

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

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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)

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## 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 appointed<sup>1</sup> 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 requests<sup>2</sup> for the renewal of the above-mentioned exemption. The request has been subject to a first completeness and plausibility check. The applicant has been requested to answer additional questions and to provide additional information, available on the request webpage of the stakeholder consultation<sup>3</sup>.

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.<sup>4</sup>

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

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

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

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

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

## 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), 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"*

The company ZED Ziegler Electronic Devices GmbH, Germany develops and manufactures electronics for UV systems. Most of our customers are situated in the European Union.

ZED is specialist in a special kind of UV lamps: **UVC** lamps. UVC lamps produce radiation with a peak wavelength of 254 nm. The main purpose of UVC lamps is the inactivation of pathogens in air and water and on surfaces. This kind of disinfection is efficient, environmental-friendly and reliable. Pathogens cannot develop a resistance against UVC radiation.

The product range of ZED Ziegler Electronic Devices GmbH, Germany comprises:

- Electronic drivers to power UV lamps,
- UVC sensor to evaluate UVC processes,
- Control and monitoring units for UVC systems,
- Trading of UVC lamps and accessories for UVC lamps.

The main applications of UV lamps in conjunction with ZED products are (sorted by relevance):

- disinfection of drinking water\*,
- treatment of waste water,
- disinfection of air and surface,
- greenhouse lighting,
- artificial sun for zoo animals.

\*Products of the ZED Ziegler Electronic Devices GmbH, Germany comply with national regulations, e.g., Austrian Standard ÖNORM M 5873-3:2020 and German Standard DIN 19294 which ensure that the disinfection of drinking water complies with the requirements of the applicable food law regulations.

Central statement of ZED Ziegler Electronic Devices GmbH, Germany:

In consideration of the state of the art, UVC lamps are irreplaceable within the next 5 years and beyond. In the area of municipal water treatment, UVC lamps will be irreplaceable for the next decades. On the contrary, the demand for UVC lamps will increase worldwide due to increasing application in air disinfection (COVID-19 pandemic) and water disinfection (climate change). No market-ready technology can replace UVC lamps in a large scale. Reasons are disadvantages in terms of disinfection power, efficiency, reliability, costs, regulations, availability, and lifetime. Considering the state of technology, alternatives like UVC LEDs or UVC excimer lamps may be only applicable for small scale point-of-use applications. Because of their technical drawbacks, the market penetration is small and only slowly increases.

## 2. QUESTIONS

1. VDMA and LightingEurope<sup>2</sup> 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 requested duration of the exemption. To support your views, please provide detailed technical argumentation / evidence in line with the criteria 4 in Art. 5(1)(a).

ZED Ziegler Electronic Devices GmbH, Germany supports the wording and scope. The requested duration of the exemption should be enlarged beyond 2026. The emerging technologies (UVC LED, UVC excimer lamps) will not be applicable in industrial scales in the foreseeable future. The reasons lie in the limited UV power, reliability, lifetime, cost-efficiency and compliance to established regulations.

- b. If applicable, please suggest an alternative wording and duration and explain your proposal.

From the technical point of view, the 5-year review period of the exemption 4(f) of Annex III of RoHS directive 2011/65/EU should not be shortened. Alternative technologies to UVC lamps are far from an industrial scale application. Further steps in science and development are needed.

The VDMA statement "***UV low-pressure discharge lamps for special purposes in the high power range.***" should be detailed:

UVC low-pressure discharge lamps for disinfection and surface treatment purposes in the power range from 5 Watts up to 1500 Watts.

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.

In the UVC market (disinfection of water, air and surfaces) two alternative technologies can be reviewed: UVC LEDs and UVC excimer lamps.

UVC LED can produce radiation with a peak wavelength in the UVC range, i.e., 275 nm. The achievable value of UVC irradiance is very low compared to a UVC lamp. To substitute one single classical UVC lamp in municipal drinking water application, several thousand of UVC LEDs are need. The energy consumption would be many times higher. Today, UVC LEDs are applied only for small “disinfection gadgets” for consumer products. The advantage compared to other disinfection technologies is neglectable. For industrial application UVC LEDs are not appropriate.

UVC excimer lamps can produce radiation in the UVC range, i.e., 222 nm. Such lamps are filled with the noble gas krypton and the toxic halogen chlorine. They are powered by very high-voltage (2000 Volts and above) and can produce toxic ozone. Such lamps are in the development state. Today, UVC excimer lamps are not applicable in an industrial scale.

Both technologies cannot be considered as valid substitutes in an industrial scale and municipal water treatment purposes.

- 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.

Ongoing research is focused on the optimization of UVC LEDs and UVC excimer lamps and driver electronics.

- 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.

UVC LEDs are inefficient, expensive, short in lifetime and not considered in the regulations. Recent research is focused on increasing efficiency and reliability. New materials and manufacturing technologies are part of the ongoing research. New concepts focus on radiation wavelength of 265 nm that promises an effective inactivation of pathogens for disinfection purposes.

UVC excimer lamps are in the state of industrial optimization. The lamp design (filler mixture, quartz materials, coatings, electrodes, mechanical design) is developed to increase efficiency, reliability and lifetime. The needed lamp voltage should be decreased to reduce dangers (high-voltage, ozone). Lamp driver concepts are in development and optimization. Challenges are efficiency, electromagnetic compatibility and reliability.

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?

The replacement of UV lamps for UVC disinfection purposes is not possible within the next 5 year and beyond. No applicable substitution technology exists.

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?
  - 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?

Let's consider the substitution of UVC systems in an industrial scale would be possible by UVC LEDs. It is not.

The additional costs and amounts of waste would be overwhelming. For example, all municipal UVC water treatment plants would need a complete reconstruction. None of the UV reactors, electronics and control systems could be reused or modified. The consumed electrical power would increase many times. Because of the short lifetime of UVC LEDs, they needed to be exchanged very often. UVC LED systems integrate radiation-emitting material, electronics, lens, etc. These components consist of many different (mixed) materials, e.g., rare earth material. Recycling of this amount of electronic waste will be a considerable challenge.

A UV lamp consists of quartz glass and metal. Materials that can be easily recycled.

- 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.

We estimate several tens of thousands of jobs in the European Union that are directly connected to UV lamps.

100 % of the jobs at ZED Ziegler Electronic Devices GmbH, Germany are directly connected to UV lamps. If exemption 4(f) of Annex III of RoHS directive 2011/65/EU is deleted, our company will immediately shut down and all 23 works will lose their quality jobs.

- 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).

Huge costs in all listed fields. All peripherals need to be adapted: plants, reactors, drivers, controls, sensors, regulations.

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

ZED Ziegler Electronic Devices GmbH, Germany supports the attempt of the European Commission to minimize the contamination of the environment with mercury. We believe that UV lamps for general lighting purposes and consumer application are obsolete. On the contrary, UV lamps in special purposes cannot be substituted within the next 5 years and beyond.

UVC lamps are the key technology for the treatment of air, surfaces, waste water and especially cleaning of drinking water. UVC lamps are established, energy-efficient, cost-efficient. UVC lamps are usually applied in a regulated environment. All peripherals like sensors, controls, lamp drivers have been optimized over decades. Industrial users recycle UV lamps after their (very long) lifetime. The recycling regulations for UV lamps are clear and effective.

**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.**

The following information is confidential and may not be published: N/A

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