Exemption Request Form

Date of submission: 16. 01.2015

1. Name and contact details

1) Name and contact details of applicant:

Company: European Aluminium Association (AISBL)

EU Transparency Register No: 9224280267-20

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AVAGO TECHNOLOGIES	**Avago Technologies Limited**
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ceced	**European Committee of Domestic Equipment Manufacturers (CECED)** **EU TR No: 04201463642-88**
Cu European Copper Institute Copper Alliance	**European Copper Institute (ECI)** **EU TR No: 04134171823-87**
COCIR	**European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry (COCIR)** **EU TR No: 05366537746-69**

	**European Garden Machinery Industry Federation (EGMF)** **EU TR No: 82669082072-33**
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	**WirtschaftsVereinigung Metalle (WVM)** **EU TR No: 9002547940-17**
	**ZVEI - Zentralverband Elektrotechnik- und Elektronikindustrie e.V.** **EU TR No: 94770746469-09**

Note: 'EU TR No' is the EU Transparency Register Number

2) Name and contact details of responsible person for this application (if different from above):

Company:	_____	Tel.:	_____
Name:	_____	E-Mail:	_____
Function:	_____	Address:	_____

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2. Reason for application:

Please indicate where relevant:

☐ Request for new exemption in:

☐ Request for amendment of existing exemption in

☒ Request for extension of existing exemption in

☐ Request for deletion of existing exemption in:

☐ Provision of information referring to an existing specific exemption in:

☒ Annex III ☐ Annex IV

No. of exemption in Annex III or IV where applicable: 6 (b)

Proposed or existing wording: ‘Lead as an alloying element in aluminium containing up to 0,4 % lead by weight‘

Duration where applicable: We apply for renewal of this exemption for categories 1 to 7, 10 and 11 of Annex I for an additional validity period of 5 years. For these categories, the validity of this exemption may be required beyond this timeframe. Although applications in this exemption renewal request may be relevant to categories 8 & 9 this renewal request does not address these categories. Further, categories 8 & 9 have separate maximum validity periods and time limits for application for renewals…;

☐ Other: _____

3. Summary of the exemption request / revocation request

3.1

Aluminium alloys containing lead can be used for various products requiring machining as the main effect of lead is an improved machinability. Lead acts as a lubricant and the addition of lead results in better chip fracturing and surface finish as well as in higher cutting speeds and a longer tool life. There is no viable environmentally friendly substitute.

Lead free alloys such as AlEco62Sn or AA 6023 have been developed to replace as far as possible some applications of 2011 alloy in the automotive sector.

However the current state-of-the-art does not indicate any suitable substitute for lead in aluminium alloys used in the production of EEE products.

There are standards describing aluminium alloys with lead as an alloying element (e.g. EN 573-3 describes the chemical composition and form of aluminium products). It is noted that although these alloys are not specifically designed for the EEE products, their application in the EEE products cannot be excluded.

3.2

Aluminium produced from recycled scrap metal may contain lead. The reason for this is that scrap coming from products from the past can contain lead content. When these products are recycled the lead will unintentionally and unavoidably be transferred to the new casting alloys.

Mechanical separation techniques in advance of the remelting/refining process such as eddy current and density processed, can hugely reduce the amount of lead as well as of other metals going into the aluminium scrap, or to some extent separate high lead containing aluminium scrap from the low lead containing scrap. However, high lead containing aluminium scrap should be recycled and not be landfilled to obtain significant environmental benefits. The last chance to remove lead is at the remelting stage. A study on 'Existing technologies for lead removal from Aluminium melts' [1] was carried out by MIMI Tech UG and finalized in June 2012 (the study is attached to this application). The study shows that only a few methods could be found and were assessed; i.e. Phase separation, Electrolysis and Vacuum distillation. These methods are either not approved above lab-scale or from an environmental/economical perspective are not feasible. The only alternative is to dilute the metal with primary aluminium. This would result in higher environmental impacts due to the fact that the production of primary aluminium is very energy intensive.

Thus, lead is included in the scrap flow as an impurity which cannot be separated during the scrapping process phase. Although lead is not added in the secondary production intentionally, it is tolerated to a certain level for the production of many secondary alloys, due to the fact that the presence of lead improves the machinability of the alloys in its subsequent treatment to produce the semi final or final products. (see point 3.2). The level of tolerance is specified in both European standards for aluminium scrap and for aluminium alloys.

In particular, aluminium alloys from the EN 43000 to 47000 series made from scrap and the products produced from these alloys may contain lead e.g. the production of

frameworks of lamps and lights, heat sinks, electrical and electronic items in housing and industries, etc.

Keeping the exemption of 0,4% lead content in aluminium provides the possibility of effective and efficient use of recycled aluminium scrap coming from the European Union.

Further restriction on the limit of lead will reduce the scrap availability to EU secondary producers, resulting in the export of lead containing scrap, hampering EU's Circular Economy.

3.3 Therefore, the European Aluminium Association (EAA), requests the extension of the existing exemption: 'Lead as an alloying element in Aluminium containing up to 0,4 % lead by weight', without specific expiring date. This request is supported by all the members of EAA as well as other related industries taking part in the cross industry project (as listed in point 1-1).

4.Technical description of the exemption request / revocation request

(A) Description of the concerned application:

1. To which EEE is the exemption request/information relevant?

   Name of applications or products: the production of frameworks of lamps and lights, heat sinks, electrical and electronic items in housing and industries, automatic dispensers etc. The list is not exhaustive. In practice the use is widespread across numerous products.

a. List of relevant categories: (mark more than one where applicable)

☒ 1	☒ 7
☒ 2	☐ 8
☒ 3	☐ 9
☒ 4	☒10
☒ 5	☒ 11
☒ 6	

b. Please specify if application is in use in other categories to which the exemption request does not refer: Although applications in this exemption renewal request may be relevant to categories 8 & 9 this renewal request does not address these categories, and we have not completed section 4(A)1.c. Further, categories 8 & 9 have separate maximum validity periods and time limits for application for renewals…;

c. Please specify for equipment of category 8 and 9:

The requested exemption will be applied in

☐ monitoring and control instruments in industry

☐ in-vitro diagnostics

☐ other medical devices or other monitoring and control instruments than those in industry

2. Which of the six substances is in use in the application/product?

   (Indicate more than one where applicable)

   ☒ Pb ☐ Cd ☐ Hg ☐ Cr-VI ☐ PBB ☐ PBDE

3. Function of the substance: The main effect of lead is an improved machinability. Lead acts as a lubricant and the addition of lead results in better chip fracturing and surface finish as well as in higher cutting speeds and a longer tool life.

   The presence of lead achieves a limited solubility thus forming soft low- melting phases, which facilitates cutting as well as reduces the frictional resistance. These elements give rise to the production of desirable small chips for optimum screw-machine operations. A small amount of lead has little influence on the resistivity of the aluminium melt. Also, the mechanical properties will not be changed significantly. The hardening of Al-Cu alloys is not affected by lead, but the machinability will be meaningfully improved. [1]

4. Content of substance in homogeneous material (%weight): <up to 0.4%

5. Amount of substance entering the EU market annually through application for which the exemption is requested: no data available for the estimation
   Please supply information and calculations to support stated figure.

6. Name of material/component: Aluminium alloy

7. Environmental Assessment: _____

   LCA: ☐ Yes

   ☒ No

(B) In which material and/or component is the RoHS-regulated substance used, for which you request the exemption or its revocation? What is the function of this material or component?

Aluminium alloys (containing lead). Aluminium alloys are widely used in the production of EEE products and parts, such as frameworks of lamps and lights, heat sinks, electrical and electronic items in housing and industries, etc.

(C) What are the particular characteristics and functions of the RoHS-regulated substance that require its use in this material or component?

The main effect of lead is an improved machinability. Lead acts as a lubricant and the addition of lead results in better chip fracturing and surface finish as well as in higher cutting speeds and a longer tool life, which are desirable from both energy saving and material use point of view.

5. Information on Possible preparation for reuse or recycling of waste from EEE and on provisions for appropriate treatment of waste

1) Please indicate if a closed loop system exist for EEE waste of application exists and provide information of its characteristics (method of collection to ensure closed loop, method of treatment, etc.)

Closed loop material system exists, i.e. aluminium scraps coming from the EEE waste are recycled and become an aluminium product again, e.g. an EEE product or an automotive or building product, etc.

Here below is a general description on the recycling of EEE waste:

After the de-pollution step carried out according to the WEEE Directive, WEEE consists chiefly of a mixture of metal, plastics and glass. From here, the treatment of WEEE in general has the following steps, though the process may vary with different combinations of: shredding, granulating (more than once), magnetic separation, and eddy current separation (more than once), there is also the possibility of density separation on the separation table and/or hand separation.

The stainless steel, Al and Cu fractions are separated from other ferrous metals and other non-ferrous metals, including lead, during these processes, mainly achieved by eddy current separation and/or density separation, and can be sent directly to the steel works or refineries. The metal content in the plastic can be high; however it is possible to further recover these metals later during the plastic recycling process or, if the plastic is incinerated, from the bottom ash of the incinerators.

The aluminium fraction will be further processed in a secondary refining plant. Before melting, when necessary, scraps may be first pre-treated to remove coating or oil. With the addition of salt, scrap is melted in a suitable furnace, and then refined and cast according to the product specification.

2) Please indicate where relevant:

☒ Article is collected and sent without dismantling for recycling
☐ Article is collected and completely refurbished for reuse
☐ Article is collected and dismantled:
  ☐ The following parts are refurbished for use as spare parts: _____
  ☐ The following parts are subsequently recycled: _____
☐ Article cannot be recycled and is therefore:
  ☐ Sent for energy return
  ☐ Landfilled

3) Please provide information concerning the amount (weight) of RoHS substance present in EEE waste accumulates per annum:

☐ In articles which are refurbished _____
☒ In articles which are recycled no data available for estimation
☐ In articles which are sent for energy return _____
☐ In articles which are landfilled _____

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6. Analysis of possible alternative substances

(A) Please provide information if possible alternative applications or alternatives for use of RoHS substances in application exist. Please elaborate analysis on a life-cycle basis, including where available information about independent research, peer-review studies development activities undertaken

There is no suitable alternative applications or alternatives. (Please see point 8 for assessment and justification). Similar conclusions have been reached both in the case of other metal alloys, e.g. steel and copper.

An IEA report from 2012 states that secondary (recycled) aluminium "accounts for 33% of today's global supply and is expected to rise to 40% by 2025"[1]. Currently most aluminium scraps contain lead and no commercial process is available to remove it. As a result recycled aluminium casting alloys will always contain some lead. Therefore, the only way to avoid lead or to comply with more stringent lead limit value is to dilute secondary aluminium with primary metal. This will result in significant increase of environmental impact due to the fact that

[1] Aluminium Production, IEA ETSAP - Technology Brief I10 – March 2012 - www.etsap.org. http://iea-etsap.org/web/HIGHLIGHTS%20PDF/I10_HL_AlProduction_ER_March2012_Final%20GSOK.pdf

primary aluminium production is an electricity intensive process. Aluminium recycling account for about 70% of the Aluminium produced in the EU. [2]

(B) Please provide information and data to establish reliability of possible substitutes of application and of RoHS materials in application

Substitution of lead as alloying element with bismuth is technically feasible, and it has been tested and used to a certain extent over the last 20 years. However, due to the following reasons it is not considered a feasible substitute.

1. It has been experienced and discussed within the secondary aluminium producers that bismuth creates an unwanted microstructure effect leading to potential problems in the refining and casting process. Thus bismuth alloys (if in large amount) need to be separated from the others for remelting.

2. A technical study from the European Copper Institute, 2010 [2] has summarised that there are various negative effects using bismuth as substitute of lead in copper alloys, including 'severe embrittlement and hence cracking when the material is subjected to thermo-mechanical stresses', 'inferior to lead as a chip breaker and more importantly, it does not have real lubricating and cooling properties.'

Furthermore, the study concludes that 'extreme care must be given to the recycling path of bismuth containing copper alloys because a contamination of other copper alloys would have disastrous consequences. On one hand bismuth embrittles the alloys; on the other hand bismuth can react with lead which leads to some hardening.' 'One must also avoid to introducing bismuth into steel scrap because it strongly reduces the ductility at high temperatures at concentrations as low as 25 ppm.'

Bismuth is expected to substitute lead and serves same functions and behaves similarly in aluminium alloys as in copper alloys. Lead functions in the same way in both aluminium and copper alloys. Although no detailed study has been carried out, the negative effects of bismuth have also been observed in the Al alloys.

[2] EAA

7. Proposed actions to develop possible substitutes

(A) Please provide information if actions have been taken to develop further possible alternatives for the application or alternatives for RoHS substances in the application.

The aluminium industry, together with its downstream industries, researched the technical possibilities to remove lead from the aluminium scrap, as well as finding and testing lead free alloys.

The current state-of-the-art does not indicate any suitable substitute for lead.

(B) Please elaborate what stages are necessary for establishment of possible substitute and respective timeframe needed for completion of such stages.

The current state-of-the-art does not indicate any suitable substitute for lead.

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8. Justification according to Article 5(1)(a):

(A) Links to REACH: (substance + substitute)

1) Do any of the following provisions apply to the application described under (A) and (C)?

- ☐ Authorisation
  - ☐ SVHC
  - ☐ Candidate list
  - ☐ Proposal inclusion Annex XIV
  - ☐ Annex XIV
- ☐ Restriction
  - ☐ Annex XVII
  - ☐ Registry of intentions
- ☒ Registration

2) Provide REACH-relevant information received through the supply chain.
Name of document:

(B) Elimination/substitution:

1. Can the substance named under 4.(A)1 be eliminated?

☐ Yes. Consequences? _____

☒ No. Justification: _____

Mechanical separation techniques in advance to the remelting/refining process such as eddy current and density processed, can hugely reduce the amount of

lead as well as of other metals going into the aluminium scrap, or to some extent separate high lead containing aluminium scrap from the low lead-containing scrap. Further removal of lead can only be achieved during the melting stages.

OEA conducted a study on 'Existing technologies for lead removal from Aluminium melts' The study was carried out by MIMI Tech UG and finalized in June 2012. The study reviewed a number of methods to remove lead from the aluminium alloys. These methods are summarised here:

Phase separation: The phase separation of the aluminium-lead alloy is examined by solidification in the molten phase. With the help of nucleating agents, lead droplets rise and freeze below the binodal temperature. Thus the droplets can be separated possibly from the molten aluminium.

This procedure is only an academic one due to the small scale of melt treatable and no reproducible results have been achieved in a pilot scale. This method might, if at all, be used for high-cost/ high-purity aluminium and special applications. But in those cases, the use of primary aluminium is probably more economical.

Electrochemical refining: Tests were carried out electrochemically in a three-layer cell. With direct addition of alkali salts and controlled addition of sodium significant reductions for lead have been achieved.

This method has existed for more than 20 years with little success beyond small-scale testing. The key obstacle is the significant amount of energy needed for the process, which makes the method both environmentally and economically undesirable.

Vacuum distillation: Laboratory and pilot tests show that vacuum treatment can also remove lead from molten aluminium at above 1000°C. However, only at 1300°C and with one hour distillation time, can the removal of lead take place with sufficient speed.

Again apart from the high system cost and difficulties to scale up, the high energy consumption renders this method environmental undesirable.

All three methods are in the stage of laboratory/academic research and small scale testing. The obstacles to the development of these methods are not only

economic in terms of system and equipment cost, but also an environmental issue, mostly due to the high amount of energy required. There are very limited options, if any, to overcome the later. Furthermore, such lead-reduced aluminium is expected to be used in special applications. But whichever applications they are, high quality aluminium from primary production is likely to be a ready and less expensive alternative. For the above discussed rationales, there are no clear ways forward.

Evidently, more ground research and tests are needed to enable further conclusions on these methods. On that, the industry is and will continuously be in cooperation with academics and research institutes.

2. Can the substance named under 4.(A)1 be substituted?
   - ☐ Yes.
     - ☐ Design changes:
     - ☐ Other materials:
     - ☐ Other substance:
   - ☒ No.

   Justification: The substitution of lead with bismuth, the only alternative substance, is not considered satisfactory. Thus, to date, there is no substitutes available (see point 6).

3. Give details on the reliability of substitutes (technical data + information): The studies from aluminium, steel and copper industries have all concluded no reliable substitute is available. These studies are attached to this application providing the detailed technical information.
4. Describe environmental assessment of substance from 4.(A)1 and possible substitutes with regard to
   1) Environmental impacts:
   2) Health impacts: _____
   3) Consumer safety impacts: _____

⇨ Do impacts of substitution outweigh benefits thereof?
Please provide third-party verified assessment on this: _____

An older investigation tried to determine the amount of lead entering foods through lead-containing aluminium samples (randomly chosen Al-foil, pans, plates and cans). In these trials, Al-products were dissolved in hydrochloric acid, titrated by acetic acid and the leached lead from aluminium was determined. It showed that the lead content of the aluminium products varied between 28 and 45ppm; however, no appreciable lead leaching from aluminium by the acid occurred at

room temperature. At 85°C some lead removal was detected up to 2.3 mg/Lit, which is lower than of 7mg/Lit delimit set by the US Food & Drug Administration. [1]

While there has been extensive research into the impacts of lead, the effects of bismuth on the environment and human health are not well studied and there is little information and data collected from the past, as little use of bismuth exists. Comprehensive toxicity and risk assessment may become available under REACH in due time.

(C) Availability of substitutes:

a) Describe supply sources for substitutes: As a raw material bismuth mainly arises as a by-product during the refining of virgin lead. In China, it is a by-product of tungsten ore processing. Typically, 30 to 200 T of lead are produced to obtain 1 T of bismuth [3].

b) Have you encountered problems with the availability? Describe: Considering the link in the production of bismuth and lead, it is difficult to envisage that a large number of lead containing applications can be covered by the amount of bismuth available. As a by-product of lead, the dominant material (lead) would need to be disposed of as, at that stage, it would have limited commercial value. This would place higher environmental and economic burdens on bismuth.

c) Do you consider the price of the substitute to be a problem for the availability?

☐ Yes ☐ No

d) What conditions need to be fulfilled to ensure the availability? _____

(D) Socio-economic impact of substitution:

⇨ What kind of economic effects do you consider related to substitution?

☒ Increase in direct production costs, Bismuth is around 10 to 15 times more expensive than lead. Furthermore, if the demand for bismuth increases and the demand for lead decreases, the price of bismuth may become even higher.

☒ Increase in fixed costs

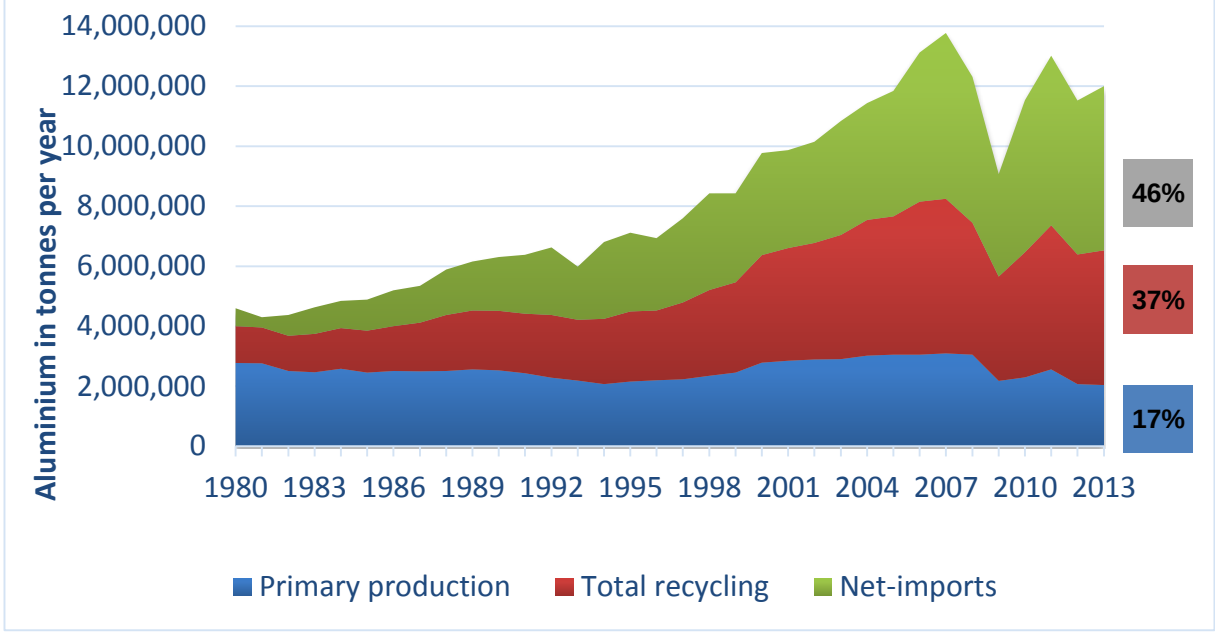
☐ Increase in overhead

☒ Possible social impacts within the EU

Decrease in recycling of aluminium scrap will impact the EU circular economy and limit the economic growth and jobs. The growth is related to increase of recycling rates in EU including aluminium recycling, as promoted in the "Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directives 2008/98/EC on waste, 94/62/EC on packaging and packaging waste, 1999/31/EC on the landfill of waste,

2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment “.

Increase of EU dependency of aluminium imports, which is already very high:



EU: Aluminium Import dependency[3]

A recent Commission study states “The aluminium industry has a strategic place in Europe's economy. It has an annual turnover of €39.7 billion and directly employs 255,000 people, with more than 1 million others indirectly employed.[4]”

[3] Source: EAA and GTS based on Eurostat data for imports

[4] EU aluminium industry suffers from regulatory costs, 8 November 2013, http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item_id=7054&lang=en

Hence there is a strong imperative for the use of aluminium and to recycle aluminium.

☒☐ Possible social impacts external to the EU

Possible increase of export of scrap with higher lead content might lead to use of the resources in non EU regions increasing the EU dependency on imported primary aluminium.

☐ Other: _____

⇨ Provide sufficient evidence (third-party verified) to support your statement: The metal prices are published up-to-date on the internet as well as by LME, etc.

9. Other relevant information

Please provide additional relevant information to further establish the necessity of your request:

_____

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10. Information that should be regarded as proprietary

Please state clearly whether any of the above information should be regarded to as proprietary information. If so, please provide verifiable justification:

No information given in this application is regarded as proprietary.

References:

[1] 'Existing technologies for lead removal from Aluminium melts', 2012, MIMI Tech UG Preusweg 98, D-52074 Aachen.

[2] 'The role of lead as an alloying element in copper alloys used for automotive components', 2012, Jean-Marie Welter.

[3] 'Recommendation on the non-use of bismuth for lead substitution', 2007, European Copper Institute. http://copperalliance.eu/docs/default-source/reach-documents/bismuthnonsuitability.pdf?sfvrsn=2

[4] 'Adaptation to scientific and technical progress of Annex II to Directive 2000/53/EC (ELV) and of the Annex to Directive 2002/95/EC (RoHS)', Contract No.: 07.0307/2008/517348/SER/G4, Final report, Freiburg, 21 June, 2010.