# Consultation Questionnaire
# Annex IV, Exemption 3

## "Lead in electromagnetic radiation amplification devices: micro-channel plate and capillary plate"

### Abbreviations and Definitions

| | |
|---|---|
| ALD | Atomic layer deposition |
| EEE | Electrical and Electronic Equipment |
| RoHS | Directive 2011/65/EU on the Restriction of Hazardous Substances in Electrical and |
| Pb | Lead |

### Background

The Oeko-Institut and Fraunhofer IZM have been appointed by the European Commission, within a framework contract[1], for the evaluation of applications for exemption from Directive 2011/65/EU (RoHS), to be listed in Annexes III and IV of the Directive.

**We welcome your contributions to the stakeholder consultation. Please read the history of the exemption and the applicant's justification for the revocation request, and kindly answer the related questions until 24 July 2026.**

Additional information supporting this request can be found on the exemption webpage of the stakeholder consultation (https://rohs.exemptions.oeko.info/exemption-consultations/2026-consultation-1 ).

### History of the exemption

When Directive 2011/65/EU was published, the current exemption IV-3 was already listed in Annex IV. An exemption for micro-channel plates was added via DELEGATED DIRECTIVE 2014/70/EU (2014) as exemption IV-39. This exemption which was reviewed by Deubzer et al. (2022).

The review showed that MCPs produced with atomic layer deposition (ALD) did not require the use of lead. The exemption wording was amended and recommended to expire on 31 December 2026, corresponding to a renewal for 5 years, which is less than the maximum 7 years:

[1] The contract is implemented through Framework Contract No. ENV.B.3/FRA/2023/0012, led by Ramboll Deutschland GmbH.

| | Exemption | Scope and dates of applicability |
|---|---|---|
| 39 | *Lead in micro-channel plates (MCPs) used in equipment for the amplification or detection of ionising radiation, electrons or ions, where at least one of the following properties is present:*<br>*(a) a compact size of the detector, where the space for the detector is limited to a maximum of 3 mm/MCP (detector thickness + space for installation of the MCP), a maximum of 6 mm in total, and an alternative design yielding more space for the detector is scientifically and technically impracticable;*<br>*(b) a two-dimensional spatial resolution, where at least one of the following applies:*<br>*(I) a response time shorter than 25 ns;*<br>*(II) a sample detection area larger than 149 $mm^2$;*<br>*(III) a multiplication factor larger than 1,3 × $10^3$.*<br>*(c) a response time shorter than 5 ns;*<br>*(d) a sample detection area larger than 314 $mm^2$;*<br>*(e) a multiplication factor larger than 4,0 × $10^7$.* | Expires on 31 December 2026 for cat. 8 medical devices including in-vitro diagnostic medical devices and cat. 9 monitoringa and control instruments including industrial monitoring and control instruments |

Source: Deubzer et al. (2022)

Substitution or elimination of lead in MCPs was found to be scientifically and technically practicable from 2027 on. The additional time after 2021 was required to allow the integration and qualification of the lead-free MCPs into EEE of Categories 8 and 9. It was further on recommended to delete the MCPs from exemption IV-3 so that it would cover only the use of lead in capillary plates, and exemption IV-39 would be the only exemption of Annex IV covering the use of lead in MCPs. Exemption IV-3 would thus read as follows:

*Lead in electromagnetic radiation amplification devices: capillary plates*

The COM has not yet officially published the decision as to the renewal of exemption IV-39 and the amendment of exemption IV-3 (status 28 May 2026).

## 1.1 Applicant's justification for the requested exemption revocation

Deubzer et al. (2022) recommended that the COM revoke exemption IV-3. The consultants to the COM assessed that lead is traditionally used in microchannel plate and capillary plate amplifiers of electromagnetic radiation to provide the surface necessary for the secondary electron emission properties critical for the production of the signal gain.

Atomic layer deposition (ALD) was initially developed to increase the gain and lifetime of microchannel plates (MCPs) used in Military/Defense applications and the field of High-Energy Physics. Nowadays, the adoption of the technology has spread to other applications and markets.

Using atomic layer deposition (ALD), unrestricted coatings can be applied to unleaded glass such that these specially layered coatings provide the surface that can provide the secondary electron emission properties without the use of restricted materials. Specifically, the application of the ALD coating can improve the performance of the devices while leaving other physical and electrical properties largely unchanged.

(Arradiance 2025) provide links to substantiate their claim that ALD can be used in microchannel plates. As to lead-free capillary plates, they highlight that mass spectrometry instruments typically utilize high aspect ratio lead glass components for which Arradiance provide thin film solutions on lead-free substrates for components in mass spectrometry instruments such as *capillary inlet tubes* and microchannel plates (MCP).[2]

## 1.2 Questions

Before you start, please fill in your contact details:

Name:

Company:

E-Mail and phone number:

1) ALD enables the elimination of lead in MCPs. Capillary plates **amplifying electromagnetic radiation** in the consultants' understanding are based on the same functional amplification principle. ALD should therefore enable the elimination of lead in these capillary plates. Art. 5(1)(a) would then no longer support maintaining the exemption and the applicants' revocation request could be followed.

   Do you agree to the above conclusion? Please explain your statement, in particular, if you do not agree.

**Please send your answers to the project email: rohs.exemptions@oeko.de at the latest by 24 July 2026.**

**Your answers shall be posted on the RoHS Evaluations website as part of the online consultation. In case parts of your answers are confidential, please provide your answers in two versions (public /confidential). Please also note, however, that requested exemptions cannot be granted based on confidential information!**

## 1.3 References

Arradiance (2025): Application for revocation of exemptions to RoHS 2. Submitted by Michael Trotter, Chief Executive Officer, Arradiance, on 22 June 2025.

[2] Cf. Arradiance, https://arradiance.com/news/2023-arradiance-unleaded-glass-technology-083123-3.pdf

DELEGATED DIRECTIVE 2014/70/EU (2014): Amendment, for the purposes of adapting to technical progress, of Annex IV to Directive 2011/65/EU of the European Parliament and of the Council as regards an exemption for lead in micro-channel plates (MCPs). https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex%3A32014L0070

Deubzer et al. (2022): Study to assess requests for renewal of 16 exemptions to Annex IV of Directive 2011/65/EU (Pack 21). Under the Framework Contract: Assistance to the Commission on technical, socio-economic and cost-benefit assessments related to the implementation and further development of EU waste legislation. Amended Final Report. in cooperation with Dr. Deubzer, Otmar, Fraunhofer IZM und UNITAR, Saskia Huber, Jana Rückschloss, Fraunhofer IZM, UNITAR Christian Clemm and Bio I. S. Shailendra Mudgal; https://op.europa.eu/en/publication-detail/-/publication/f46d5d27-2d8d-11ed-975d-01aa75ed71a1.