

Consultation Questionnaire Exemption No. 4(f) of RoHS Annex III

Current wording of the exemption:

Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex

Requested validity period: Maximum (5 years and 7 years (cat. 8 and 9) respectively)

ACRONYMS AND DEFINITIONS

UV	Ultra Violet
LED	Light-Emitting-Diode
Hg	Mercury
LEU	LightingEurope

1. INTRODUCTION

1.1. Background

Bio Innovation Service, UNITAR and Fraunhofer IZM have been appointed¹ by the European Commission through for the evaluation of applications for the review of requests for new exemptions and the renewal of exemptions currently listed in Annexes III and IV of the RoHS Directive 2011/65/EU.

VDMA and Lighting Europe submitted requests² for the renewal of the above-mentioned exemption. The request has been subject to a first completeness and plausibility check. The applicant has been re-quested to answer additional questions and to provide additional information, available on the request webpage of the stakeholder consultation³.

The stakeholder consultation is part of the review process for the request at hand. The objective of this consultation and the review process is to collect and to evaluate information and evidence according to the criteria listed in Art. 5(1)(a) of Directive 2011/65/EU.⁴

To contribute to this stakeholder consultation, please answer the below questions until the 27th of May 2021.

1.2. Summary of the Exemption Request

According to VDMA: “*The application for prolongation of the existing exemption refers to mercury-containing UV discharge lamps which are used for curing (e.g. of layers of inks and coatings, adhesives and sealants),*

¹ It is implemented through the specific contract 070201/2020/832829/ENV.B.3 under the Framework contract ENV.B.3/FRA/2019/0017

² Exemption request available at [RoHS Annex III exemption evaluation - Stakeholder consultation \(biois.eu\)](https://biois.eu/rohs-annex-iii-exemption-evaluation-stakeholder-consultation)

³ Clarification questionnaire available at [RoHS Annex III exemption evaluation - Stakeholder consultation \(biois.eu\)](https://biois.eu/rohs-annex-iii-exemption-evaluation-stakeholder-consultation)

⁴ Directive 2011/65/EU (RoHS) available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011L0065:EN:NOT>

for disinfection (e.g. of water, surfaces and air) and for other industrial applications (surface modification, surface activation) The application includes the following lamp types:

- **UV medium-pressure discharge lamps (MPL) for curing, disinfection and other industrial applications** (internal operating pressure > 100 mbar). The UV medium-pressure lamps can be doped with iron, gallium or lead in addition to the mercury they contain.
- **UV low-pressure discharge lamps for special purposes** in the high power range. [...]

Typical applications to be covered by this application include curing, e.g. of inks and coatings, disinfection of water etc., and other industrial applications like surface activation and cleaning.

It is technically not possible to replace mercury in special UV lamps with other materials/chemicals in order to achieve the same widespread radiation distribution. LED-based technologies are increasingly being used, which in certain applications (e.g. curing) also offer many advantages over mercury-containing UV lamps. Nevertheless, LED technologies cannot be used as an equivalent replacement in many applications. ”

According to LightingEurope, “[...] The renewal application concerns lamps and UV light sources defined as:

- High Pressure Sodium (vapour) lamps (HPS) for horticulture lighting,
- Medium and high-pressure UV lamps for curing, disinfection of water and surfaces, day simulation for zoo animals, etc...
- Short-arc Hg lamps for projection, studio, stage lighting, microlithography for semiconductor production, etc...

Replacement of mercury and mercury containing lamps is impracticable:

- The lamps covered by exemption 4(f) must remain available on the EU market:
 - o For new equipment for certain applications where no functionally suitable alternatives are available
 - o As spare parts for in-use equipment as replacing end-of-life lamps avoids having equipment become electronic waste before due time”

Jelosil UV Technology GmbH, based in Le Landeron, Switzerland.

We produce a wide range of low pressure mercury and amalgam lamps.

This is a kind of special light sources are widely used for:

- *Drinking and waste water disinfection in **industrial scale**,*
- *Air disinfection **in industrial scale** including measures against distributing of COVID 19 through public places,*
- *Total oxidisable carbons reduction,*
- *Ballast water disinfection on board of large ocean ships,*
- *Surfaces disinfection including food, pharm, medical industry,*
- *Ozone generation and disinfection,*
and many other applications.

2. QUESTIONS

1. VDMA and LightingEurope² requested the renewal of the above exemption for the maximum validity periods with the same scope and wording for all EEE of cat. 3 and 5 (VDMA) and cat. 1-10 (LEU).
 - a. Please let us know whether you support or disagree with the wording, scope and re-quested duration of the exemption. To support your views, please provide detailed technical argumentation / evidence in line with the criteria⁴ in Art. 5(1)(a).
 - b. If applicable, please suggest an alternative wording and duration and explain your proposal.

The wording should be retained, and an extension should be requested at least until 2026 and beyond. The reasons are:

Reference to RoHS Art. 5(1)(a): Exemptions for materials and components may be considered, if:

- *“their elimination or substitution via design changes or materials and components is scientifically or technically impracticable”*
- *“the reliability of substitutes is not ensured”*
- *“the total negative environmental, health and consumer safety impacts caused by substitution are likely to outweigh the total environmental, health and consumer safety benefits there off”*

2. Please provide information concerning possible substitutes or elimination possibilities at present or in the future so that the requested exemption could be restricted or revoked.
 - a. Please explain substitution and elimination possibilities and for which part of the applications in the scope of the requested exemption they are relevant.

At the present time mentioned low pressure mercury and amalgam lamps are the most efficient light sources suites for UV disinfection applications due to:

- *Up to 40% efficiency of generation for 254 nm resonance line of Mercury in arc discharge,*
- *254 nm resonance line of Mercury is very close to the maximum of microorganism’s sensitivity for UV light,*
- *Technical possibility of constructing powerful light sources with power up to 1500 W and lamp length up to 3 m.*

Other important application of low pressure mercury and amalgam lamps is using 185 nm resonance line of mercury. This used for ozone generation and critical process in photo reactions during harmful organic substances decomposing including water, air and surfaces cleaning from industrial contaminations. The main reasons to use mentioned kind of light sources for this applications is

- *Up to 15% efficiency of generation for 185 nm resonance line of Mercury in simple arc discharge,*
- *Good efficiency of 185 nm irradiance to support critical photoreactions during harmful organic decomposing process,*
- *Technical possibility of constructing powerful light sources with power up to 1500 W and lamp length up to 3 m.*

Very important feature of low pressure mercury and amalgam lamps that we have convenient technical possibility to cut 185 nm line from spectra with a special glass type in case we concentrated only on disinfection without needs for ozone generating and other photoreactions.

Review of low pressure UV lamps replacement possibilities.

1. UVC LED.

Typical power in the range 185-254 nm is 0.2 W. This value is not comparable with typical low pressure UV lamp power and UVC output. Thousands of LED required to replace even one typical amalgam lamp with power in the range 250...800 W.

<https://www.lasercomponents.com/de/news/die-staerkste-uv-c-led-der-welt/>

https://www.lasercomponents.com/fileadmin/user_upload/home/Datasheets/bolb/smd6060-uv-led-high-power.pdf

2. Eximer lamps – to replace 185 nm generation lamps.

<https://www.osram.com/media/resource/hires/318445/ti-osram-xeradex-l40120sb-s4685-gb.pdf>

Complicated electronic with microwave range and low light generation efficiency - not more than 5%. High production costs. Lower lamp power comparing with regular low pressure lamps.

3. Luminescent cathode lamps

Hard to develop and keep workable for long time the special phosphor compounds. No ready solutions, technology is under development.

4. Lasers

Complicate and expensive construction. Hard to adapt technology to use in the industrial scale.

We can conclude that all possible technical solutions can't be comparable with the mercury low pressure and amalgam lamps in efficiency, power, simplicity of accompanying equipment and costs.

Even if we will be able to change the low pressure and amalgam lamps with other light sources it will lead to change complete the electronic part of the existing equipment in any application. This will lead to the huge costs for production and development.

Each technical possibility lead to increasing of total energy consumption because so far mercury and amalgam low pressure lamps are more energy efficient.

- b. Please provide information as to research to find alternatives that do not rely on the exemption under review (substitution or elimination), and which may cover part or all of the applications in the scope of the exemption request.

At the present time all the alternatives can be based on huge increasing of energy consumption and equipment costs. Development of the alternatives for low pressure mercury and amalgam lamps started 20-30 years ago and till now can't reach really comparable characteristics for power, energy efficiency and production costs.

From an industrial point of view, the shortening of the period of validity does not make sense, because the development of alternative solutions (e.g., based on UV LEDs) already took a lot of time. Especially, the development for new applications in the UVC area is still facing major challenges. So, the absence or real alternative for mentioned mercury light source give additional trouble to cover new UV technology applications.

Furthermore, it can also be assumed that not all the specific UV applications are well-known to VDMA and Lighting Europe and have therefore been neglected to be investigated and considered in detail. The previous wording of the exception: "Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex" should therefore be retained unchanged.

- c. Please provide a roadmap of such on-going substitution/elimination and research (phases that are to be carried out), detailing the current status as well as the estimated time needed for further stages.

We don't see the existence of a roadmap for the complete substitution/elimination of mercury-based discharge lamps in most fields of application. There are other technologies available which might justify investment into new machines and which might gain market share with respect to conventional UV applications over time. But for numerous existing machines/processes/applications, there is no reasonable replacement available.

According to our experience, replacement of existing UV lamp system with alternatives leads to a manifold of problems including quality issues, process downtime, productivity decrease, high investment costs and higher overall operational costs.

3. Do you know of other manufacturers producing devices of comparable features and performance like the ones in the scope of this exemption request that do not depend on RoHS-restricted substances, or use smaller amounts of these substances compared to the applications in the scope of this exemption?

Technically in discharge lamp technology to provide the required spectra we have to keep certain concentration of the mercury atoms in the unit of discharge volume. For some applications this amount is smaller for some bigger but it is always depending on the special light source power and overall dimensions. If more powerful and energy efficient lamps required, then bigger discharge volume we have to fill up with mercury atoms. So, to reach the physical effect of atom light emission we have to use certain amount of mercury. This helps to deduct the costs and increase energy efficiency.

In case of other technologies that could be considered as an alternative to UV treatment methods, for example using chemical reaction based methods – there are obvious disadvantages, which allow UV technology methods continuously develop and improve during last 30 years. Since UV technology more efficient against most microorganisms, cost efficient, environment friendly and due to compact sizes mentioned technology can be used in the requirements of limited free space.

4. As part of the evaluation, socio-economic impacts shall also be compiled and evaluated. For this purpose, if you have information on socioeconomic aspects, please provide details in respect of the following:
 - a. What are the volumes of EEE in the scope of the requested exemptions which are placed on the market per year?

The market is huge. Decades millions cubic meters of water per day get UV treatment for disinfection in EU. For this used thousands of special mercury and amalgam UV lamps.

- b. What are the volumes of additional waste to be generated should the requested exemption not be renewed or not be renewed for the requested duration?

Most existing machines on the market running with mercury discharge lamps would have to be considered as additional waste and would have to be disposed of. In many cases, it is economically and/or technologically not feasible to retrofit existing equipment with alternative light sources.

If UV lamps are no longer available, the following processes and entire machines are no longer usable:

1. UV drinking and waste water treatment.
2. TOC reduction water treatment
3. Air UV treatment
4. UV surfaces disinfection
5. Ballast water disinfection.

Our company will be stopped as we are more concentrated on high power UV lamps for industrial applications.

Stored materials as high purity quartz glass, ceramic caps, tungsten-moly filaments, replacement lamps and machinery of a total value of 300'000 € would have to be scrapped.

- c. What are estimated impacts on employment in total, in the EU and outside the EU, should the requested exemption not be renewed or be renewed for less than the re-quested time period? Please detail the main sectors in which possible impacts are expected – manufacturers of equipment in the scope of the exemption, suppliers, re-tail, users of MRI devices, etc.

Most employers of mercury-based UV technology would be confronted with a professional ban, leading to huge amount of unemployment and loss of products and productivity. Many companies and factories would stop existing.

We don't have exact figure and can only state to the best of our knowledge that thousands of companies exist only in the EU that employ UV technology based on mercury lamps. Some of them rely to up to 100% on the availability of mercury lamps (e.g., lamp manufacturers, power supply manufacturers, quartz suppliers, UV measuring device manufacturers, printers and coaters).

- d. Please estimate additional costs associated should the requested exemption not be renewed, and how this is divided between various sectors (e.g. private, public, industry: manufacturers, suppliers, retailers).

5. Any additional information which you would like to provide?

Additional costs will rise up for:

- *unemployment*
- *investment costs for companies into new machinery/equipment*
- *costs for disposal of no longer usable machines and equipment*
- *Loss of product diversity since no longer all products can be produced for technological and/or economic reasons.*

Due to all the possible consequences described above, our business will cease to exist.

Please note that answers to these questions can be published in the stakeholder consultation, which is part of the evaluation of this request. If your answers contain confidential information, please provide a version that can be made public along with a confidential version, in which proprietary information is clearly marked.

Please do not forget to provide your contact details (Name, Organisation, e-mail and phone number) so that the project team can contact you in case there are questions concerning your contribution.

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