	No discharge to waste water	No discharge to waste water	1.57 (0.05)	No discharge to waste water
<b>4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES</b>						
<b>Occupational exposure/ Environmental emissions</b>						
<p>The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). If measured data are not available, scaling tool for human health part is: MEASE (free download via: <a href="http://www.ebrc.de/mease.html">www.ebrc.de/mease.html</a>). For environmental exposure: DU-Scaling tool (free download via: <a href="http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool/">http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool/</a>).</p>						



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**vii) Exposure Scenario N. 7**

**Professional uses of diantimony trioxide preparations (Use of (di)antimony trioxide in pigments, paints, coatings, flexible sealing materials)**

<b>Systematic title based on use descriptor</b>	SU22 (Professional uses) PC1, PC9a, PC18, PC20, PC24, PC26, PC32, PC34 (appropriate PROCs and ERCs are given in section 2 below)
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.
<b>Assessment Method</b>	For occupational assessment either measured data or MEASE was used. Environmental assessment uses EUSES.

**2. Operational conditions and risk management measures**

Workplace	Involved tasks	Involved PROCs	Involved ERC
Mixing of paints	Mixing/handling of paints	8a, 19	8c, 8f, 10a, 11a, 12a
Application of paints	Painting, brushing and roller applications	10, 13	
Spraying of paints	Paint spraying	11	
Use of preparations at elevated temperatures	Application of flame retarded flexible sealing materials	23	

**2.1 Control of workers exposure**

**Product characteristic**

Workplace	Used in preparation	Content in preparation	Physical form	Emission potential
Mixing of paints	not restricted		aqueous solution	very low
Application of paints	not restricted		aqueous solution	very low
Spraying of paints	yes	<1 %	aqueous solution	medium
Use of preparations at elevated temperatures	yes	<25 %	bound in solid matrix	low (process temperature is far below melting point of (di)antimony trioxide)

**Amounts used**

Not restricted.

**Frequency and duration of use/exposure**

Duration of exposure is not restricted except for the workplace "Spraying of paints" which is limited to 240 minutes.

**Human factors not influenced by risk management**

The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m<sup>3</sup>/shift (8 hours).

**Other given operational conditions affecting workers exposure**

Not restricted or not relevant.

**Technical conditions and measures at process level (source) to prevent release**

No containment for any workplace is required.

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

A dilution ventilation is required during all workplaces. Consider control rooms or other measures to separate workers from emission sources if a reduced exposure duration is given above.

**Organisational measures to prevent /limit releases, dispersion and exposure**

Check section 7.1.2, section 8.2.2.2 and section 11 in the core MSDS for further information.

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<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>				
<b>Workplace</b>	<b>Specification of respiratory protective equipment (RPE)</b>	<b>RPE efficiency (assigned protection factor, APF)</b>	<b>Specification of gloves</b>	<b>Further personal protective equipment (PPE)</b>
Mixing of paints	not required	na	water-proof gloves	standard working clothes (overall with long sleeves) and safety shoes
Application of paints	not required	na	water-proof gloves	
Spraying of paints	FFP1 mask	APF=4	water-proof gloves	
Use of preparations at elevated temperatures	FFP2 mask	APF=10	heat resistant gloves	

## 2.2 Control of environmental exposure

### Amounts used

Based on a EU tonnage of 30000 tonnes Sb/year and equation given in R.16 (EU tonnage/10/2000\*4) the modelled tonnage is 6 tonnes Sb/year/typical STP. This therefore covers the combined risk from all uses (professional and consumer) of (di)antimony trioxide containing products and articles.

### Frequency and duration of use

Continuous use/release, 365 days/year

### Environment factors not influenced by risk management

Default data for receiving water and for the municipal sewage treatment plant are 18 000 m<sup>3</sup>/d and 2000 m<sup>3</sup>/d, respectively (resulting dilution factor 10). For marine assessments a default additional tenfold dilution is assumed.

### Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

For local assessment of diffuse inputs of Sb all emissions are assumed to go to a local sewage treatment works.

Modelled release factors to water: 3.2% before STP (ERC).

Release factors to air and soil are not relevant because only a local assessment of the municipal STP and subsequent aquatic compartment is required.

### Conditions and measures related to municipal sewage treatment plant

EUSES default STP with primary settler with effluent discharge rate 2000000/d, serving 10000 inhabitants. Zero degradation assumed. 79.1 % to sludge, 20.9 % to water calculated in EUSES based on partition coefficients. Sludge assumed to be spread to agricultural land.

### Conditions and measures related to external treatment of waste for disposal

Appropriate waste codes: 20 01 34, 20 01 40, 20 03 01, 20 03 07

Suitable Disposal:

Waste from end-of-life articles can be disposed of as municipal waste, except when they are separately regulated, like electronic devices, batteries, vehicles, etc.

Disposal of wastes is possible via incineration (operated according to Directive 2000/76/EC on the incineration of waste) or landfilling (operated according to Reference Document on the Best available Techniques for Waste Industries of August 2006 and Council Directive 1999/31/EC and Council Decision 19 December 2002).

A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2012)

## 3. Exposure estimation and reference to its source

### Occupational exposure

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for (di)antimony trioxide of 0.5 mg/m<sup>3</sup>.

<b>Workplace</b>	<b>Method used for inhalation exposure assessment</b>	<b>Inhalation exposure estimate (RCR)</b>	<b>Method used for dermal exposure assessment</b>	<b>Dermal exposure estimate (RCR)</b>
Mixing of paints	MEASE	0.05 mg/m <sup>3</sup> (0.1)	Dermal exposure has to be minimised to an extent as technically feasible when working under certain conditions as described in above exposure scenario section 2 and in section 8 and section 11 of the core MSDS.	
Application of paints	MEASE	0.05 mg/m <sup>3</sup> (0.1)		
Spraying of paints	MEASE	0.3 mg/m <sup>3</sup> (0.6)		
Using of preparations at elevated temperatures	MEASE	0.3 mg/m <sup>3</sup> (0.6)		

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<b>Environmental emissions</b>						
Local PEC for wide dispersive use with low or no intended releases						
<b>Air mg.m-3 (RCR)</b>	<b>Fresh water mg/l (RCR)</b>	<b>Marine water mg/l (RCR)</b>	<b>Sediment freshwater mg/kg wwt (RCR)</b>	<b>Sediment marine water mg/kg wwt (RCR)</b>	<b>Soil mg/kg wwt (RCR)</b>	<b>STP mg/l (RCR)</b>
NR	5.87E-03 (0.052)	7.2E-04 (0.063)	5.6 (0.72)	1.15 (0.74)	9.93 (0.30)	5.5E-02 (0.022)
<b>4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES</b>						
<b>Occupational exposure/ Environmental emissions</b>						
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). If measured data are not available, scaling tool for human health part is: MEASE (free download via: <a href="http://www.ebrc.de/mease.html">www.ebrc.de/mease.html</a> ).						

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**viii) Exposure Scenario N. 8**

<b>Professional uses of (di)antimony trioxide contained in articles</b>			
<b>Systematic title based on use descriptor</b>	SU22 (Professional uses) AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in section 2 below)		
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.		
<b>Assessment Method</b>	For occupational assessment either measured data or MEASE was used. Environmental assessment uses EUSES.		
<b>2. Operational conditions and risk management measures</b>			
Workplace	Involved tasks	Involved PROCs	Involved ERC
Use of back-coated textiles	Cutting, pressing, smoothing, etc. of flame retarded textiles in upholstery industry	21	8c, 8f, 10a, 11a, 12a
Use of flame retarded rubber goods	Installation and use of flame retarded conveyor belts in underground mining and other niche applications	21	
Processing of flame retarded articles	Sawing and grinding of wood treated with flame retarded adhesives	24	
Handling of other flame-retarded articles	Use (installation and subsequent use) of flame retarded articles (such as plastic cases of electrical installations, flame retarded cable insulations, etc.)	21	
<b>2.1 Control of workers exposure</b>			
<b>Product (article) characteristic</b>			
Workplace	Content in article	Release potential	Emission potential
Use of back-coated textiles	<25 %	applied to textile back-surface, not bound into matrix	medium dustiness during abrasive tasks, professional use of upholstery (very low dustiness) is assumed to be covered
Use of flame retarded rubber goods	<25 %	tightly bound into rubber matrix	very low dustiness
Processing of flame retarded articles	<25 %	tightly bound in wood adhesive	low dustiness during abrasive tasks (e.g. grinding)
Handling of other flame-retarded articles	<25 %	tightly bound in plastics matrix	very low dustiness
<b>Amounts (contained in articles) present at workplace</b>			
Not restricted.			
<b>Frequency and duration of use/exposure</b>			
Duration of exposure is not restricted for any workplace.			
<b>Human factors not influenced by risk management</b>			
The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m <sup>3</sup> /shift (8 hours).			

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<b>Other given operational conditions affecting workers exposure</b>
Not restricted or not relevant.
<b>Technical conditions and measures at process level (source) to prevent release</b>
No containment for any workplace is required.
<b>Technical conditions and measures to control dispersion from source towards the worker</b>
An integrated local exhaust ventilation (efficiency 80%) is required in workplace "Processing of flame retarded articles". Dilution ventilation is required in workplace "Use of back-coated textiles" and "Use of flame retarded rubber goods". Localised controls for other workplaces are not required. Consider control rooms or other measures to separate workers from emission sources if a reduced exposure duration is given above.
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>
Check section 7.1.2, section 8.2.2.2 and section 11 in the core MSDS for further information.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
No respiratory protective equipment required for any workplace. Check section 8 in the core MSDS for further information.
<b>2.2 Control of environmental exposure</b>
<b>Amounts used</b>
Based on a EU tonnage of 30000 tonnes Sb/year and equation given in R.16 (EU tonnage/10/2000*4) the modelled tonnage is 6 tonnes Sb/year/typical STP. This therefore covers the combined risk from all uses (professional and consumer) of (di)antimony trioxide containing products and articles.
<b>Frequency and duration of use</b>
Continuous use/release, 365 days/year
<b>Environment factors not influenced by risk management</b>
Default data for receiving water and for the municipal sewage treatment plant are 18 000 m <sup>3</sup> /d and 2000 m <sup>3</sup> /d, respectively (resulting dilution factor 10). For marine assessments a default additional tenfold dilution is assumed.
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>
For local assessment of diffuse inputs of Sb all emissions are assumed to go to a local sewage treatment works. Modelled release factors to water 3.2% before STP (ERC). Release factors to air and soil are not relevant because only a local assessment of the municipal STP and subsequent aquatic compartment is required.
<b>Conditions and measures related to municipal sewage treatment plant</b>
EUSES default STP with primary settler with effluent discharge rate 2000000l/d, serving 10000 inhabitants. Zero degradation assumed. 79.1 % to sludge, 20.9 % to water calculated in EUSES based on partition coefficients. Sludge assumed to be spread to agricultural land.
<b>Conditions and measures related to external treatment of waste for disposal</b>
Appropriate waste codes: 20 01 34, 20 01 40, 20 03 01, 20 03 07 Suitable Disposal: Waste from end-of-life articles can be disposed of as municipal waste, except when they are separately regulated, like electronic devices, batteries, vehicles, etc. Disposal of wastes is possible via incineration (operated according to Directive 2000/76/EC on the incineration of waste) or landfilling (operated according to Reference Document on the Best available Techniques for Waste Industries of August 2006 and Council Directive 1999/31/EC and Council Decision 19 December 2002).  A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2012)

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**3. Exposure estimation and reference to its source**

**Occupational exposure**

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for (di)antimony trioxide of 0.5 mg/m<sup>3</sup>.

Workplace	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Use of back-coated textiles	published data (upholstery, Iavicoli, 2002)	0.001 mg/m <sup>3</sup> (0.002)	Dermal exposure has to be minimised to an extent as technically feasible when working under certain conditions as described in above exposure scenario section 2 and in section 8 and section 11 of the core MSDS.	
Use of flame retarded rubber goods	MEASE	0.03 mg/m <sup>3</sup> (0.06)		
Processing of flame retarded articles	MEASE	0.24 mg/m <sup>3</sup> (0.48)		
Handling of other flame-retarded articles	MEASE	0.03 mg/m <sup>3</sup> (0.06)		

**Environmental emissions**

Local PEC for wide dispersive uses with low release

Air mg.m-3 (RCR)	Fresh water mg/l (RCR)	Marine water mg/l (RCR)	Sediment freshwater mg/kg wwt (RCR)	Sediment marine water mg/kg wwt (RCR)	Soil mg/kg wwt (RCR)	STP mg/l (RCR)
NR	5.87E-03 (0.052)	7.2E-04 (0.063)	5.6 (0.72)	1.15 (0.74)	9.93 (0.30)	5.5E-02 (0.022)

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

**Occupational exposure/ Environmental emissions**

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). If measured data are not available, scaling tool for human health part is: MEASE (free download via: [www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)).

\*\*\*\*\*THE END OF REPORT\*\*\*\*\*