LIGHTINGEUROPE
THE VOICE OF THE LIGHTING INDUSTRY

Request to renew Exemption 6(c)

under the RoHS Directive 2011/65/EU

Copper alloy containing up to 4% lead by weight

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THE VOICE OF THE LIGHTING INDUSTRY

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2 Reason for application

LightingEurope submits this application to:	*request for extension of existing exemption no. 6 (c) Copper alloy containing up to 4% lead by weight*
LightingEurope proposes to continue using the existing wording which is:	*Copper alloy containing up to 4% lead by weight*
LightingEurope requests a duration of	Maximum validity period required

3 Summary of the exemption request

Per DIRECTIVE 2011/65/EU Article 5(2) Annex III Exemption 6(c) will expire automatically per 21/07/2016, unless an application for renewal has been made to the Commission in accordance with Annex V.

With reference to the above, this request concerns the extension of the exemption 6(c) Copper alloy containing up to 4% lead by weight.

In order to secure reliable electrical contacts, copper-alloys are required as material for contact-pins of fluorescent lamps, starters, GU10 lamps and HID R-mini lamps. The use of lead in these copper-alloys is in its turn required to enable mass-production of the contact-pins. Reliable and safe electrical contact over the entire life of the lamp, including end of life, is crucial.

Alternatives for lead, having the same positive properties, have not been found, despite extensive research. So when exemption 6(c) would be terminated, the industry would have no other alternative than to change-over to copper-alloys without lead. Unfortunately, for below reasons, this is not possible.

- Global availability of contact-pins made of lead-free copper alloys is by far not covering the amount needed for the Lighting industry. Adaptation of the equipment and processes at the suppliers producing lead-containing copper alloys today would require high investments. Given the turn-around in the Lighting industry from conventional lighting to LED lighting it is expected that the uncertainty is too high for these suppliers to justify the required high investments.

- Lead is needed to make the copper alloy more ductile. This ensures that mechanical processes to connect the lead wires from the lamp to the contact-pins result in a reliable connection. Reliable connections are crucial for safety and proper function of the lamp. Bad connections may result in loose wires that can result in un-safe situations. Arcing between parts may occur and consequently very high temperatures can cause fire or other safety problems. At end of life, when the defect lamp needs to be taken out of the socket, pins may come loose from the lead wires which may result in open live parts. The life time of many products is high, up to 80.000 hr. The lighting industry has no experience with lead-free contact material under all application conditions and in mass-scale production, testing would take many years.

Husemann (Phoenix Contact GmbH) and Müller (Harting KGaA) have filed a general request for prolongation of exemption 6(c). There are some lighting specific aspects that need to be emphasized. For these reasons LightingEurope is requesting an extension of exemption 6(c) without any limitation.

4 Technical description of the exemption request

4.1 Description of the lamps and their applications

4.1.1 Lamps covered by this exemption

This exemption covers Copper alloys containing up to 4% lead by weight.

Copper containing lead is used in a wide variety of lamps: TL fluorescent lamps, CFLni fluorescent lamps, starters for fluorescent lamps, GU10 reflector lamps and HID R-mini lamps

There is a huge variety in product designs because of their specific purpose, technology, wattage, size, life time, internal phosphor coating, production process etc. Below a few examples of the various lamp types are shown.

4.1.2 Applications covered by this exemption

All lamps and starters that contain pins to connect the lamp or starter to the lamp holder are concerned.

4.1.3 Annex I category covered by this exemption

List of relevant Annex I categories for this exemption

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5

☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11

Application in other categories, which the exemption request does not refer to: N/A

Equipment of category 8 and 9: N/A

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

LightingEurope is of the opinion that lamps in general are category 5 because the most are used for general illumination. However, they have some of the characteristics of components (used in luminaires), consumables (finite lifetime and regularly replaced) and spare parts, lamps in luminaires have to be replaced when they cease functioning).

Some manufacturers of electrical equipment in other RoHS categories may install fluorescent lamps into their equipment for general illumination purposes and so they will need to use lamps that comply with the RoHS directive, however the products that they place on the market are not category 5 but may be household appliances, medical devices or potentially in any RoHS category 1 - 11.

LightingEurope is aware of the difficulty to unambiguously classify certain lamps in the category set out by RoHS legislation. For lamp manufacturers it is essential to have legal certainty regarding the possibility to put the products on the market irrespective of the planned application as manufacturers are not able to control the use of the lamps in products falling in other categories in or out of the RoHS scope. In practice, most lamps are installed in buildings for lighting applications (category 5) but some are used in other types of equipment in all other RoHS categories. The way that lamps are used has no effect on lamp design so will not affect this exemption request.

Therefore lamp manufacturers do consider the lamps in scope of this document to belong to category 5 as individual products.

4.2 Description of the substance

4.2.1 Substance covered by this exemption

LightingEurope is asking for exempting

☒ Pb ☐ Cd ☐ Hg ☐ Cr-VI ☐ PBB ☐ PBDE

4.2.2 Function of lead in lamp components

4.2.2.1 Reliability and safety

Lead is needed to make the copper-alloy more ductile. This is relevant for the mechanical processes on the copper component to connect the lead wires from the inner side of the lamp to the contact pins. These pins are the mechanical and electrical connection to the lamp holder. To make the connection between the inner lead wire and the contact pin, the manufacturing equipment needs to apply less force with lead-containing copper (because this material is more ductile), and the connection can be made without any defects. These connections are crucial to ensure proper and safe functioning of the lamp. Loose wires or bad connections will result in a lamp that doesn't light. Also arcing between parts may occur and consequently very high temperatures can cause fire or other safety problems. At end of life, when the defect lamp needs to be taken out of the socket, pins may come loose from the lead wires which may result in open live parts. The lighting industry has very long experience with the existing lead containing materials but no experience with lead-free contact material in mass-scale.

There is no evidence that lead-free materials cannot be used, but given the long life-time of lamps in combination with the mass scale application it also cannot be proven that lead-free contacts have the same performance regarding safety and reliability under all application conditions (current density, temperature, humidity etc).

Below photos show lamps with safety issues caused by arcing and defect pins. Seen the severity of the potential problems the lighting industry needs to be very cautious in changing the material of the contact pins.





4.2.2.2 Machinability

An important function of lead in copper alloys is to improve the machinability of the alloy. Husemann (Phoenix Contact GmbH) and Müller (Harting KGaA) describe this aspect in the general request for prolongation of exemption 6(c).

The lighting industry will directly be impacted when machinability of copper alloys will be reduced due to the elimination of lead in copper alloys. At this moment there is only very limited supply of lead-free material and the industry would need to expand their production capacity which would require investments in additional equipment and tooling.

4.2.2.3 Transition to LED

The lighting industry is in the middle of changing over from conventional lighting technology (halogen, fluorescent, HID) to LED technology. LED lamps in general have a longer life-time than conventional lamps. This will impact the industry in many ways and consequently also the contact material:

- Reliability and safety will become even more important than today. Specified life-time of LED lamps is very long, 40000 to 60000 hours is no exception. This requires reliable and safe operation for many decades regardless the operation environment. Lead containing alloys have proven their reliability and safety in the past. The extreme long life-time of products makes testing of new materials extremely difficult, practically impossible. Staying at proven solutions is necessary.

- The long life-time of LED lamps will have as a consequence that the amount of new lamps sold will gradually decrease. The long life-time of LED technology also enables the integration of LED modules in the luminaire and replacement of lamps is not required anymore. As a result the use of contact pins, and therefor also the use of lead will be reduced in the years to come.

- The expected decrease in volume of contact pins in the coming years will make it very unattractive for the suppliers of these pins to invest in additional equipment and tooling. A shortage of supply may be the consequence.

4.2.3 Location of lead in lamps

Lead is present in the contact pins in a wide variety of lamps and starters. The pins in the lamps and starters contain less than 4% lead in the copper alloy.

4.2.4 Amount of lead

A maximum of 4 % of lead is allowed. This percentage is used for the calculation although on average the amount is well below the threshold.

TL: 25 tons. Approximately 800 Million TL lamps are sold in Europe. The pin weight is 0,2 kg/1000 pins.

Starters: 7 tons. Approximately 200 Million starters are sold in Europe. The pin weight is 0,43 kg/1000 pins

CFLni: 2 tons. Approximately 100 Million CFLni lamps are sold in Europe. The pin weight is 0,2 kg/1000.

GU10: 4 tons. Approximately 100 Million GU10 lamps are sold in Europe. The pin weight is 0,43 kg/1000 pins

In total approximately 38 ton of lead is used annually. Thanks to the longer life-time of LED lamps compared to conventional lamps this amount will gradually reduce in the coming years

4.2.5 Environmental assessments, LCAs

There are no specific LCA's available wrt lead.

5 Waste management

5.1 Waste streams

☒ 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:

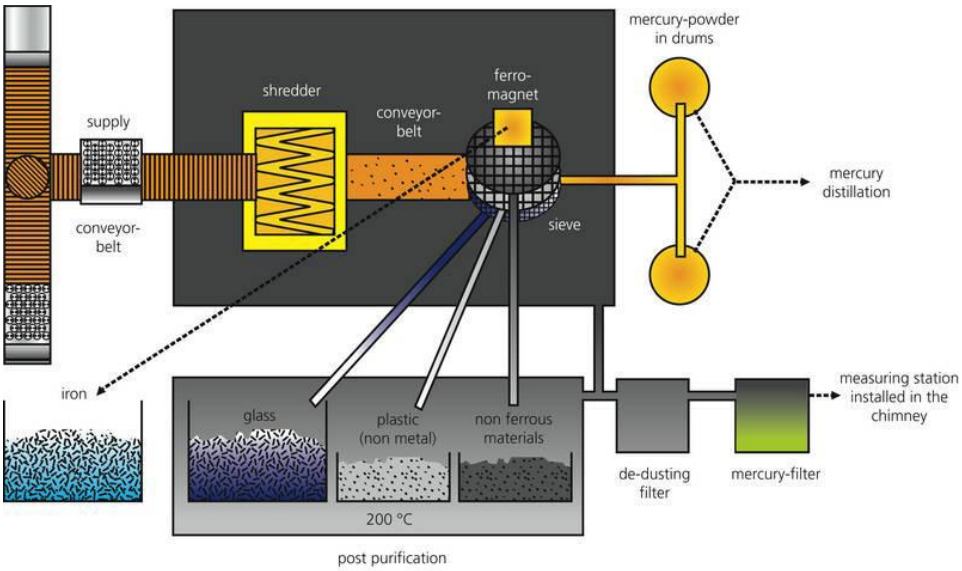
- ☐ Sent for energy return
- ☐ Landfilled

In this paragraph the focus is on the waste stream of fluorescent lamps. Lamps that are sold in the consumer (mainly GU10 lamps) channel will not be recycled and are handled as normal waste. Recycling of copper-alloys is described by Husemann (Phoenix Contact GmbH) and Müller (Harting KGaA) in the general request for prolongation of exemption 6(c).

Fluorescent lamps, responsible for about 70% of the total amount of lead in contact pins of lamps, are in the scope of EU Directives 2002/96/EC - WEEE and 2012/19/EU– WEEE Recast. Take back systems are installed in all EU Member States: end users

and most commercial customers can bring back the lamps free of charge. Fluorescent lamps are collected separately from general household waste and separately from other WEEE waste. Below picture shows the various steps in the recycling process:

Recycling steps of fluorescent lamps in Indaver (Belgium). Source:www.indaver.be/waste-treatment/recycling/mercurial-waste.html



European legislation on Waste Electrical and Electronic Equipment makes producers responsible for end of life products within this category as from August 13th, 2005. Target setting as consequence of the present legislation is 4 kg per inhabitant per year for all categories.

European Lamp Companies have founded Collection & Recycling Organizations in the EU Member-States, with the objective to organize the collection and recycling of gas discharge lamps. Goal is to comply with present and probable future EU legislation and meet or exceed national targets.

In general the following channels have been established in the respective member-states providing countrywide coverage:

- Direct collection from large end users:

  Containers have been made available, ad hoc or permanently, and will be collected upon notification by the end user that the container is full.

- Collection through distribution:

  Wholesalers and Retailers place collection means at their premises respectively in their shops. Collection is done upon notification.

- Collection through municipalities:

  Where infrastructure allows collection means are placed at municipality depots.

'JEKKO' collection container

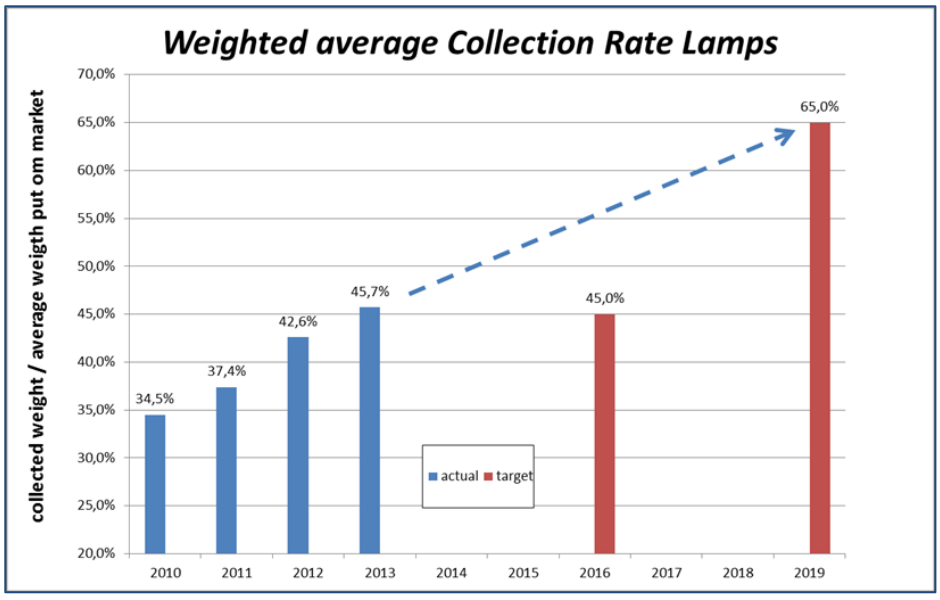
Campaigns are being executed or have been planned to re-enforce the role of the government to educate the population that gas-discharge lamps have to be disposed of in an environmentally friendly way. An

example of such a campaign is the distribution of ‘Jekko’ containers to 1 million households in the Netherlands. Another way of organising the take back for consumers is via supermarkets as done by Récylum in France.

5.2 Amount of lead in WEEE

- ☐ In articles which are refurbished
- ☒ In articles which are recycled
- ☐ In articles which are sent for energy return
- ☐ In articles which are landfilled

Amount of substance entering the EU market annually (base year 2013) through application for which the exemption is requested:



Collection rate of lamps

About 50% of the TL- and CFLni lamps are recycled in 2014 which means that 13,5 tons out of the 38 tons of lead will be recycled via WEEE.

6 Substitution

Can the substance of this exemption be substituted?

☐ Yes, by
- ☐ Design changes:
- ☐ Other materials:
- ☐ Other substance:

☒ No

6.1 Substituting lead (Pb)

The substitute for lead-containing pins are lead-free pins. Due to shortage of lead-free production companies it is not possible to purchase all the lead-free material that the lighting industry needs. To produce contact pins from lead free copper alloys requires other production equipment at our suppliers than making them from lead containing copper alloys.
Other materials replacing lead with the same properties have not been found.despite extensive research (See document of Husemann and Müller)

6.2 Feasibility of the alternatives

There are no feasible alternatives for lead. See document of Husemann and Müller.
The feasibility of lead-free contact pins has been discussed in section 4.2.2

6.3 Availability of substitutes

.
Only one supplier is known which can produce lead-free contact pins. This supplier cannot supply the total demand.
The back-ground of the poor availability is described by Husemann and Müller.

6.4 Impact of substitution

The industry would need to expand their production capacity which would require investments in additional equipment and tooling. Given the changes that are on-going in the lighting industry it is expected that suppliers will be very reluctant to do investments.

As a consequence shortage on the global market to fulfil our total demand of lead free pin material can be expected.

6.4.1 Environmental impact of substitutes

No environmental impact as the substitute would be the elimination of lead.

6.4.2 Health and safety impact of substitutes

Not applicable

6.4.3 Socio-economic impact of substitution

Economic effects related to substitution:

- ☒ Increase in direct production costs
- ☒ Increase in fixed costs
- ☐ Increase in overhead
- ☐ Possible social impacts within the EU
- ☐ Possible social impacts external to the EU
- ☐ Other:

Investments are necessary to switch-over from lead-containing- to lead-free contact pins. Next to that the reject level (waste material) will be higher than with lead containing copper-alloy. There are no estimations on the total sum.

As already mentioned in this document before, the safety and reliability of the lamps concerned might be impacted.

6.4.4 Impact of substitution on innovation

Focus of the lighting industry lies on LED technology. An extension of the exemption will have no negative effect on the efforts to further innovate towards “LEDification”.

6.4.5 Future trends of substitution

Lamps: LED technology performance is developing, however the balance between cost price, lifetime and efficiency and the speed in which it will take place is not yet clear.

6.5 Links to REACH, according to RoHS Directive Article 5(1)(a)

Do any of the following provisions apply to the application described?

no

☐ Authorisation
- ☐ SVHC
- ☐ Candidate list
- ☐ Proposal inclusion Annex XIV

☐ Restriction
- ☐ Annex XIV
- ☐ Annex XVII
- ☐ Registry of intentions

☐ Registration

Provide REACH-relevant information received through the supply chain.

Not Applicable

7 Removal of lead in copper

Can lead be eliminated?

☐ Yes.
☒ No.

See earlier chapters

8 Reduction of lead content of lamps

Reduction of lead content is not an option. This is described by Husemann and Müller.

9 Other relevant information

10 Information that should be regarded as proprietary