Consultation Questionnaire Exemption 15 of RoHS Annex III

Table 1: Currently valid exemption wordings of the exemption 15 series

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| No. | Current exemption wording | Current scope and dates of applicability |
| III-15 | Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages | Applies to categories 8, 9 and 11.Expires on * 21 July 2021 for category 8 other than in vitro diagnostic medical devices and category 9 industrial monitoring and control instruments.
* 21 July 2023 for category 8 in vitro diagnostic medical devices.
* 21 July 2024 for category 9 industrial monitoring and control instruments, and for category 11.
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| III-15(a) | Lead in solders to complete a viable electrical connection between the semiconductor die and carrier within integrated circuit flip chip packages where at least one of the following criteria applies: * a semiconductor technology node of 90 nm or larger;
* a single die of 300 mm² or larger in any semiconductor technology node;
* stacked die packages with die of 300 mm² or larger, or silicon interposers of 300 mm² or larger.
 | Applies to categories 1 to 7 and 10.Expires on 21 July 2021 for categories 1 to 7 and 10 |

Acronyms and Definitions

Cat. Category, referring to the categories of EEE specified in Annex I of the current RoHS Directive 2011/65/EU

COM European Commission

EEA European Economic Area (EU 27 + Iceland, Liechtenstein and Norway)

EEE Electrical and electronic equipment

EU European Commission

FCP Flip chip package

IMCI Industrial monitoring and control instruments

Lead-free Not containing lead in the application in scope of the exemption to be reviewed

# Background and objectives of this review

Bio Innovation Service, UNITAR-SCYCLE and Fraunhofer IZM have been appointed[[1]](#footnote-2) by the European Commission for the evaluation of applications for new exemptions and the renewal of exemptions currently listed in Annexes III and IV of the RoHS Directive 2011/65/EU.

TMC requested the renewal of exemption 15 with its current wording for the maximum validity of seven years for cat. 9 industrial monitoring and control instruments (IMCI). The applicant was requested to respond to clarification questionnaires prior to this stakeholder consultation to complete missing information. This questionnaire along with the exemption application and – if submitted - supporting evidence from other stakeholders are accessible on the stakeholder consultation web page.

The stakeholder consultation is part of the review process for the exemption request at hand. It addresses third parties – not the applicants – to provide and to evaluate information and evidence according to the criteria listed in Art. 5(1)(a) of Directive 2011/65/EU.[[2]](#footnote-3)

Exemptions 15 and 15(a) were reviewed by Deubzer et al. (2022). They recommended not to renew the exemptions because the applicants failed to provide the evidence required by Art. 5(1)(a) to substantiate their renewal request. The applicants’ renewal request included cat. 8 and 9. TMC, not being a member of the consortium requesting the exemption renewal, had sumitted a document claiming that the renewal requests for cat. 9 IMCI for which most exemptions expire in 2024 are premature and should not be dealt with in the 2020/2021 exemption reviews. The Commission (COM) rejected this claim[[3]](#footnote-4) so that the Deubzer et al. (2022) reviewed exemptions 15 and 15(a) including cat. 9 IMCI.

The European Commission (COM) have not yet officially published their decision as to the adoption of the above recommendation. The COM wishes the consultants to assess in this current review round whether there are any substantial reasons in line with Art. 5(1)(a) against the adoption of the above recommendation for EEE of categories 8, 9 and 11.

In the case at hand, this implies that TMC is requested to answer the questions that remained open in the previous review of exemptions 15 and 15(a) so that the exemption could possibly be reommended to be renewed for cat. 9 IMCI. To reflect the scientific and techncial progress in the exemption wording, it will be assessed whether at least the current exemption 15(a) (c.f. Table 1) is applicable to cat. 9 IMCI instead of currently applicable exemption 15 with its unspecified and thus very wide scope.

**To contribute to this stakeholder consultation, please answer the below questions until 11 December 2023.**

**Please also see the applicants’ request form and clarification questionnaire response and – if submitted – further information on the consultation web page[[4]](#footnote-5).**

# Questions

1. In their answers to the clarification questionnaire TMC insisted that they request the renewal of exemption 15 – not 15(a) – for cat. 9 IMCI. *Exemption III-15 permits lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flipchip packages and is currently in force for Industrial Monitoring and Control equipment. Alternatives have entered the market in recent designs and a change to 15(a) restricting Pb-containing solder by die and node size has occurred. However, there are still a significant number of suppliers that have not investigated or implemented these changes.*

Exemption 15(a) was introduced following the review of the predecessor exemption – today’s exemption 15 – by Gensch et al. (2016) to reflect the status of science and technology. Lead-free smaller node flip chip packages (< 90 nm) for example have been placed on the market since 2007, i.e. for at least 16 years already.

Have flip chip packages (FCPs) still been placed on the market after 2016 which do not comply with the current exemption 15(a) but only with the current exemption 15? If yes, could you please provide examples of such FCPs?

1. In the last review of exemptions 15 and 15(a) by Deubzer et al. (2022) the applicants failed to illustrate the 2022 technological status of modern flip chip technologies. The current exemption 15(a) probably does not reflect the current technological status due to the below open questions:
	1. First clause of exemption 15(a):
	Flip chip packages (FCPs) with technology nodes larger than 90 nm are still placed on the EEA market in new EEE. These older FCP models cannot be redesigned to enable the use of lead-free solders but smaller node lead-free FCPs have been available since 2007. Cat. 9 IMCI will have been in the scope of the RoHS Directive 2011/65/EU since 2011, i.e. for 13 years, when exemption 15 will expire in 2024.

Please explain why FCPs with technology nodes larger than 90 nm are still required in cat. 9 IMCI for another 7 years until 2031 in the presence of lead-free alternatives since 2007, and 20 years after cat. 9 IMCI were adopted to the scope of the RoHS Directive.

* 1. Second clause of exemption 15(a):
	The applicants in the last review by Deubzer et al. (2022) claimed that the use of lead is scientifically and technically impracticable for FCPs with dies of 300 mm2 or more, independently from the technology nodes. The review process revealed that larger die size FCPs (single dies and stacked) with smaller technology nodes can be produced with lead-free solders. The applicants did not provide information as to which die size (> 300 mm²) and technology nodes FCPs can be produced with lead-free solders.

Can you please answer this question? Since when are lead-free FCPs with dies larger than 300 mm² available on the market?

* 1. Third clause of exemption 15(a):
	The review of exemption 15/15(a) by Gensch et al. (2016) showed that using plastic/organic interposers instead of silicon interposers enables lead-free soldering of stacked die FCPs with interposers of 300 mm² and more. In the last review by Deubzer et al. (2022), applicants stated that the usability of plastics instead of silicon interposers has its limits and, among others, depends on the number of connections between adjacent dies in the FCP. The applicants failed, however, to explain the conditions and limitations for the use of organic interposers that why these conditions either cannot not be used to restrict the exemption scope, or why such a scope restriction does not make sense. The actual scientific and technical practicability of lead-free soldering in FCPs with large (≥ 300 mm²) interposers remained unclear.

Could you please explain the conditions – or sets of conditions - that require the use of silicon interposers for interposer sizes ≥ 300 mm² instead of organic interposers. Please also take into account whether and how far the chiplet technology and/or the use of silicon bridges instead of silicon interposers enable the use of lead-free solders in such FCPs.

1. TMC provided a socioeconomic analysis related to the above exemption request. The document is available online in the consultation folder for this exemption.
Do you agree with the underlying method, data and conclusions?
2. Is there any additional information which you would like to provide?

**Please note that answers to these questions can be published on the stakeholder consultation website and in the review report. 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.**

**It would be helpful for the review process if you could kindly provide the information in formats that allow copying text, figures and tables to be included in the review report.**

References

Deubzer et al. (2022): Study to assess requests for renewal of 12 exemptions to Annex III of Directive 2011/65/EU 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. Final Report. Pack 23. in cooperation with Dr. Otmar Deubzer (Fraunhofer IZM and UNITAR], Jana Rückschloss (Fraunhofer IZM) and Christian Clemm (UNITAR)Deubzer et al.Dr. Otmar Deubzer (Fraunhofer IZM and UNITAR]; Jana Rückschloss (Fraunhofer IZM); Christian Clemm (UNITAR)https://​data.europa.eu​/​doi/​10.2779/​507661Study to assess requests for renewal of 12 exemptions to Annex III of Directive 2011/65/EU 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 legislation19 December 2022Deubzer et al.19 December 2022Dr. Otmar Deubzer (Fraunhofer IZM and UNITAR]; Jana Rückschloss (Fraunhofer IZM); Christian Clemm (UNITAR)RoHS 28, Pack 23https://​data.europa.eu​/​doi/​10.2779/​507661. Hg. v. Publication Office of the European Union. European Commission (RoHS 28, Pack 23). Retrieved fromhttps://​data.europa.eu​/​doi/​10.2779/​507661.

Gensch et al. (2016): Assistance to the Commission on Technological, Socio-Economic and Cost -Benefit Assessment Related to Exemptions from the Substance Restrictions in Electrical and Electronic Equipment - Study to assess renewal requests for 29 RoHS 2 Annex III exemptions. RoHS 14. in cooperation with Carl-Otto Gensch, Yifaat Baron, Markus Blepp, Katja Moch, Susanne Moritz, Oeko-Institut and Dr. Deubzer, Otmar, Fraunhofer Institut Zuverlässigkeit und Mikrointegration IZMGensch et al.Carl-Otto Gensch; Yifaat Baron, Markus Blepp, Katja Moch, Susanne Moritz, Oeko-Institut; Dr. Deubzer, Otmar, Fraunhofer Institut Zuverlässigkeit und Mikrointegration IZMhttps://​circabc.europa.eu​/​sd/​a/​eda9d68b-​6ac9-​4fb9-​8667-​5e561d8c957e/​RoHS-​Pack\_​9\_​Final\_​Full\_​report\_​Lamps\_​Alloys\_​Solders\_​June2016.pdfAssistance to the Commission on Technological, Socio-Economic and Cost -Benefit Assessment Related to Exemptions from the Substance Restrictions in Electrical and Electronic Equipment - Study to assess renewal requests for 29 RoHS 2 Annex III exemptions7 June 2016Gensch et al.7 June 2016Carl-Otto Gensch; Yifaat Baron, Markus Blepp, Katja Moch, Susanne Moritz, Oeko-Institut; Dr. Deubzer, Otmar, Fraunhofer Institut Zuverlässigkeit und Mikrointegration IZMRoHS XIVhttps://​circabc.europa.eu​/​sd/​a/​eda9d68b-​6ac9-​4fb9-​8667-​5e561d8c957e/​RoHS-​Pack\_​9\_​Final\_​Full\_​report\_​Lamps\_​Alloys\_​Solders\_​June2016.pdf (Adaptation to Scientific and Technical Progress of Annexes III and IV of Directive 2011/65/EU, RoHS XIV). Retrieved fromhttps://​circabc.europa.eu​/​sd/​a/​eda9d68b-​6ac9-​4fb9-​8667-​5e561d8c957e/​RoHS-​Pack\_​9\_​Final\_​Full\_​report\_​Lamps\_​Alloys\_​Solders\_​June2016.pdf.

1. It is implemented through the specific contract 070201/2020/832829/ENV.B.3 under the Framework contract ENV.B.3/FRA/2019/0017 [↑](#footnote-ref-2)
2. Directive 2011/65/EU (RoHS) available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011L0065:EN:NOT> [↑](#footnote-ref-3)
3. C.f. BIO IS, <https://rohs.biois.eu/RoHS_Pack-23_Report_Final_20221220.pdf> [↑](#footnote-ref-4)
4. Consultation web page: <https://rohs.biois.eu/requests2.html> [↑](#footnote-ref-5)