



EUROPEAN  
COMMISSION

Brussels, **XXX**  
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**COMMISSION DELEGATED DIRECTIVE (EU) .../...**

**of **XXX****

**amending, for the purposes of adapting to scientific and technical progress, Annex III to Directive 2011/65/EU of the European Parliament and of the Council as regards an exemption for lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages**

(Text with EEA relevance)

*This draft has not been adopted or endorsed by the European Commission. Any views expressed are the preliminary views of the Commission services and may not in any circumstances be regarded as stating an official position of the Commission.*

## **EXPLANATORY MEMORANDUM**

### **1. CONTEXT OF THE DELEGATED ACT**

This Commission Delegated Directive amends, for the purpose of adapting to technical progress, Annex III of Directive 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast)<sup>1</sup> (RoHS 2) as regards an exemption for specific applications containing lead.

RoHS 2 restricts the use of certain hazardous substances in electrical and electronic equipment, as provided for in its Article 4. It entered into force on 21 July 2011.

The restricted substances are listed in Annex II to RoHS 2. While the restrictions of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers are in force to date, the restrictions of bis(2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP) shall apply from 22 July 2019 or later. Annexes III and IV to RoHS 2 list the materials and components of electrical and electronic equipment (EEE) for specific applications exempted from the substance restriction of RoHS 2 Article 4(1).

Article 5 makes provision for the adaptation to scientific and technical progress (inclusion, renewal, amendments and revoking of exemptions) of Annexes III and IV. Pursuant to Article 5(1)(a), exemptions are to be included in Annexes III and IV only if such inclusion does not weaken the environmental and health protection afforded by Regulation (EC) No 1907/2006<sup>2</sup> and where any of the following conditions is fulfilled: their elimination or substitution via design changes or materials and components which do not require any of the materials or substances listed in Annex II is scientifically or technically impracticable; the reliability of substitutes is not ensured; or the total negative environmental, health and consumer safety impacts caused by substitution are likely to outweigh the total environmental, health and consumer safety benefits thereof.

Furthermore, Article 5(1) provides that the European Commission (the Commission) shall include materials and components of EEE for specific applications in the lists in Annexes III and IV by means of individual delegated acts in accordance with Article 20. Article 5(3) and Annex V establish the procedure for submitting applications for granting, renewing, or revoking an exemption.

### **2. CONSULTATIONS PRIOR TO THE ADOPTION OF THE ACT**

Since the publication of RoHS 2, the Commission has received numerous<sup>3</sup> requests from economic operators, according to the provisions in Article 5(3) and Annex V, for both granting new and renewing existing exemptions.

The current Annex III exemption 15 permits the use of lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages. The Commission received one application for renewal of this exemption in January 2015. While exemption 15 had 21 July 2016 as expiration date for categories 1 to 7 and 10<sup>4</sup>,

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<sup>1</sup> OJ L 174, 1.7.2011, p. 88.

<sup>2</sup> OJ L 396, 30.12.2006, p. 1

<sup>3</sup> The list is given at: [http://ec.europa.eu/environment/waste/rohs\\_eee/adaptation\\_en.htm](http://ec.europa.eu/environment/waste/rohs_eee/adaptation_en.htm)

<sup>4</sup> These categories are namely: 1. Large household appliances; 2. Small household appliances; 3. IT and telecommunications equipment; 4. Consumer equipment; 5. Lighting equipment; 6. Electrical and

in line with the requirements of the RoHS Directive (Article 5(5), second subparagraph), it continues to apply until a decision on the renewal application is taken by the Commission.

With a view to evaluating the application for exemption, the Commission launched a study to carry out the required technical and scientific assessment, including an eight-week online open-ended stakeholder consultation<sup>5</sup> on the application. Two contributions were made to the stakeholder consultation.

The final report containing the assessment of the application was published<sup>6</sup>; stakeholders were notified.

Subsequently, the Commission consulted the Member States expert group for delegated acts under RoHS 2 in written form as agreed during a previous meeting<sup>7</sup>. The experts agreed with the draft presented by the Commission, with a large majority of silent members. All necessary steps relating to exemptions from the substance restriction pursuant to Articles 5(3) to 5(7) have been performed. Due to the large amount of simultaneous exemption requests and connected administrative requirements, the Commission decision procedure followed alternative deadlines as per Article 5(5)<sup>8</sup>. The Council and the European Parliament were notified of all activities.

The final report highlighted in particular the following technical information and assessment:

- Lead solder is used in flip chip connections as bumps and solders for attaching the die to the chip carrier. These solders must be resistant to electromigration 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 have high ductility to reduce thermo-mechanical stress in under bump metallurgy structures, in particular in larger dies.
- Currently, substitution or elimination of lead is still scientifically and technically impracticable for certain flip chip packages.

The evaluation results for categories 1 to 7 and 10 show that at least one of the relevant criteria specified in Article 5(1)(a) is met by the exemption request relating to entry 15 in Annex III. The existing wording of the exemption was amended to narrow down the scope of the exemption to applications for which reliable alternatives are still not available, adding subentry 15(a) to point 15. A validity period until 21 July 2021 was determined; this is not expected to have adverse impacts on innovation. Where reliable alternatives are already available, only negligible socioeconomic impacts of substitution are to be anticipated for this period as gradual substitution with lead free alternatives is already underway.

For categories other than categories 1 to 7 and 10, the existing exemption remains as per the validity periods set out in Article 5(2). The specific exemption does not weaken the environmental and health protection afforded by Regulation (EC) No 1907/2006 (REACH), in accordance with Article 5 of Directive 2011/65/EU.

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electronic tools; 7. Toys, leisure and sports equipment; 10. Automatic dispensers. EEE categories are listed in Annex I to the RoHS Directive.

<sup>5</sup> [Consultation period](#): from 21.08.2015 to 16.10.2015

<sup>6</sup> <https://bookshop.europa.eu/en/assistance-to-the-commission-on-technological-socio-economic-and-cost-benefit-assessment-related-to-exemptions-from-the-substance-restrictions-in-electrical-and-electronic-equipment-pbKH0416554/>

<sup>7</sup> The consultations were carried out in written form from 27 April until 18 May 2017.

<sup>8</sup> A list of the required administrative steps is available on the [Commission website](#). Current stage of the procedure can be viewed for each draft delegated act in the Interinstitutional Registry of Delegated Acts at <https://webgate.ec.europa.eu/regdel/#/home>.

### **3. LEGAL ELEMENTS OF THE DELEGATED ACT**

The Delegated Directive grants an exemption from the restrictions in Article 4(1), to be listed in Annex III of Directive 2011/65/EU, for the use of lead in specific applications.

The instrument is a Delegated Directive, as provided for by Directive 2011/65/EU, and in particular meeting the relevant requirements of Article 5(1)(a) thereof.

The objective of the Delegated Directive is to contribute to the protection of human health and the environment and approximate the provisions for the functioning of the internal market in the field of electrical and electronic equipment, by allowing the use of otherwise banned substances for specific applications, in line with the provisions and under the conditions of RoHS 2 and the therein established procedure for the adaptation of the Annexes III and IV to scientific and technical progress.

In accordance with the principle of proportionality, the measure does not go beyond what is necessary to achieve its objective.

The proposal has no implications for the EU budget.

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**amending, for the purposes of adapting to scientific and technical progress, Annex III to Directive 2011/65/EU of the European Parliament and of the Council as regards an exemption for lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages**

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to 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<sup>1</sup> and in particular Article 5(1)(a) thereof,

Whereas:

- (1) Directive 2011/65/EU requires Member States to ensure that electrical and electronic equipment placed on the market does not contain certain hazardous substances listed in Annex II to that Directive. That requirement does not apply to the applications listed in Annex III to Directive 2011/65/EU.
- (2) The different categories of electrical and electronic equipment for which Directive 2011/65/EU applies (categories 1 to 11) are listed in Annex I to that Directive.
- (3) Lead is a restricted substance listed in Annex II to Directive 2011/65/EU. The use of lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages was, however, exempted from the restriction and is currently listed in entry 15 of Annex III to that Directive. The expiry date of that exemption was, for categories 1 to 7 and 10, 21 July 2016.
- (4) The Commission received an application for renewal of that exemption before 21 January 2015, in accordance with Article 5(5) of Directive 2011/65/EU. The exemption remains valid until a decision on that application has been adopted.
- (5) Lead solder is used in flip chip connections as bumps and solders for attaching the die to the chip carrier. The solders must be resistant to electromigration failure at the extremely high current densities required and able to create a solder hierarchy that allows staged assembly and rework of components in the manufacturing process. They must also have high ductility to reduce thermo-mechanical stress in under bump metallurgy structures, in particular in larger dies.
- (6) For certain applications covered by the current exemption, a substitution or elimination of lead is still scientifically and technically impracticable due to the lack of reliable substitutes. The exemption does not weaken the environmental and health

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<sup>1</sup> OJ L 174, 1.7.2011, p. 88.

protection afforded by Regulation (EC) No 1907/2006 of the European Parliament and of the Council<sup>2</sup>. It should therefore be renewed for those particular applications.

- (7) For all other applications currently covered by the exemption, the conditions for renewal are not fulfilled. The exemption for those applications should continue to apply for 12 months after the date of entry into force of this Delegated Directive in accordance with Article 5(6) of Directive 2011/65/EU.
- (8) Since, for the applications concerned by that renewal, no reliable alternatives are available on the market, the exemption for those applications should be renewed for categories 1 to 7 and 10 for the maximum duration of five years until 21 July 2021. In view of the results of the ongoing efforts to find a reliable substitution, the duration of the exemption is unlikely to have adverse impacts on innovation.
- (9) For categories other than 1 to 7 and 10, the existing exemption remains valid as per the validity periods set out in the second subparagraph of Article 5(2) of Directive 2011/65/EU. For reasons of clarity, the dates of expiry should be added in Annex III to that Directive.
- (10) Directive 2011/65/EU should therefore be amended accordingly,

HAS ADOPTED THIS DIRECTIVE:

#### *Article 1*

Annex III to Directive 2011/65/EU is amended as set out in the Annex to this Directive.

#### *Article 2*

1. Member States shall adopt and publish, by [\[the last day of the 12<sup>th</sup> month after the date of entry into force of this Directive\]](#) at the latest, the laws, regulations and administrative provisions necessary to comply with this Directive. They shall forthwith communicate to the Commission the text of those provisions.

They shall apply those provisions from [\[the last day of the 12<sup>th</sup> month after the date of entry into force of this Directive + 1 day\]](#).

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

2. Member States shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive.

#### *Article 3*

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

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<sup>2</sup> Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and establishing a European Chemicals Agency (OJ L 396, 30.12.2006, p. 1).

*Article 4*

This Directive is addressed to the Member States.

Done at Brussels,

*For the Commission*

*The President*

[\[...\]](#)

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