

7th Adaptation to Scientific and Technical Progress of Exemptions 8(e), 8(f), 8(g), 8(h), 8(j) and 10(d) of Annex II to Directive 2000/53/EC (ELV)

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Authors:

Carl-Otto Gensch, Oeko-Institut

Yifaat Baron, Oeko-Institut

Otmar Deubzer, Fraunhofer Institut IZM

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The European Commission

Prepared by:

Oeko-Institut e.V.

Freiburg Head Office

P.O. Box 1771

79017 Freiburg, Germany

Street Address

Merzhauser Str. 173

79100 Freiburg, Germany

Tel.: +49 (0) 761 – 4 52 95-0

Fax +49 (0) 761 – 4 52 95-288

Web: www.oeko.de

Fraunhofer-Institut IZM

Environmental and Reliability Engineering

Gustav-Meyer-Allee 25

13355 Berlin, Germany

Tel.: +49 30 46403-157

Fax: +49 30 46403-131

Web: www.izm.fraunhofer.de

Approved by:

Adrian Gibbs, Eunomia

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Contact Details

Eunomia Research & Consulting Ltd

37 Queen Square

Bristol

BS1 4QS

United Kingdom

Tel.: +44 (0)117 – 9172250

Fax: +44 (0)8717 – 142942

Web: www.eunomia.co.uk

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6.0 Exemption 8 (g) “Lead in solders of flip chip packages”

Abbreviations and Definitions

BGA	Ball grid array
CMOS	Complementary metaloxide semiconductor
FC	Flip chip
FCP	Flip chip package

Declaration

The phrasings and wordings of stakeholders’ explanations and arguments have been adopted from the documents provided by the stakeholders as far as possible. Formulations have been altered in cases where it was necessary to maintain the readability and comprehensibility of the text.

6.1 Description of Requested Exemption

ACEA et al.¹³⁵ applies for the continuation of Exemption 8(g) in Annex II of the ELV Directive without an expiry date. The current wording of this exemption is:

Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages.

The exemption shall be reviewed in 2014.

6.1.1 History of the Exemption

Goodman¹³⁶ first reviewed this application concerning a possible exemption from the RoHS Directive 2002/95/EC¹³⁷. As a result, Exemption 15 was listed in the annex of

¹³⁵ ACEA et al. (2013b) ACEA, CLEPA, JAMA, KAMA stakeholder document “acea_clepa_jama_kama_contribution_Ex_8g_20131104.pdf”, submitted during the online stakeholder consultation, retrieved from http://elv.exemptions.oeko.info/fileadmin/user_upload/Consultation_2013_1/Exemption_8_g/_acea_clepa_jama_kama_contribution_Ex_8g_20131104.pdf; last accessed 20.11.2013

¹³⁶ Goodman (2004) Paul Goodman, Philip Strudwick, Robert Skipper: Technical adaptation under Directive 2002/95/EC (RoHS) - Investigation of exemptions – Final Report. ERA Report 2004-0603, December 2004, retrieved from http://ec.europa.eu/environment/waste/weee/pdf/era_technology_study_12_2004.pdf; last accessed 06.12.2013

¹³⁷ RoHS 1 (2002) Directive 2002/95/EC of the European Parliament and of the Council of 27.01.2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment,

RoHS 1, with an identical wording to that of the current ELV Exemption 8(g). The exemption was reviewed again in 2008¹³⁸ under the RoHS 1 regime. The Commission followed the consultants' recommendation¹³⁹ and granted the continuation of the exemption without specifying an explicit expiry date so that the exemption would have remained valid until 2014. The exemption was later transferred as Exemption 15, without change, to Annex III of the RoHS recast Directive 2011/65/EU¹⁴⁰. Article 5(2)¹⁴¹ of the RoHS Directive stipulates that all exemptions are to have a limited duration. If the maximum duration is to apply to Exemption 15 of RoHS, it shall remain available for most equipment until 22 July 2016 and for equipment of the RoHS Annex I category 8 (medical devices) and category 9 (monitoring and control equipment) for 7 years, starting when the category is to come into the scope of RoHS (i.e., from the 22 July 2014/2016/2017 until 22 July 2021/23/24).

In 2009, just after the review under RoHS 1, the application was also reviewed, concerning a possible exemption from Directive 2000/53/EC¹⁴². Based on the results of the previous review of Exemption 15 under the RoHS Directive, the consultants' recommended granting the exemption¹⁴³, and it was added as Exemption 8(g) to Annex II of the ELV Directive with the above wording and a review date in 2014.

retrieved from

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011L0065:EN:NOT>; last accessed 05.12.2013

¹³⁸ The consultation documents can be found here: <http://rohs.exemptions.oeko.info/index.php?id=31>

¹³⁹ Oeko-Institut (2009) Gensch, C.; Zangl, S.; Groß, R.; Weber, A. (Oeko-Institut e.V.); Deubzer, O. (Fraunhofer IZM); Adaptation to scientific and technical progress under Directive 2002/95/EC, Final Report, February 2009, retrievable from http://ec.europa.eu/environment/waste/weee/pdf/final_reportl_rohs1_en.pdf; last accessed 20.11.2011

¹⁴⁰ RoHS 2 (2011) Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast), retrieved from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011L0065:EN:NOT>; last accessed 05.12.2013

¹⁴¹ Article 5(2) of the RoHS Directive stipulates: "Measures adopted in accordance with point (a) of paragraph 1 shall, for categories 1 to 7, 10 and 11 of Annex I, have a validity period of up to 5 years and, for categories 8 and 9 of Annex I, a validity period of up to 7 years... For the exemptions listed in Annex III as at 21 July 2011, the maximum validity period, which may be renewed, shall, for categories 1 to 7 and 10 of Annex I, be 5 years from 21 July 2011 and, for categories 8 and 9 of Annex I, 7 years from the relevant dates laid down in Article 4(3), unless a shorter period is specified." See also clarification in RoHS FAQ Document: http://ec.europa.eu/environment/waste/rohs_eee/pdf/faq.pdf.

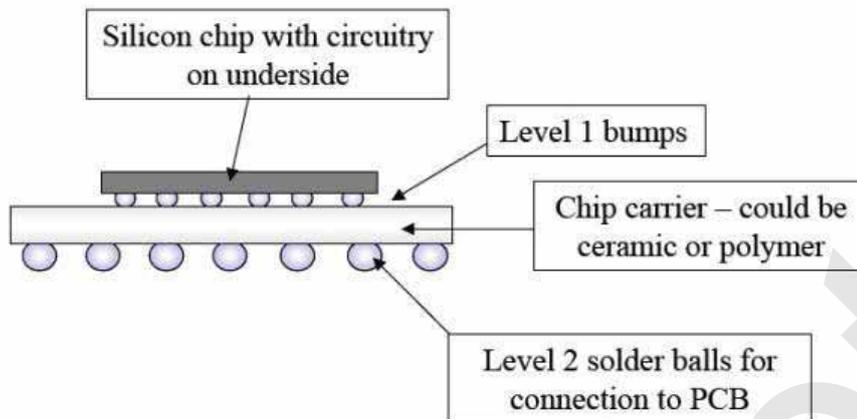
¹⁴² ELV Directive (2000) Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles, retrieved from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2000L0053:20130611:EN:PDF>; last accessed 05.12.2013

¹⁴³ Oeko-Institut (2010) Zangl, S.; Hendel, M.; Blepp, M.; Liu, R.; Gensch, C. (Oeko-Institut); Deubzer, O. (Fraunhofer Institute for Reliability and Microintegration IZM); Adaptation to scientific and technical progress of Annex II to Directive 2000/53/EC (ELV) and of the Annex to Directive 2002/95/EC (RoHS), revised version of the final report, Freiburg, 28 July 2010, retrievable from

6.1.2 Technical Description of the Exemption

Figure 6-1 displays the schematic view of a flip chip package (FCP).

Figure 6-1: Schematic View of a Flip Chip Assembly



Source: Goodman¹⁴⁴ (modified)

ACEA et al.¹⁴⁵ describes the status of lead use in FCP referring to Oeko-Institut¹⁴⁶:

- For the level 2 interconnects, lead-free solders can be used. For level 1 interconnects, different solders are applied:
 - High melting point solders with 85% and more of lead, e. g. 97%Pb3Sn, 90%Pb10%Sn;
 - Lead-free solders, such as SnAg, Sn3.5%Ag0.7%Cu (SAC);
 - Gold, copper or gold tin;
 - Eutectic solder (63%Sn37%Pb).
- The solders used on level 1 in the flip chip connections must be:
 - Resistant to electro-migration failure at the extremely high current densities required;
 - Able to create a solder hierarchy that allows staged assembly and rework of components in the manufacture process; and

https://circabc.europa.eu/sd/d/a4bca0a9-b6de-401d-beff-6d15bf423915/Corr_Final%20report_ELV_RoHS_28_07_2010.pdf; last accessed 05.09.2013

¹⁴⁴ Op. cit. Goodman (2004)

¹⁴⁵ Op. cit. ACEA et al. (2013b)

¹⁴⁶ Op. cit. Oeko-Institut (2009)

- Have high ductility to reduce thermo-mechanical stress in under bump metallurgy structures in particular in larger dies.

In 2008, lead-free solders could not yet provide all these functionalities to a sufficient degree and hence were not appropriate to replace the leaded solders. Lead solders in particular were important for high reliability applications, large dies, and high performance applications with high current densities.

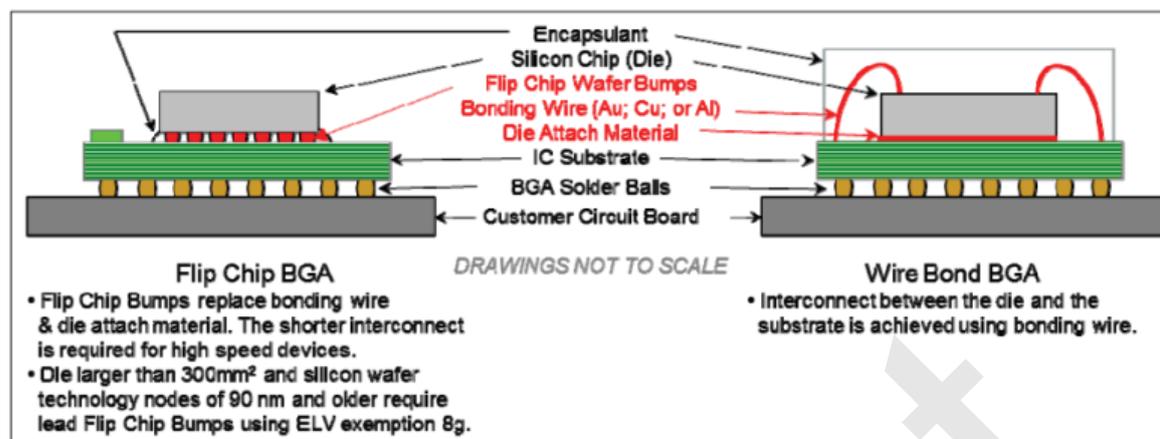
ACEA et al.¹⁴⁷ explains that flip chip interconnection technology is used in highly complex multi-chip and stacked package integrated circuits, e.g. controllers for communication equipment. The technology offers advantages in high frequency (HF) applications where heat dissipation and radiation (heat as well as electromagnetic) are critical. Controllers using these advantages can be found in a wide variety of uses in vehicles, e.g.

- Long range distance control;
- Lane departure warning systems;
- Frontal projection systems;
- Car radio;
- Vision systems;
- Car-infotainment;
- Traffic sign recognition;
- Navigation systems;
- Telematic systems;
- Head-up displays;

Figure 6-2 shows the typical design of flip chip devices in comparison to the traditional design using wire bond connections. The “Flip Chip Wafer Bumps” are produced with lead solder.

¹⁴⁷ Op. cit. ACEA et al. (2013b)

Figure 6-2: Design of Flip Chip Devices and Traditional Wire Bond Connected Packages



Source: ACEA et al.¹⁴⁸ / ACEA et al.¹⁴⁹. BGA = Ball grid array

ACEA et al.¹⁵⁰ claims that as of today, a significant number of existing automotive flip chip applications cannot be converted into lead-free and the use of lead therefore remains unavoidable.

6.1.3 Amount of Lead Used under the Exemption

ACEA et al.¹⁵¹ indicates that the typical lead content for a lead flip chip die within a semiconductor product may vary from a minimum of 0.5 mg to a maximum of 300 mg, depending primarily upon the size and number of bumps. The median estimated lead from flip chip bumps under ELV is 0.015 grams. The flip chip products are used in selected few sockets within automotive applications. There are no metrics to identify the number of lead flip chip components within an average vehicle.

ACEA et al.¹⁵² calculates that, assuming one to three flip chip components per vehicle and based upon the latest estimated 13.4 million registered units in the European Economic Area (EU + Norway, Iceland and Liechtenstein), the total lead placed on the EU market is estimated with about 0.2 to 0.6 metric tonnes per year.

¹⁴⁸ Op. cit. ACEA et al. (2013b)

¹⁴⁹ ACEA et al. (2013c) ACEA, CLEPA, JAMA, KAMA stakeholder document "ACEA, CLEPA, JAMA, KAMA Answers_Questionnaire-1_Exe-8g_20131220.pdf", sent via e-mail to Otmar Deubzer, Fraunhofer IZM, by Peter Kunze, ACEA, on 20.12.2013

¹⁵⁰ Op. cit. ACEA et al. (2013b)

¹⁵¹ Op. cit. ACEA et al. (2013b)

¹⁵² Op. cit. ACEA et al. (2013b)

6.2 Stakeholders' Justification for Exemption

ACEA et al.¹⁵³ provides the following reasons for the continued use of lead in the requested exemption:

- Chip sizes of more than 300 mm², or fabrication processes using structures of 90 nm and above or/and additional solder die attach;
- The incremental stress from the Cu pillars or from other lead-free materials introduces severe long term reliability problems such as bump integrity, dielectric cracking and die cracking;
- The influence of cooling parameters having more influence on microstructure¹⁵⁴;
- The thermo mechanical load during the processing of the FCPs limits the achievable and required long term reliability;
- In vehicle use, the component has to tolerate high mechanical and thermal stress over a long period of time

According to ACEA et al.¹⁵⁵, the chip and factory design as well as the process technology are often incompatible with the stiff Pb-free flip chip bumps for designs based upon older CMOS (complementary metal-oxide semiconductor) technology with 90 nm or larger printed transistor line width. The conversion to Pb-free bumps results in reliability failures.

Similarly, ACEA et al.¹⁵⁶ states that products in semiconductor manufacturing technologies with a die size greater than 300 mm² do not meet automotive long-term reliability requirements. The large dies are especially susceptible to bump failures near the corners when using stiff or less pliable Pb-free bumps.

ACEA et al.¹⁵⁷ admits that newly developed lead free flip chip products are available for die sizes of less than 300 mm² and less than 90 nm node structures, but by far not yet covering all the various products, designs and applications in the current uses described above (see applications detailed in Section 6.1.2). For these products, long-term reliability and performance under harsh environment, still has to be assessed and field experience gained. These lead free flip-chip applications typically fail the essential AEC-Q 100¹⁵⁸ specification for the endurance demands, thus excluding their usage for automotive applications.

¹⁵³ Op. cit. ACEA et al. (2013b)

¹⁵⁴ S. Wiese: Verformung und Schädigung von Werkstoffen der Aufbau- und Verbindungstechnik e.g. p 455 ff; Springer Verlag, Heidelberg 2010 ff; source as referenced in ACEA et al. (2013b)

¹⁵⁵ Op. cit. ACEA et al. (2013b)

¹⁵⁶ Op. cit. ACEA et al. (2013b)

¹⁵⁷ Op. cit. ACEA et al. (2013b)

¹⁵⁸ <http://www.aecouncil.com/AECDocuments.html>; source as referenced in ACEA et al. (2013b)

ACEA et al.¹⁵⁹ states that significant progress has been made in alternative interconnection and packaging technologies. However, challenges remain with regard to the use of substitute materials and interconnection technologies. Newly designed products using that substitute may not be suitable for existing and forthcoming applications in vehicles, especially, when considering new technology fields like (hybrid) electric vehicles and the requirements on components resulting thereof. These developments are currently ongoing, but still will need much effort within the automotive industry and related supply chain for successful completion.

ACEA et al.¹⁶⁰ explains that automotive flip chip technology is relatively new. Applications such as engine control or advanced traffic control and passenger safety systems (e.g. "eCall") require advanced solutions, where lead free flip chip may not be possible. The semiconductor industry has been converting new products to lead-free flip chip bumps and has launched extensive design and development activities to find lead free alternatives for the automotive industry. These lead-free technologies have been introduced for product designs using structures less than 90 nm in width and with an area less than 300 mm². New materials for lead-free flip chip connections have been developed and implemented, such as copper pillars. The wafer fabrication technologies for less than 90 nm were designed for lead-free bumps. With the shrinking fabrication geometries, the dies become smaller and create less stress on the bonding pads and circuitry, as temperatures change and packages flex. Also, the new technologies were designed with a more robust wafer stack in the fabrication process, able to withstand the additional stress. As a result, many flip chip devices contain lead-free bumps for connecting the die to the integrated semiconductor package but, as stated above, these are not yet available and/or qualified for automotive applications.

According to ACEA et al.¹⁶¹, manufacturers have unsuccessfully attempted to retrofit lead-free bumps onto older and larger technology products designed for lead bumps. When attempted, the increased stress from the rigid lead-free bump resulted in product reliability failures. Due to quality and reliability concerns, some contract assembly sites do not offer lead-free flip chip bumps for the older and larger die, so there may be no alternatives available for these products.

According to ACEA et al.¹⁶², the semiconductor industry is known for rapid product innovation. Products in vehicles have, however, a long life cycle. Flip chip connections are used on high power, high reliability and high performance products. In these applications, the OEM market demands full characterization of all possible chip defects. This historical information is only available through years of evaluation. Product delivery for product replacement and repair and for other highly custom and low volume applications may continue for decades after a product passes its peak

¹⁵⁹ Op. cit. ACEA et al. (2013b)

¹⁶⁰ Op. cit. ACEA et al. (2013b)

¹⁶¹ Op. cit. ACEA et al. (2013b)

¹⁶² Op. cit. ACEA et al. (2013b)

sales volume. Companies may ship inventory that was fabricated years ago for these low volume products. This further complicates attempts to redesign with lead-free materials during the tail-end of a [FCP] product life cycle.

ACEA et al.¹⁶³ states that it is essential that Exemption 8(g) is extended because:

- Concerned applications for these products include safety critical applications like “emergency call”, “car to car communication” and applications in regulated areas like “telematics”;
- The development and transition cycles in the global automotive industry can extend beyond a decade; and
- Flip chip technology supports the ongoing miniaturization of components and contributes to resource efficiency.

6.2.1 Road Map for Substitution or Elimination

ACEA et al. were asked to provide a roadmap for the substitution or elimination of lead. ACEA et al.¹⁶⁴ explains that for selected high power, high reliability and/or high performance products, the ELV Exemption 8(g) will be required during the development and evaluation of substitute materials and interconnection technologies. Specifically, ACEA et al.¹⁶⁵ considers that Exemption 8(g) is necessary for a time period related to the following concerns:

- Until replacement materials and processes are successfully identified for large die, high power and high reliability products;
- Until long term reliability is assessed and qualified under the harsh use conditions in vehicles according to automotive specifications (e.g. AEC-Q100); and
- Until products become available for automotive applications from a reasonable number of suppliers and in sufficient quantity.

ACEA et al.¹⁶⁶ claims that after an automotive suitable lead free material is identified, and material / process development is frozen, usually a minimum of 6 years will be required to qualify the new material through the whole supply chain. Based upon the current status of these special products, it is not possible to estimate a transition date. Product delivery for replacement and repair will need to continue for the life of type approved vehicles.

¹⁶³ Op. cit. ACEA et al. (2013b)

¹⁶⁴ Op. cit. ACEA et al. (2013b)

¹⁶⁵ Op. cit. ACEA et al. (2013b)

¹⁶⁶ Op. cit. ACEA et al. (2013b)

6.3 Critical Review

6.3.1 Elimination of Lead

ACEA et al.¹⁶⁷ presents traditional wire-bonded BGA in the context of FCP in Figure 6-2. ACEA et al. and were therefore asked whether and how far wire bonded BGAs could replace FCP, thus eliminating the use of lead. ACEA et al.¹⁶⁸ explains the significant technical advantages of the flip chip technology¹⁶⁹:

- High density packaging of complex integrated circuits, especially for high frequency applications like communication circuits cannot be realized by wire bond packages;
- Bond connections can only be made on the peripheral area of a chip. This causes strong limitations to the design of the chip (all input and output lines need to be placed to the outer area, thus the number of available input/output parts is limited);
- In FCP, input and output lines can be connected to all parts of the chip, and a much higher number of connecting points is possible. This offers the following advantages:
 - Better electrical properties to achieve good high frequency robustness;
 - Reduced height of assemblies;
 - Less space needed.

Besides the technical advantages, ACEA et al.¹⁷⁰ remarks that wire bonded BGA also contains lead in the die attach material displayed in Figure 6-2.¹⁷¹

Given the technical advantages of FCP, it is plausible that wire bonded BGA are not appropriate to eliminate the use of lead, all the more as wire bonded BGA also depend on the use of lead.

6.3.2 Substitution of Lead

According to ACEA et al.¹⁷², lead free flip chip products are available for die sizes of less than 300 mm² and less than 90 nm node structures, but long-term reliability and performance under harsh environments and within field experience are still missing.

¹⁶⁷ Op. cit. ACEA et al. (2013b)

¹⁶⁸ Op. cit. ACEA et al. (2013c)

¹⁶⁹ Steffen Wiese: *Verformung und Schädigung von Werkstoffen der Aufbau- und Verbindungstechnik* e.g. p 36f; Springer Verlag Heidelberg 2010; source as referenced in ACEA et al. (2013c)

¹⁷⁰ Op. cit. ACEA et al. (2013c)

¹⁷¹ For details see review of Exemption 8(e)

¹⁷² Op. cit. ACEA et al. (2013b)

These lead free flip-chip applications typically fail the essential AEC-Q 100¹⁷³ specification for the endurance demands thus excluding their usage for automotive applications.

This raises the question what “typically” means in this context, as it may imply that some of these lead-free packages pass the AEC-Q 100 test. ACEA et al.¹⁷⁴ states that “typically” here means that these lead free technology products are not yet offered on the market with AEC-Q100 qualification, and that therefore the Automotive Industry assumes that such products are not yet mature enough to be offered to the Automotive Industry. The first step for use in automotive applications is that the FCP pass this specification. Then further reliability tests with prototype boards in laboratory and after that, tests in vehicles are necessary.

According to ACEA et al.¹⁷⁵, new high performance electronics technologies depend on the use of advanced FCP. ACEA et al. were asked how such modern technologies can be used in vehicles if they need to be evaluated for years before they are allowed in vehicles, and if no such components are qualified for automotive uses, as ACEA et al. claim.

ACEA et al.¹⁷⁶ explained that the FCP, which are in current use in automotive applications, were designed years ago, when the technology was developed and introduced after reliability was proven in the market. The lead free products are not compatible with these previous products. Previous products cannot be produced in the new technology (<90 nm node structure wafer technology). The functionality is not identical. Introduction of new lead free FCP will become possible, when the new technology flip chip products are available on the market, suitable and qualified for the automotive applications.

ACEA et al.¹⁷⁷ further claims that manufacturers have unsuccessfully attempted to retrofit lead-free bumps onto older technology products designed for lead bumps. The increased stress from the rigid lead-free bumps resulted in product failures. Due to quality and reliability concerns, some contract assembly sites do not offer lead-free flip chip bumps for the older die, so there may be no alternative for these products. The main issue is the cyclic thermo-mechanical load on and within the joints of bumps /die attach.

6.3.3 Conclusions

On the one hand, ACEA et al. had claimed that the AEC-Q 100 test is the indispensable condition for the use of lead-free FCP in automotive applications, and

¹⁷³ <http://www.aecouncil.com/AECDocuments.html>; source as referenced in ACEA et al. (2013b)

¹⁷⁴ Op. cit. ACEA et al. (2013c)

¹⁷⁵ Op. cit. ACEA et al. (2013c)

¹⁷⁶ Op. cit. ACEA et al. (2013c)

¹⁷⁷ Op. cit. ACEA et al. (2013c)

that no lead-free FCP have passed this test. On the other hand, ACEA et al. could not confirm that lead-free FCP are not in use in some vehicles. ACEA et al. could not clarify this contradiction. After several unsuccessful rounds of questionnaires, the open questions were discussed at the stakeholder meeting on 9 May 2014 at Fraunhofer IZM in Berlin.

ACEA et al.^{178,179,180} and ACEA et al.^{181,182,183} maintained their statement that no lead-free FCP have passed the AEC Q-100 test. At the meeting in Berlin, ACEA et al.¹⁸⁴ finally admitted that lead-free FCP that have passed the AEC Q-100 test are on the market.

ACEA et al. were asked to explain why, if lead-free FCP with automotive qualifications are available, they are not used in automotive applications, in particular for those applications, which are less challenging and less critical for security. ACEA et al.¹⁸⁵ explained that, depending on the application (e.g. car multimedia) and the place of installation within the car, vehicle manufacturers could require additional validation (compared to component manufacturer) and the use of lead-free FCP (or otherwise) is assessed on a case-by-case basis. This additional validation could exceed the standard validation e.g. AEC Q- 100 of the electronic component done by the component supplier and could lead to the possibility that a component has successfully passed the validation but still does not meet the requirements of the assembly or the vehicle. The qualification depends on several influencing factors. In case the "standard" qualification of the FCP is sufficient after verification within the application, lead-free FCPs are already used (e.g. for car multimedia) and will be used in future for suitable applications. However, ACEA et al. did not provide any further

¹⁷⁸ ACEA et al. (2013a) ACEA, CLEPA, JAMA, KAMA stakeholder document "acea_clepa_jama_kama_contribution_cover_letter_20131104.pdf", submitted during the online stakeholder consultation, retrieved from http://elv.exemptions.oeko.info/fileadmin/user_upload/Consultation_2013_1/acea_clepa_jama_kama_contribution_cover_letter_20131104.pdf; last accessed 11.11.2013

¹⁷⁹ Op. cit. ACEA et al. (2013b)

¹⁸⁰ Op. cit. ACEA et al. (2013c)

¹⁸¹ ACEA et al. (2014a) ACEA, CLEPA, JAMA, KAMA stakeholder document "ACEA CLEPA JAMA KAMA Answers_Questionnaire-2_Exe-8g_20140221", sent via e-mail to Otmar Deubzer, Fraunhofer IZM, by Peter Kunze, ACEA, on 21.02.2014

¹⁸² ACEA et al. (2014b) ACEA, CLEPA, JAMA, KAMA stakeholder document "ACEA, CLEPA, JAMA and KAMA Answers_Questionnaire-3_Exe-8g_20140407.pdf", sent via e-mail to Otmar Deubzer, Fraunhofer IZM, by Peter Kunze, ACEA, on 07.04.2014

¹⁸³ ACEA et al. (2014c) ACEA, CLEPA, JAMA, KAMA stakeholder document "ACEA, CLEPA, JAMA and KAMA Answers_Questionnaire-4_Exe-8g_20140507.pdf", sent via e-mail to Otmar Deubzer, Fraunhofer IZM, by Peter Kunze, ACEA, on 08.05.2014

¹⁸⁴ ACEA et al. 2014b ACEA, CLEPA, JAMA, KAMA stakeholder document "General-Answers_Follow-up-Questionnaire_ACEA-et-al_20140528.pdf", sent via e-mail to Yifaat Baron, Oeko-Institut, by Peter Kunze, ACEA, on 28.05.2014

¹⁸⁵ Ibid.

details. It is thus understood that lead-free FCP still have restrictions in automotive applications, but that they are probably used nevertheless.

ACEA et al. were further asked to provide information on how many and which types of lead-free FCP have passed the AEC Q-100 test. ACEA et al.¹⁸⁶ claims to have no such information available. ACEA et al.¹⁸⁷ did not explain why a worldwide consortium of vehicle manufacturers and their suppliers actually does not have any information on numbers and types or at least examples of lead-free FCP that are qualified according to the AEC Q-100 test. At the same time, ACEA et al. claim that this test is the obligatory initial qualification of components for automotive uses. The question arises how ACEA et al. undertake steps to avoid the use of lead in FCP where its use is avoidable according to Art. 4(2)(b)(II), if they do not even know which FCP have successfully passed this initial test qualifying them for further testing for automotive applications. At the same time, however, ACEA et al. ask for the continuation of the exemption. ACEA et al. were asked to clarify this situation.

ACEA et al.¹⁸⁸ reaffirmed that no further information is available concerning the lead-free FCP that have passed the initial qualification according to AEC Q100. They did not answer or comment on the question raised above.

Overall, the information provided is insufficient and does not give a clear picture of the actual situation of lead-free FCP technologies used in vehicles. The consultants are therefore not in a position to evaluate whether and where the use of lead in FCP is unavoidable in line with the requirements of Art. 4(2)(b)(II).

6.4 Recommendation

The information provided by ACEA et al. is insufficient and does not allow a proper assessment of the actual status of lead-free FCP in automotive uses. Since the applicant did not provide sufficient information justifying the continuation, it is recommended that the Commission cancel Exemption 8(g) or continue the exemption for now, scheduling a further review in 2016, if possible, building on the information gathered during the review of Exemption 15 in Annex III to the RoHS Directive which is currently scheduled to expire in July 2016.

¹⁸⁶ Ibid.

¹⁸⁷ Ibid.

¹⁸⁸ ACEA et al. (2014e) ACEA, CLEPA, JAMA, KAMA stakeholder document "ACEA-et-al_Final-Questions_Exe-8g_20140703.pdf", sent via e-mail to Otmar Deubzer, Fraunhofer IZM, by Peter Kunze, ACEA, on 4 July 2014

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