# SAFETY DATA SHEET

## Lead metal (lead metal powder [particle diameter <1mm])

Safety Data Sheet according to REACH Regulation (EC 1907/2006), and CLP Regulation (EC 1272/2008).

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

**1.1 Product identifier**

**Name of Substance:** **Lead metal (lead metal powder [particle diameter <1mm])**

| | |
|---|---|
| **EC number:** | **231-100-4** |
| **EC name:** | **Lead** |
| **CAS number (EC inventory):** | **7439-92-1** |
| **Registration number** | **[to be added by registrant]** |

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

Uses considered in Exposure Scenarios (short summaries in Annex):

1 Lead Powder Production
2 Use of Lead metal in production of a range of lead articles (e.g. cast, rolled and extruded production, ammunition and lead shot)
3 Professional use of lead solder

The placing on the market for supply to the general public is prohibited for lead metal powder on its own and in mixtures at 0.03% or more Pb by weight. As such, the consumer use of lead solder is a use advised against.

In accordance with the CSR, the use of lead shot over wetlands is a use advised against.

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

Company Name
Address
Address
Address
Tel:
Fax.
E mail:

**1.4 Emergency telephone number**

**In case of emergency** **Tel.** **(24 hours, or if not, specify when available)**

### SECTION 2: Hazards Identification

**2.1 Classification of the substance or mixture**

The following acute Ecotoxicity Reference Values (ERVs) were used to determine the classification of **lead metal powder**:

| pH range | Descriptor | ERV |
|---|---|---|
| 6 | ERV (Ecotoxicity Reference Value) | 73.6 µg Pb/L (dissolved) |
| 7 | ERV (Ecotoxicity Reference Value) | 37.8 µg Pb/L (dissolved) |
| 8 | ERV (Ecotoxicity Reference Value) | 20.5 µg Pb/L (dissolved) |

The following chronic Ecotoxicity Reference Values (ERVs) were used to determine the classification of **lead metal powder**:

| pH range | Descriptor | ERV |
|---|---|---|
| 6 | ERV (Ecotoxicity Reference Value) | 17.8 µg Pb/L (dissolved) |
| 7 | ERV (Ecotoxicity Reference Value) | 9.0 µg Pb/L (dissolved) |
| 8 | ERV (Ecotoxicity Reference Value) | 6.1 µg Pb/L (dissolved) |

### 2.1.1 Industry classification proposals

| Name | Classification | Specific concentration limits, M-factors |
|---|---|---|
| Lead powder; [particle diameter <1mm] | **Repr. 1A**; H360FD: May damage fertility. May damage the unborn child.<br>**Lact.**; H362: May cause harm to breast-fed children.<br>**STOT RE1**; H372: Causes damage to organs through prolonged or repeated exposure.<br>**Aquatic Acute 1**; H400: Very toxic to aquatic life.<br>**Aquatic Chronic 1**; H410: Very toxic to aquatic life with long lasting effects. | Repr. 1A; H360D: C ≥ 0.03%;<br>STOT RE 1; H372: C ≥ 0.5% |

## 2.2 Label elements

**Classification Labelling and Packaging Regulation EC 1272/2008**

**Danger**

H360FD May damage fertility. May damage the unborn child.
H362 May cause harm to breast-fed children.
H372 Causes damage to central nervous system, blood and kidneys through prolonged or repeated exposure by inhalation or ingestion.
H410 Very toxic to aquatic life with long lasting effects.

[P Statements – six most appropriate to be selected by supplier]

**Labelling required under REACH Annex XVII, Entry 30: 'Restricted to professional users'.**

## 2.3 Other hazards

Melting or operations generating dust, fume or vapours can result in sufficient lead entering the body to be hazardous to health. Oxidation products (including lead compounds) may also form on the surface of metallic lead.

See Section 11 for more information on the health hazards.

[Any further relevant hazards to be completed by supplier for their specific products]

# SECTION 3: Composition/information on ingredients

## 3.1 Substances

| Constituent | EC Number | Concentration (% w/w) | Hazard classification |
|---|---|---|---|
| Lead | 231-100-4 | >95 [registrant to add own purity] | **Repr. 1A**; H360FD: May damage fertility. May damage the unborn child.<br><br>**Lact.; H362:** May cause harm to breast-fed children.<br><br>**STOT RE1; H372:** Causes damage to organs through prolonged or repeated exposure.<br><br>**Aquatic Acute 1**; H400: Very toxic to aquatic life.<br><br>**Aquatic Chronic 1**; H410: Very toxic to aquatic life with long lasting effects. |

| Impurity | EC Number | Concentration (% w/w) | Hazard classification |
|---|---|---|---|
| [Registrant to add other | [Registrant to indicate EC | [Registrant to indicate | [Registrant to indicate the |

| | | | |
|---|---|---|---|
| impurities in their own product, if hazardous and if over thresholds of concern] | number or other international identifier] | concentration] | hazard associated with that impurity] |

**3.2 Mixtures**
Not applicable

## SECTION 4: First Aid Measures

**4.1 Description of first aid measures**

EYE CONTACT: Ensure that contact lenses are removed before rinsing eyes. Separate eyelids, wash the eyes thoroughly with water (15 min). Seek medical attention if irritation persists.

INHALATION: Move to fresh air. If required, provide artificial respiration. Consult doctor if symptoms persist. In case of unconsciousness place patient securely in side position for transportation.

SKIN CONTACT: Remove any contaminated clothing. Wash affected area with water and soap immediately and rinse thoroughly. Seek medical attention if irritation persists.

INGESTION: Rinse mouth with water. Call for a doctor immediately. Show this safety data sheet.

**4.2 Most important symptoms and effects, both acute and delayed**
Clinical manifestations of lead poisoning include weakness, irritability, asthenia, nausea, abdominal pain with constipation, and anaemia.

**4.3 Indication of any immediate medical attention and special treatments needed**
Symptoms of poisoning may occur after several hours; seek medical attention.

## SECTION 5: Firefighting Measures

**5.1 Extinguishing media**
The product itself does not burn. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.CO2, powder or water spray. Fight larger fire with alcohol resistant foam. For safety reasons unsuitable extinguishing agents: water with full jet.

**5.2 Special hazards arising from the substance or mixture**
In case of fires, hazardous combustion gases are formed: Lead fumes; Lead oxide.

**5.3 Advice for fire fighters**
Use respiratory protective equipment.

## SECTION 6: Accidental Release Measures

**6.1 Personal precautions, protective equipment and emergency procedures**
Avoid formation of dust. Wear suitable respiratory protective equipment. See Section 8 for further details.

**6.2 Environmental precautions**
Do not allow to enter sewers / surface or ground water. In case of spillage to water course or public sewers inform responsible authorities.

**6.3 Methods and materials for containment and clearing up**
Arrange for recovery or disposal in suitable containers. Dispose contaminated material as hazardous waste. Ensure adequate ventilation.

**6.4 References to other sections**
See Sections 8 and 13 for further advice.

## SECTION 7: Handling and Storage

**7.1 Precautions for safe handling**
Thorough dedusting. Ensure good ventilation/extraction at the workplace. Open and handle receptacle with care. Keep respiratory protective equipment available. The product is not flammable.

**7.2 Conditions for safe storage, including any incompatibilities**
Keep container closed. Store in dry condition. Keep receptacle tightly sealed.

**7.3 Specific end uses(s)**
Specific Exposure Scenarios included as an Annex to Section 16.

## SECTION 8. Exposure Controls/Personal Protection

**8.1 Control parameters**

**8.1.1 Human Toxicity values**

OELs - Lead and inorganic compounds (as Pb):

| | **Limit values – 8 hours mg/m³** | **Limit values – short term mg/m³** |
|---|---|---|
| European Union | 0.15 inhalable aerosol | |
| | | |
| Austria | 0.1 inhalable aerosol | 0.4 inhalable aerosol |
| Belgium | 0.15 | |

| | | |
|---|---|---|
| Denmark | 0.05 inhalable aerosol | 0.10 inhalable aerosol |
| Finland | 0.1 | |
| France | 0.1 inhalable aerosol | |
| Germany (AGS) | 0.1 inhalable aerosol | |
| Hungary | 0.15 inhalable aerosol<br>0.05 respirable aerosol | 0.60 inhalable aerosol<br>0.2 respirable aerosol |
| Ireland | 0.15 | |
| Italy | 0.15 inhalable aerosol | |
| Latvia | 0.005 | 0.01 (15-min average) |
| Poland | 0.05 | |
| Spain | 0.15 inhalable aerosol | |
| Sweden | 0.1 inhalable aerosol<br>0.15 respirable aerosol | |
| Switzerland | 0.1 inhalable aerosol | 0.8 inhalable aerosol |
| United Kingdom | 0.15 | |

Biological action levels, inorganic lead

[Registrant to add other national biological action levels as required.]

| | |
|---|---|
| European Union | 70 µg/dL (Binding Limit Value) |
| | |
| Denmark | 20 µg/dL |
| Germany | 40 µg/dL<br>10 µg/dL (for woman, age below 45 years) [Suspended] |
| France | 40 µg/dL<br>30 µg/dL (for woman of reproductive capacity) |
| Ireland | 70 µg/dL |
| Italy | 60 µg/dL<br>20 µg/dL (for woman of reproductive capacity) |
| Spain | 70 µg/dL |
| United Kingdom | 60 µg/dL<br>30 µg/dL (for woman of reproductive capacity) |

DN(M)ELs for workers:

| **Exposure pattern** | **Route** | **Descriptors** | **DNEL/DMEL (appropriate unit)** | **Most sensitive endpoint** |
|---|---|---|---|---|
| Acute – systemic effects | Dermal (mg/kg bw /day) | NA | NA | NA |
| | Inhalation (mg/m$^3$) | NA | NA | NA |
| Acute – local effects | Dermal (mg/cm$^2$) | NA | NA | NA |
| | Inhalation (mg/m$^3$) | NA | NA | NA |
| Long-term – systemic effects | Systemic (µg lead /dL blood) | NOAEL = 40 µg/dL<br><br>NOAEL = 10 µg/dL | 40 µg/dL<br><br>10 µg/dL | Adult neurological function<br>Developmental effect on foetus of pregnant women |
| Long-term – local effects | Dermal (mg/cm$^2$) | NA | NA | NA |
| | Inhalation (mg/m$^3$) | NA | NA | NA |

### 8.1.2 Ecological toxicity values

The following Predicted No Effect Concentrations were used to determine the environmental risk of lead metal:

| **Compartment** | **PNEC Value** |
|---|---|
| Freshwater | 3.1 µg Pb/L (dissolved lead) |
| Marine water | 3.5 µg Pb/L (dissolved lead) |
| Freshwater sediment (with/without bioavailability correction) | 41.0/174.0 mg Pb/kg dw |
| Marine water sediment | 164.2 mg Pb/kg dw |
| Terrestrial | 212.0 mg Pb/kg dw |
| STP Micro-organisms | 0.1 mg Pb/L |

## 8.2 Exposure controls

### 8.2.1 Organisational measures

Personal Hygiene: Ensure workers follow simple hygiene rules (e.g. do not bite nails and keep them cut short, avoid touching or scratching face with dirty hands or gloves); Ensure workers do not wipe away sweat with hands or arms; Ensure workers use disposable tissues rather than a handkerchief; Prohibit drinking, eating and smoking in production areas, or access to eating and non-production areas in working clothes; Ensure workers wash hands, arms, faces and mouths (but preferably shower) and change into clean clothing before entering eating areas; For high exposure workplaces, separate rooms for cleaning hands,

removal of clothes, showers and clean clothes may be necessary; Ensure workers handle dirty working clothes with care; Allow no personal belongings to be taken into production areas, or items that have been used in production areas to be taken home. Ensure general shop cleanliness is maintained by frequent washing/vacuuming. Clean every workplace at the end of every shift.

Blood lead monitoring: Set in place a certified monitoring regime which covers all site activities; Define a policy for submitting workers to regular blood lead monitoring, including increased frequency for workers undertaking high-risk jobs and workers with elevated blood lead levels; Ensure all workers have a blood test prior to working on site. Set an "action level" that is typically 5 µg/dL below the exposure limit deemed to be safe. If the action level is exceeded, appropriate measures are to be taken, to prevent further increases in blood lead. If the safe threshold is exceeded, continue or begin ban on overtime, ensure strict hygiene procedures are followed, undertake detailed inspections to ensure correct use of personal protective equipment, undertake detailed inspections to ensure recommended workplace procedures are followed, move employee to workplace where exposure is expected to be lower or remove from lead environment altogether, further increase blood lead sampling frequency, and continue frequent sampling until results are below the first action level.

**8.2.2 Personal Protection Equipment**

Respiratory protection: Suitable respiratory protective device recommended. In case of brief exposure or low pollution use dust mask or half mask with particle filter P2. Assess the need to wear respiratory protective equipment in production areas. Consider use effective masks accompanied by a compliance policy (ensure proper shaving; ensure workers do not remove RPE in production areas in order to communicate). Where masks are used, employ formal mask cleaning and filter changing strategies.

Hand Protection: Protective gloves. Material of gloves: Neoprene or Leather.

Eye protection: Safety glasses.

Skin protection: Wear protective work clothing. For workers in areas of significant exposure, provide sufficient working clothes to enable daily change into clean clothes. In such cases all work clothing should be cleaned by the employer on a daily basis and is not permitted to leave the work site.

**8.2.3 Environmental Protection**

One or more of the following measures may if necessary be taken to reduce emissions to water:
- Chemical precipitation: used primarily to remove the metal ions
- Sedimentation
- Filtration: used as final clarification step
- Electrolysis: for low metal concentration
- Reverse osmosis: extensively used for the removal of dissolved metals
- Ion exchange: final cleaning step in the removal of heavy metal from process wastewater

One or more of the following measures may if necessary be taken to reduce emissions to air:
- Electrostatic precipitators using wide electrode spacing: Wet electrostatic precipitators:
- Cyclones, but as primary collector Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values Membrane filtration techniques can achieve
- Ceramic and metal mesh filters. PM10 particles are removed
- Wet scrubbers

Lead removal from treatment works should be at least the minimum default 84% removal used in the CSR. Solid material collected from on-site treatment must be sent for metal recovery or treated as hazardous waste. Waste water treatment sludge must be recycled, incinerated or landfilled and not used as agricultural fertiliser.

## SECTION 9: Physical and Chemical Properties

**9.1 Information on basic physical and chemical properties**

| | |
|---|---|
| **Appearance:** | Grey-blue powder |
| **Odour:** | None |
| **Odour threshold:** | Not applicable |
| **pH:** | Not applicable |
| **Melting point:** | 326°C |
| **Boiling point:** | >600°C |
| **Flashpoint:** | Not applicable |
| **Evaporation rate:** | Not applicable |
| **Flammability:** | Not flammable |
| **Upper/lower flammability limits:** | Not applicable |
| **Vapour pressure:** | Not applicable |
| **Vapour density** | Not applicable |
| **Relative density** | 11.45 |
| **Solubility in water:** | 185 mg/L at 20°C (pH 10.96) |
| **Solubility in other solvents:** | Not applicable |
| **Partition coefficient (log Kow)** | Not applicable |
| **Autoignition temperature** | Not applicable |
| **Decomposition temperature** | Not applicable |
| **Viscosity** | Not applicable |
| **Explosive properties** | Not explosive |
| **Oxidising properties** | Not oxidising |

**9.2 Other information**

**Particle size:** [To be confirmed by each supplier]

## SECTION 10: Stability and Reactivity

**10.1 Reactivity**
Lead is not a reactive substance and no reactive hazards are expected.

**10.2 Chemical stability**
Expected to be stable under normal conditions of use.

**10.3 Possibility of hazardous reactions**
No hazardous reactions expected under normal conditions of use.

**10.4 Conditions to avoid**
Not applicable.

**10.5 Incompatible materials**
Strong oxidising agents.

**10.6 Hazardous decomposition products**
No decomposition if used as directed.

## SECTION 11: Toxicological Information

**11.1 Information on toxicological effects**

This product has not been tested for most endpoints although carcinogenicity studies have been conducted. Judgements on the expected toxicity of this product have been made based upon consideration of sparingly soluble inorganic lead compounds and the agreed harmonised classification of lead metal powder.

| | |
|---|---|
| **Toxicokinetic assessment** | Lead metal powder is slowly absorbed by ingestion and inhalation and poorly absorbed through the skin. If absorbed, lead will accumulate in the body with low rates of excretion, leading to long-term build up. Part of risk management is to take worker blood samples for analysis to ensure that exposure levels are acceptable. |
| **(a) acute toxicity** | Lead metal in powder form is not considered to be acutely toxic. Low toxicity is also exhibited by sparingly soluble inorganic lead compounds with similar water solubility. It is not easily inhaled or ingested, and if it is accidentally ingested may pass through the gastrointestinal system without significant absorption into the body. Lead is not easily absorbed through the skin. |
| **(b) skin corrosion/irritation** | Studies have shown that sparingly soluble inorganic lead compounds are not corrosive or irritating to skin, and this lack of effect is expected also for metallic lead in the massive or powder form. This conclusion is supported by the lack of reports of irritant effects from occupational settings. |
| **(c) serious eye damage/irritation** | Studies have shown that sparingly soluble inorganic lead compounds are not corrosive or irritating to eyes, and this lack of effect is expected also for metallic lead in massive or powder forms. This conclusion is supported by the lack of reports of irritant effects from occupational settings. |
| **(d) respiratory/skin sensitisation** | There is no evidence that lead metal (massive or powder) causes respiratory or skin sensitisation. |
| **(e) germ cell mutagenicity** | The evidence for genotoxic effects of highly soluble lead compounds is contradictory, with numerous studies reporting both positive and negative effects. Responses appear to be induced by indirect mechanisms, mostly at very high concentrations that lack physiological relevance. |
| **(f) carcinogenicity** | There is some evidence that inorganic lead compounds may have a carcinogenic effect, and they have been classified by IARC as probably carcinogenic to humans (Group 2A). However, carcinogenicity tests of lead metal powder have been negative. Epidemiology studies of workers exposed to inorganic lead compounds have found a limited association with stomach cancer. IARC has concluded that lead metal is possibly carcinogenic to humans (Group 2B). |
| **(g) reproductive toxicity** | Exposure to high levels of lead and inorganic lead compounds resulting in systemic uptake may cause adverse effects on male and female fertility, including adverse effects on sperm quality. Prenatal exposure to inorganic lead compounds is also associated with adverse effects on the development of the unborn child. |
| **(h) STOT-single exposure** | Inorganic lead compounds have generally been found to be of relatively low acute toxicity by ingestion, in contact with skin, and by inhalation, with no evidence of any local or systemic toxicity from such exposures. The bioavailability of lead metal is low and acute lead exposure is not expected to result in acute toxicity effects. |
| **(i) STOT-repeated exposure** | Lead is a cumulative poison and may be absorbed into the body through ingestion or inhalation. Inorganic lead compounds have been documented in observational human |

studies to produce toxicity in multiple organ systems and body function including the haemotopoetic (blood) system, kidney function, reproductive function and the central nervous system. There is evidence that postnatal exposure to lead is associated with effects on neurobehavioral development in children.

**(j) aspiration hazard** Lead metal powder is a solid and aspiration hazards are not expected to occur.

## SECTION 12: Ecological Information

The environmental effects have been assessed using read-across from studies with similar inorganic lead compounds.

### 12.1 Toxicity

Lead powder is considered to be acutely toxic in the environment and also to present a long term hazard to aquatic organisms. Toxicity will depend on the level of free lead in solution, which in turn is affected by pH, water hardness, salinity, etc. Lead toxicity is expected to be greater in softer waters.

**Reliable acute freshwater aquatic toxicity data** (tests conducted with soluble lead salts; all toxicity data reported as dissolved lead):

| Test Organisms: | Endpoint | Range of values |
|---|---|---|
| Fish: *Pimephales promelas, Oncorhynchus mykiss* | 96h-$LC_{50}$ | pH 5.5 – 6.5: 40.8 – 810.0 µg Pb/L<br>pH >6.5 – 7.5: 52.0 – 3,598.0 µg Pb/L<br>pH > 7.5 – 8.5: 113.8 – 3,249.0 µg Pb/L |
| Invertebrates: *Daphnia magna, Ceriodaphnia dubia* | 48h-$LC_{50}$ | pH 5.5 – 6.5: 73.6 – 655.6 µg Pb/L<br>pH >6.5 – 7.5: 28.8 – 1,179.6 µg Pb/L<br>pH > 7.5 – 8.5: 26.4 – 3,115.8 µg Pb/L |
| Algae: *Pseudokirchneriella subcapitata, Chlorella kesslerii* | 72h-$ErC_{50}$ (growth rate) | pH 5.5 – 6.5: 72.0 – 388.0 µg Pb/L<br>pH >6.5 – 7.5: 26.6 – 79.5 µg Pb/L<br>pH > 7.5 – 8.5: 20.5 – 49.6 µg Pb/L |

Tests were conducted according to international accepted test guidelines or scientifically acceptable methods.

**Reliable chronic toxicity test results** (tests conducted with soluble lead salts; all toxicity data reported as dissolved lead):

| Test organisms | Range of values ($EC_{10}$, NOEC) |
|---|---|
| ***Aquatic freshwater toxicity data*** | |
| Fish: *Oncorhynchus mykiss, Salmo salar, Pimephales promelas, Salvelinus fontinalis, Ictalurus punctatus, Lepomis macrochirus, Salvelinus namaycush, Cyprinus carpio, Acipenser sinensis* | 17.8 – 1,558.6 µg Pb/L |
| Invertebrates: *Hyalella azteca, Lymnaea palustris, Ceriodaphnia dubia, Lymnaea stagnalis, Philodina rapida, Daphnia magna, Alona rectangular, Diaphanosoma birgei, Chironomus tentans, Brachionus calyciflorus, Chironomus riparius, Baetis tricaudatus.* | 1.7 – 963.0 µg Pb/L |
| Algae: *Pseudokirchneriella subcapitata, Chlorella kesslerii, Chlamydomonas reinhardtii.* | 6.1 – 190.0 µg Pb/L |
| Higher plants: *Lemna minor* | 85.0 – 1,025.0 µg Pb/L |
| The most sensitive toxicity endpoints were (reproduction; *C. dubia*) and growth (*L. stagnalis*): 1.7 µg Pb/L. Symptoms of toxicity were effects on survival, growth, reproduction, hatching, (population) growth rate and malformation during development. Toxicity of dissolved lead in freshwater is dependent on the physico-chemistry of the freshwater (mainly dissolved organic carbon, pH, hardness). | |
| **Aquatic marine toxicity data** | |
| Fish: *Cyprinodon variegatus* | 229.6 – 437.0 µg Pb/L |
| Invertebrates: *Mytilus trossolus, Americamysis bahia, Mytilus galloprovincialis, Neanthes arenaceodentata, Strongylocentrotus purpuratus, Paracentrotus lividus, Dendraster excentricus, Tisbe battagliai, Crassotrea gigas* | 9.2 – 1,409.6 µg Pb/L |
| Algae: *Skeletonema costatum, Phaeodactylum tricornutum, Dunaliella tertiolecta.* | 52.9 – 1,234.0 µg Pb/L |
| Higher plants: *Champia parvula* | 11.9 µg Pb/L |
| The most sensitive toxicity endpoint was malformation (*M. trossulus):* 9.2 µg Pb/L. Symptoms of toxicity include effects on survival, growth, growth rate, reproduction and malformation during development | |
| **Sediment freshwater toxicity data** | |
| Invertebrates: *Tubifex tubifex, Ephoron virgo, Hyalella azteca, Gammarus pulex, Lumbriculus variegatus, Hexagenia limbata, Chironomus tentans* | 573.0 – 3,390.0 mg Pb/kg dw |
| The most sensitive toxicity endpoint was reproduction (*T. tubifex*): 573.0 mg Pb/kg dw. Symptoms of toxicity include effects on survival, growth, and reproduction. Toxicity of lead in freshwater sediment is dependent on the acid volatile sulphide content (AVS) of the freshwater sediment. | |
| **Sediment marine toxicity data** | |
| Invertebrates: *Neanthes arenaceodentata, Leptocheirus plumulosus* | 680.0 – 1,291.0 mg Pb/kg dw |
| The most sensitive toxicity endpoint was growth (*N. arenaceodentata*): 680.0 mg Pb/kg dw. Symptoms of toxicity include effects on survival, growth, and reproduction | |
| **Terrestrial toxicity data** (values were determined in different topsoils with contrasting properties and spiked with soluble lead salts): | |
| Invertebrates: *Folsomia candida, Proisotoma minuta, Sinella curviseta,* | 34.0 – 2,445.0 mg Pb/kg dw |

| | |
|---|---|
| *Eisenia fetida, Eisenia andrei, Dendrobaena rubida, Lumbricus rubellus, Aporrectodea caliginosa* | |
| Plants: *Hordeum vulgare*, *Zea mays*, *Echinochloa crus-galli*, *Lolium perenne*, *Sorgum bicolor*, *Triticum aestivum*, *Oryza sativa* and *Avena sativa, Raphanus sativus, Lycopersicon esculentum, Lactuca sativa, Cucumis sativus, Picea rubens, Pinus taeda* | 57.0 – 6,774.0 mg Pb/kg dw |
| Micro-organisms: denitrification, N-mineralization, nitrification, basal respiration, substrate-induced respiration | 97.0 – 7,880.0 mg Pb/kg dw |
| The most sensitive toxicity endpoint was reproduction (*F. candida*): 34.0 mg Pb/kg. Symptoms of toxicity include effects on survival, growth, hatching, yield, reproduction, and microbe mediated processes. Toxicity of lead in soils is dependent on 1) the ageing processes and 2) the Cation Exchange Capacity (eCEC) of the soil. | |

Tests were conducted according to international accepted test guidelines or scientifically acceptable methods.

**Toxicity data for micro-organisms (for STP)** (tests conducted with soluble lead salts)*:*

| Test Organisms: | Effect | Range of values ($EC_{10}$, NOEC) |
|---|---|---|
| Bacterial populations | Respiration | 1.06 – 2.92 mg Pb/L |
| | Ammonia uptake rate | 2.79 – 9.59 mg Pb/L |
| Protozoan community | Mortality | 1.0 – 7.0 mg Pb/L |

Tests were conducted according to international accepted test guidelines or scientifically acceptable methods.
For an overview of PNECs for the different compartments, refer to Section 8.1.2.

**12.2 Persistence and degradability**

Lead is naturally occurring and ubiquitous in the environment. Lead is obviously persistent in the sense that it does not degrade to $CO_2$, water, and other elements of less environmental concern. In the water compartment, lead is rapidly and strongly bound to the suspended solids of the water column. This binding and subsequent settling to the sediment allows for rapid metal removal of lead from the water column. Insignificant remobilisation of lead from sediment is expected.

**12.3 Bioaccumulative potential**

Available BCF/BAF data for the aquatic environment show a distinct inverse relationship with the exposure concentration demonstrating that lead is homeostatically regulated by aquatic organisms. A median BAF within environmentally relevant concentrations of 1,552 $L/kg_{ww}$ is observed in aquatic organisms. In the soil compartment no bioaccumulation is expected. The BAFs are not significantly affected by the Pb concentration in the soil. A median BAF value for soil dwelling organisms is 0.10 $kg_{dw}/kg_{ww}$. Available information on transfer of Pb through the food chain indicates that lead does not biomagnify in aquatic or terrestrial food chains.

**12.4 Mobility in soil**

Lead metal powder is sparingly soluble in water and with its relatively high Kd value, is expected to be absorbed onto soils and sediments. Typical log Kd-values of 5.2, 5.7 and 3.8 have been determined for freshwater sediment, marine sediment and soil, respectively.

**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 lead monoxide The criterion for persistence is not applicable for inorganic Pb. Under conditions of a standard EUSES lake, Pb meets the criteria for rapid removal from the water column (> 70% in 28 days). Bioaccumulation criterion is not applicable to inorganic substances such as Pb. However, Pb is considered to be toxic, since the most sensitive NOECs, HC5-50 and PNEC values are lower than 10 µg Pb/L.

**12.6 Other adverse effects**

Lead metal powder is not expected to contribute to ozone depletion, ozone formation, global warming or acidification.

## SECTION 13: Disposal Considerations

**13.1 Waste treatment methods**

Should be recycled or disposed as hazardous waste. Do not allow product to reach sewage system.
European waste catalogue: [May be altered as the supplier deems appropriate]
17 04 03 lead, or
06 04 05* wastes containing other heavy metals

## SECTION 14: Transport Information

| | ADR/RID/AND | IMDG Code | IATA DGRs |
|---|---|---|---|
| 14.1 UN Number | UN3077 | UN3077 | UN3077 |
| 14.2 UN Proper Shipping Name | ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S. (Lead metal (lead metal powder (particle diameter <1mm))) | ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S. (Lead metal (lead metal powder (particle diameter <1mm))) | ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S. (Lead metal (lead metal powder (particle diameter <1mm))) |

| | | | |
|---|---|---|---|
| 14.3 Transport Hazard Class(es) | 9 | 9 | 9 |
| 14.4 Packing Group | III | III | III |
| 14.5 Environmental hazards | Environmentally Hazardous | Marine Pollutant | - |
| 14.6 Special precautions for user | No specific transport precautions | | |
| 14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code | Not transported by sea in bulk | | |
| 14.8 Other Information | *IMDG Code Segregation Group (if none applicable insert "Not Applicable")*: Segregation Groups 7 and 9 | | |

## SECTION 15: Regulatory Information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

Lead metal is included on the REACH Candidate List of Substances of Very High Concern for Authorisation (Toxic to Reproduction, Category 1A; Article 57c)

Restrictions on use: this substance is subject to REACH restrictions according to:

- Annex XVII, Entry No. 30 (regarding supply to the general public)
- Annex XVII, Entry No. 63

[Information for national regulations to be completed by supplier.]

**15.2 Chemical Safety Assessment**

A Chemical Safety Assessment has been carried out for this product.

## SECTION 16: Other Information

**H Statements used in Sections 2 and 3**

| | |
|---|---|
| H360FD | May damage fertility. May damage the unborn child. |
| H362 | May cause harm to breast-fed children. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |
| H400 | Very toxic to aquatic life |
| H410 | Very toxic to aquatic life with long lasting effects. |

**Revision information:**

[Insert Revision number based on company safety data sheet history for this substance.]

*Information for SDS compilers, delete before publishing: This SDS template was prepared according to the format required by Commission Regulation (EU) 2015/830, in light of the inclusion of Pb metal in the REACH Candidate List of substances of very high concern for Authorisation. It applies from 27 June 2018.*

**Legal Statement:**

The information contained within this Safety Data Sheet is the property of the members of the Lead REACH Consortium. Only legal entities with legitimate access may use this data.

**List of Abbreviations**

Acute Tox.: Acute Toxicity
CAS No: CAS Registry Numbers
Carc.: Carcinogenic
CLP: Classification, Labeling and Packaging of chemicals
DN(M)EL: Derived No-Effect Level or Derived Minimal Effect Level
DW: Dry weight
EC No: European Commission number
EC Name: European Commission Name
EHS: Environmentally hazardous substance
IARC: International Agency for Research on Cancer
IBC: International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
$LC_{50}$: Lethal Dose, 50%

$LD_{50}$: Lethal Dose, 50%
MARPOL: International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978
NOAEL: No observed adverse effect level.
NOEC: No Observed Effect Concentration
OELs: Occupational Exposure Limits
P Statement: Precautionary statement
PNEC: Predicted No-Effect Level
PBT: Persistent, bio-accumulative, toxic
REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals
Repr.: Reprotoxic
STOT: Single Target Organ Toxicity
SDS: Safety Data Sheet
vPvB: Very Toxic Very Bio-accumulative
WW: Wet weight

**References from Section 8.1.2**

Acute Toxicity data:

Diamond JM, Koplish DE, McMahon III J and Rost R. (1997). Evaluation of the water-effect ratio procedure for metals in a riverine system. Environmental Toxicology and Chemistry, Vol 16, No 3, pp. 509-520, 1997.

Grosell M, Gerdes R, Brix KV (2006). Influence of Ca, humic acid and pH on lead accumulation and toxicity in the fathead minnow during prolonged water-borne lead exposure. Comparative Biochemistry and Physiology, Part C 143 (2006) 473-483.

Grosell M (2010b). The effects of pH on waterborne lead toxicity in the fathead minnow, Pimephales promelas - 24 February 2010. Testing laboratory: University of Miami, USA.

Davies PH, JP Goettl, JR Sinley and NF Smith (1976). Acute and chronic toxicity of lead to rainbow trout Salmo Gairdneri, in hard and soft water. Water Research, Vol 10, pp 199-206.

Roger JT, Richards JG, Wood CM (2003). Ionoregulatory disruption as the acute toxic mechanism for lead in the rainbow trout (Oncorhynchus mykiss). Aquatic Toxicology 64 (2003) 215-234.

Schubauer-Berigan MK et al. (1993b). pH-dependent toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environmental Toxicology and Chemistry, Vol 12, pp. 1261-1266, 1993.

Spehar RL, Fiandt JT. (1986). Acute and chronic effects of water quality criteria-based metal mixtures on three aquatic species. Environ Toxicol Chem 5:917-931.

Chronic Toxicity Data:

Aery N C and Jagetiya B L (1997). Relative toxicity of Cadmium, Lead and Zinc on Barley. Commun. Soil Sci. Plant Anal., 28(11&12), 949-960. Testing laboratory: Dept. of Botany, University College of Science, M. L. Sukhaida University, Udaipur, India.

Bengtsson G., Gunnarsson T. and Rundgren S. (1986). Effects of metal pollution on the earthworm Dendrobaena Rubida (Sav.) in Acified soils. Water, Air and Soil Pollution 28 (1986) 361-383. Testing laboratory: University of Lund. Ecology Building, Helgonavagen, Sweden.

Besser JM, Brumbaugh WG, Brunson EL and Ingersoll CG (2005). Acute and chronic toxicity of lead in water and diet to the amphipod Hyalella azteca. Environmental Toxicology and Chemistry, Vol. 24, No. 7, pp. 1807-1815, 2005.

Chang F-H and Broadbent F E (1981). Influence of trace metals on carbon dioxide evolution from a yolo soil. Soil Science, vol 132 No 6, december 1981.

Farrar JD, Bridges TS. (2003). Effects of lead on Leptocheirus plumulosus, Neanthes arenaceodentata, Chironomus tentans and Hyalella azteca following long-term sediment exposures. Report for the International Lead Zinc Research Organization. US Army Engineer Research and Development Center, Vicksburg, Mississippi.

Madoni P, Davoli D, Gorbi G, Vescovi L (1996). Toxic effect of heavy metals on the activated sludge protozoan community. Water Research, 30 (1), 135-141. Testing laboratory: Istituto di Ecologica, Universita di Parma, Italy.

Madoni P, Davoli D, Guglielmi L (1999). Response to SOUR and AUR to heavy metal contamination in activated sludge. Water Research, 33 (10), 2459-2464. Testing laboratory: Dipartimento di Scienze Ambientali, Universita di Parma, Italy.

Nguyen LTH, Roman Y, Zoetardt H, Janssen CR. (2003). Ecotoxicity of lead to the tubificid oligochaete Tubifex tubifex tested in natural freshwater sediments. Draft final report to the International Lead Zinc Research Organization. Laboratory of Environmental Toxicology and Aquatic Ecology, Ghent University, Belgium.

Wood C. M. & Nadella S. (2010). Effects of salinity and DOC on Pb Toxicity to Marine Organisms. Testing laboratory: Dept. of Biology, McMaster University, Hamilton, Canada L8S 4K1. Report date: 2010-01-01.

# Annex: Exposure Scenarios

## ES 1: Lead Powder Production

| 1. Title | | |
|---|---|---|
| Identified Use | Use of lead metal in the production of powders (Solder) | |
| Systemic title based on use descriptor | SU 15, SU 17; PC 0, PC 7; ERC 2 | |
| **2. Operational conditions and risk management measures** | | |
| Involved PROCs | Involved Tasks | |
| PROC 26 | Raw material handling | |
| PROC 22, 25 | Manufacture of Solder (molten lead alloy) | |
| PROC 27a, 27b | Powder Production: Blowing of molten lead alloy with different gases | |
| PROC 27a, 27b, 26 | Powder Production: Ultrasonic atomisation (Solder falling onto an ultrasonic horn) and Centrifugal atomisation (Solder falling onto a spinning disc) | |
| PROC 21 | Storage and Shipment | |
| **2.1 Control of workers exposure** | | |
| Product characteristic | Raw material are lead or lead alloy ingots, bars, or other forms of massive lead with a lead content usually in the range 36-99%. | |
| Amounts used | Not restricted | |
| Frequency and duration of use/exposure | Full shift exposure (8 hours) for all workplaces. | |
| Human factors not influenced by risk management | See Section 8 of the SDS, above (hygiene measures affecting lead blood levels) | |
| Other given operational conditions affecting workers exposure | Indoor handling, room volume >150 $m^3$ Outdoor handing for raw material processes. | |
| Technical conditions and measures at process level (source) to prevent release | Enclosed systems are required for all workplaces other than Raw Material Handling and Storage and Shipment. | |
| Technical conditions and measures to control dispersion from source towards the worker | Controls give 78% minimum worker exposure reduction.<br>Risk Management Measures include enclosure of process equipment, negative draft exhaust systems and/or local exhaust ventilation. Pass waste air through cleaning equipment. | |
| Organisational measures to prevent /limit releases, dispersion and exposure | See Section 8 of the core SDS, above. | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Minimum Respiratory Protective Equipment (RPE) is FFP 2 mask, except in cases where adequate ventilation/emission control in place (see also section 8). Leather gloves are required for all workplaces other than Raw Handling and Storage and Shipment. | |
| **2.2 Control of environmental exposure** | | |
| Amounts used | Not restricted | |
| Frequency and duration of use | Continuous use/release, up to 300 days/year | |
| Environment factors not influenced by risk management | No emissions to the environment. | |
| Other given operational conditions affecting environmental exposure | Not applicable | |
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | See Section 8 of the SDS, above. | |
| | Estimated fraction released to water (g/tonne): | No emissions |
| | Estimated fraction released to air (g/tonne): | |
| Organisational measures to prevent/limit release from site | See Section 8 of the SDS, above. | |

| | | | | |
|---|---|---|---|---|
| Conditions and measures related to external treatment of waste for disposal | Pb-bearing wastes resulting from the processes described above are generated in the form of solids (e.g. dross, slags). These should be treated by a licensed waste treatment operator (landfilled or inceinerated) according to relevant waste regulation. | | | |
| 3 Exposure estimation | | | | |
| Health Exposure Estimations (based on measures outlined in section 2.1) | | Predicted Blood Lead Levels (Maximum) | Derived No-Effect Level | Risk Characterisation Ratio |
| | Blood lead concentrations for male workers (maximum): | 16.0 µg/dL | 40.0 µg/dL | 0.4 |
| Environmental Exposure Estimations (based on measures outlined in section 2.2) | | Predicted Exposure Concentrations (Maximum) | Predicted No Effect Concentrations | |
| | Freshwater: | No Emissions | 3.1 µg/l | N/A |
| | Marine: | No Emissions | 3.5 µg/l | N/A |
| | Freshwater sediment: | No Emissions | 174.0 mg/kg dw | N/A |
| | Marine water sediment: | No Emissions | 164.2 mg/kg dw | N/A |
| | Terrestrial: | 28.3 mg/kg dw | 212.0 mg/kg dw | 0.13 |
| | Sewage treatment plant: | No Emissions | 100 µg/l | N/A |
| 4 Guidance to DU to evaluate whether they work inside the boundaries set by the ES | | | | |
| 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 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). For environmental exposure, a DU-Scaling tool (free download: http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool) is available. For human health, exposure (as measured blood lead levels) must be below the DNEL:<br><br>DNEL for male workers: 40 µg/dL<br>DNEL for female workers of reproductive capacity: 10 µg/dL | | | | |

# ES 2: Use of Lead metal in production of a range of lead articles (e.g. cast, rolled and extruded production, ammunition and lead shot) – Industrial

| 1. Title | |
|---|---|
| Identified Use | Use of lead metal in the production of cast, rolled and extruded products, e.g. weights, foil, string, rope, bars, shot, sheathing and cables. |
| Systemic title based on use descriptor | SU 15, SU 17; PC 7, PC 38; AC 7, AC1, AC 2, AC 3; ERC 5 |
| 2. Operational conditions and risk management measures | |
| Involved PROCs | Involved Tasks |
| PROC 26 | Raw material handling |
| PROC22, 23 | Melting |
| PROC 23 | Refining and Casting |
| PROC 14 | Extrusion |
| PROC 24 | Milling/Rolling |
| PROC 21 | Sawing/Slitting |
| PROC 25 | Soldering/Manufacture of Solder |
| PROC 21, 22, 23, 24, 25, 4, 5 | Production of lead shot |
| PROC 21 | Ammuntion Manufacture (i.e. assembly of ammunition) |
| PROC 23 | Addition of coating metal to bath |
| PROC 23 | Hot dip coating |
| PROC 21 | Storage and Shipment |

| 2.1 Control of workers exposure | | | | |
|---|---|---|---|---|
| Product characteristic | Raw material are lead ingots, bars, or other forms of massive lead (1-99% purity). Raw materials can also include lead powder and paste. Finished lead articles are in solid form. | | | |
| Amounts used | Not restricted | | | |
| Frequency and duration of use/exposure | 4 – 8 hour shifts for all workplaces. | | | |
| Human factors not influenced by risk management | See Section 8 of the SDS, above (hygiene measures affecting lead blood levels). | | | |
| Other given operational conditions affecting workers exposure | Indoor handling, room volume >20$m^3$ for raw material handling, >60$m^3$ for melting and >1000$m^3$ for all other workplaces. | | | |
| Technical conditions and measures at process level (source) to prevent release | Enclosed systems required for melting, refining and casting and possibly soldering/production of lead shot. Open systems/no direct handling required for remaining workplaces. | | | |
| Technical conditions and measures to control dispersion from source towards the worker | Controls give 78% minimum worker exposure reduction. Risk Management Measures include enclosure of process equipment, dilution ventilation and/or local exhaust ventilation. Pass waste air through cleaning equipment. LEV typically required for all processes other than storage and shipment. | | | |
| Organisational measures to prevent /limit releases, dispersion and exposure | See Section 8 of the core SDS, above. | | | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Minimum Respiratory Protective Equipment (RPE) is FFP 2 mask, except in cases where adequate ventilation/emission control in place (see also section 8). Leather or thermal-protective gloves required for all processes other than milling/rolling, sawing/slitting and storage and shipment. | | | |
| 2.2 Control of environmental exposure | | | | |
| Amounts used | Not restricted. | | | |
| Frequency and duration of use | Continuous use/release, up to 300 days/year. | | | |
| Environment factors not influenced by risk management | Flow rate of receiving surface water is 37 $m^{3/}$s. | | | |
| Other given operational conditions affecting environmental exposure | Not applicable. | | | |
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | See Section 8 of the SDS, above. | | | |
| | Estimated emissions released to water: | 20 kg/annum/site | | |
| | Estimated emissions released to air: | 100 kg/annum/site | | |
| Organisational measures to prevent/limit release from site | See Section 8 of the SDS, above. | | | |
| Conditions and measures related to external treatment of waste for disposal | Pb-bearing wastes resulting from the processes described above are generated in the form of solids (e.g. dross, slags). These should be treated by a licensed waste treatment operator (landfilled or incinerated) according to relevant waste regulation. | | | |
| 3 Exposure estimation | | | | |
| Health Exposure Estimations (based on measures outlined in section 2.1) | | Predicted Blood Lead Levels (Maximum) | Derived No-Effect Level | Risk Characterisation Ratio |
| | Blood lead concentrations for male workers (maximum): | 33.7 µg/dL | 40.0 µg/dL | 0.84 |
| Environmental Exposure Estimations (based on measures outlined in section 2.2) | | Predicted Exposure Concentrations (Maximum) | Predicted No Effect Concentrations | |
| | Freshwater: | 0.622 µg/l | 3.1 µg/l | 0.20 |
| | Marine: | 0.049 µg/l | 3.5 µg/l | 0.014 |
| | Freshwater sediment: | 103.5 mg/kg dw | 174.0 mg/kg dw | 0.59 |
| | Marine water sediment: | 57.1mg/kg dw | 164.2 mg/kg dw | 0.35 |
| | Terrestrial: | 28.3 mg/kg dw | 212.0 mg/kg dw | 0.13 |
| | Sewage treatment plant: | The site is assumed not to be connected with an off-site STP | | |
| 4 Guidance to DU to evaluate whether they work inside the boundaries set by the ES | | | | |

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 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). For environmental exposure, a DU-Scaling tool (free download: http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool) is available. For human health, exposure (as measured blood lead levels) must be below the DNEL:

DNEL for male workers: 40 µg/dL
DNEL for female workers of reproductive capacity: 10 µg/dL

# ES 3: Professional Use of Lead Solder

| 1. Title | | | | |
|---|---|---|---|---|
| Identified Use | Professional Use of Lead Solder | | | |
| Systemic title based on use descriptor | PC 7, PC 38; SU 15, SU 16, SU 17, SU 19, SU 0; AC 3, AC 7; ERC 0, ERC 8c | | | |
| **2. Operational conditions and risk management measures** | | | | |
| Involved PROCs | Involved Tasks | | | |
| PROC 0, PROC 4, PROC 5, PROC 15, PROC 25 | Use of low temperature melting solders for electrical appliance assemblage or repair and pipe joining or assembly of stained glass articles. | | | |
| **2.1 Control of workers exposure** | | | | |
| Product characteristic | Ingots, wire or powder of metallic alloy containing lead (typically range of 37-75%). | | | |
| Amounts used | Based on maximum professional use of 20 kg per shift. | | | |
| Frequency and duration of use/exposure | Use of lead solders is assumed to occur 0.5 - 3 hours per day, five days per week | | | |
| Human factors not influenced by risk management | See Section 8 of the SDS, above (hygiene measures affecting lead blood levels) | | | |
| Other given operational conditions affecting workers exposure | No limitations assessed | | | |
| Technical conditions and measures at process level (source) to prevent release | None needed. | | | |
| Technical conditions and measures to control dispersion from source towards the worker | Ensure good ventilation where possible. | | | |
| Organisational measures to prevent /limit releases, dispersion and exposure | See Section 8 of the core SDS, above. | | | |
| Conditions and measures related to personal protection, hygiene and health evaluation | For operations covered by this scenario, gloves should ideally be worn. | | | |
| **2.2 Control of environmental exposure** | | | | |
| Overview | No environmental emissions during professional use. | | | |
| Conditions and measures related to recovery of articles at the end of service life | Soldered articles are expected to be recovered and recycled (by a licensed recovery operator in accordance with relevant legislation), owing to the intrinsic values of the substrates and the solders. | | | |
| **3 Exposure estimation** | | | | |
| Health Exposure estimations (based on measures outlined in section 2.1) | | Predicted Blood Lead Levels (Maximum) | Derived No Effect Level | Risk Characterisation Ratio |
| | Solder, electrical, stained glass, plumbing | 1.55 µg/dL | 40µg/dL | 0.04 |
| | Solder, industrial (bars) | 5.2 µg/dL | 40µg/dL | 0.13 |
| Environmental Exposure estimations (based on measures outlined in section 2.2) | Not applicable | | | |

| 4 Guidance to DU to evaluate whether they work inside the boundaries set by the ES |
|---|
| 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 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). For environmental exposure, a DU-Scaling tool (free download: http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool) is available. For human health, exposure (as measured blood lead levels) must be below the DNEL:<br><br>DNEL for male workers: 40 µg/dL<br>DNEL for female workers of reproductive capacity: 10 µg/dL |