

1st Questionnaire (Clarification Questionnaire) Exemption No. 7a (renewal request)

Exemption for „Lead in high melting temperature type solders (i.e. lead-based alloys containing 85 % by weight or more lead)“

Abbreviations and Definitions

HMP high melting point solder

Background

The Oeko-Institut and Fraunhofer IZM have been appointed within a framework contract¹ for the evaluation of applications for the renewal of exemptions currently listed in Annexes III of the new RoHS Directive 2011/65/EU (RoHS 2) by the European Commission.¹

Bourns Inc. submitted a request for the renewal of the above mentioned exemption, which has been subject to a first evaluation. The information you have referred has been reviewed and as a result we have identified that there is some information missing and have formulated a few questions to clarify some aspects concerning your request before we can start the online consultation.

Please answer the below questions until 28 July 2015 latest or otherwise let us know until when you can provide the requested information.

Questions

- 1) Annex III of the RoHS Directive was reviewed in 2008/2009. It was assessed that at that time high melting point (HMP) solders were used in the following applications²:
 - I. Internal electrical interconnections within an electronic component
 - II. Die attach
 - III. Plastic overmoulding
 - IV. Ceramic BGAs
 - V. High power applications
 - VI. Solders for mounting electronic components onto sub-assembled modules or sub-circuit boards
 - VII. Solders used as a hermetic sealing material between a ceramic package or plug and a metal case
 - VIII. Others (please specify)

¹ Contract is implemented through Framework Contract No. ENV.C.2/FRA/2011/0020 led by Eunomia

² For details see report of (Carl-Otto Gensch, Öko-Institut e. V., et al.), with the assistance of Stéphanie Zangl, Rita Groß, Anna Weber, Öko-Institut e. V., and Otmar Deubzer, Fraunhofer IZM (19 February 2009), page 99 to 106

Please indicate for which of the above applications you request the continued use of lead HMP solders.

Answer:

- I – Internal electrical interconnections within an electronic component, and
- II – Die attach

2) You state that your customers include aerospace, automotive and military mandating high temperature solders with melting points above 300C in components they use in their products.

Aerospace, automotive and military are excluded from the scope of the RoHS Directive.

Please explain whether and how far your exemption request is also valid for the equipment in the scope of the RoHS Directive, which has lower reliability requirements, in particular as cat. 8 and 9 (medical devices, monitoring and control instruments) are not part of this review.

Answer:

The summary included, as an example, in the statement, “Many of our customers including aerospace, automotive and military...”, but Bourns’ customer base is not limited to those Industry sectors. Bourns customer base is much broader including Automotive, Consumer, Industrial/Medical and Communications. Circuit Protection is a major part of Bourns product offerings. Many of the circuit protection models require LHMP solders. Application examples include:

- Electro-Static Discharge (ESD) Protection for appliances, computers, consumer electronics, general purpose ESD protection, high speed communication ports (such as USB 3.0, IEEE1394, HDMI, Gb Ethernet), fast communication ports (such as USB 1.1, 10/100b Ethernet ports); RS232, RS422 & RS485 type applications;
- Surge Protection for Central office POTS, access equipment POTS, fiber to the home, xDSL and integrated linecards, PABx protection, VOIP protection, xDLS modem protection, ISDN linecards and NT equipment, V.92 modems, cordless DECT and analog phones, set top boxes;
- LED shunt protectors for LED streetlights, avionics lighting, high-bay industrial lighting, intrinsically safe lighting, low maintenance lighting;
- SIP and DIP Resistor Networks used in access equipment, barcode scanners, cable boxes, computer peripherals, consumer electronics, data communications, fax equipment, modems, monitoring equipment, portable power generators, satellite systems, telecom switching devices and test equipment;
- Transient voltage suppressor (TVS) diodes used in appliances, portable electronics, desktop PCs & notebooks, digital cameras, MP3 players, base stations, port protection (USB1.0, 1.1, 2.0, 3.0, RS-485, Ethernet, RS-232, RS-422, etc).
- Power TVS - AC & DC power supplies used in telecom and other exposed applications often require protection against hostile events such as a power line surge and indirect lightning strikes. Avoiding damage to the power supply by limiting the peak surge voltage to an acceptable level without short-circuiting the line for an extended period of time is crucial to minimizing downtime of critical systems. Other applications include wireless base stations, photovoltaic systems, street lighting, process control equipment and surge protection devices (SPD).
- Overcurrent and overvoltage protection for automobile applications including window regulators, powerbus (mode protection), DC motor applications, car alarm systems,

power steering motors, GPS shark fin antennae, cooling and HVAC systems, electronic control unit (ECU) input/output protection, load dump and other transient voltage protection, infotainment, telematics and navigation input/output protection.

Bourns models used for these applications are listed in Exemption Request Form application question 4(A)1. These parts all require a LHMP used by a multitude of customers for their specific applications.

- 3) You claim that it is difficult to find one suitable substitute. The absence of a single drop-in solution resulting in the fact that more than one substitute might be required would not justify an exemption in line with the criteria of Art. 5(1)(a). The same applies to your statement that the use of gold-containing solders is cost-prohibitive.
- a) You state in your exemption request that “Applications where simple substitutions were possible have already occurred.” Please explain whether and how far lead-free solutions are available covering at least parts of the applications of lead HMP solders. Please explain these applications in detail.

Answer: It was stated in the proposed actions that applications where SnPb solders can be converted to a non-lead solder have already taken place. The SnPb solder was replaced with SAC305 or a similar material but was not a LHMP solder. Discussion with our product groups using LHMP, there has been no substitute HMP solder identified to date with the same reliability and performance in harsh environments.

- b) Please explain the status of gold-tin-solders as substitute for lead HMP solders in your applications.

Answer: The AuSn solder mentioned was discussed in a 2012 Tech Paper found during a literature search. There are other articles discussing possible alternatives to the traditional LHMP solders, but it seems there is still more to do on the trial side. The negative point is the increase in cost due to the gold. At this point, Bourns has not tested AuSn as an alternative; it appears the same for many other component manufacturers. This is most likely due to the high cost. Equipment and/or process changes may also be necessary which is unknown at this time. There are also some disadvantages such as low ductility and low melting point compared to LHMP solders.

http://www.globalspec.com/Indium/ref/high_melting_leadfree_mixed_biaqx_solder_paste_system_98747_r0.pdf

- 4) You calculated the total amount of lead used under the requested exemption with approximately 77 g. Is this the total amount of lead in your products, or in all products using the exemption? Please substantiate your calculation, if possible for worldwide sales of components using this exemption.

Answer: As mentioned in the application, it is difficult to know exactly the amount of LHMP in components sold since the majority of our sales are via global, regional distributors and e-Catalogs. With new information from our product lines, the estimate of 77g is incorrect. The grand total for all products containing LHMP is not available, but there are some examples from various product lines included in the application:

Examples of products containing LHMP sold (Pb content) in the past year:

SMA-type Diodes 11.84 kg Pb (approximately 5M units)

SMB-type Diodes 129.32 kg Pb (approximately 60M units)

Fixed Resistors 822.8 kg Pb (approximately 15.8M units)

Transformer 0.022 kg Pb (custom parts – small quantity)

Total from examples: 963.982 kg Pb

- 5) You say that Bourns is still researching and testing alternative solders or processes to eliminate the high temperature solder in some cases. Please explain what you tested and what the main test results were.

Answer: Bourns continues to evaluate potential alternatives via literature search, discussions with suppliers and participation in industry conferences/meetings. So far, a reliable substitute with the needed characteristics has not been identified. With the changes in termination plating in recent years due to RoHS compliance, soldering temperatures have increased resulting in the continued need of LHMP solders for some components including the Bourns part discussed. As components become smaller in size and must still survive and function in harsh environments, the challenge is difficult.

One example is the Die Attach 5 Project which is a study by the electronics industry and their suppliers to identify new materials and their potential as an alternative to LHMP solders. The link to this study was provided in the application in Section 3. Assuming an alternative may emerge in future years, the challenge will then be the testing to confirm suitability, possible equipment and/or process changes and costs, and customer notices and qualifications.

- 6) Please provide a roadmap for substitution detailing the various stages and related timelines that need to be carried out in order to substitute lead HMP solders up to the stage that products without the relevant RoHS substance can be made available on the EU market. Where relevant, please state what stages could run in parallel and what stages need to take place on a linear basis.

Answer: Bourns' plan for possible substitution is to continue to stay abreast of advances in the electronics industry in the LHMP solder area. This will be achieved by continuing our research discussed in Question 5. Should a potential substitute emerge, the evaluation, possible redesign of components and/or processes and long-term reliability testing would then begin. Since there is no promising substitute at this time, it is not possible to predict the stages and timelines due to the unknown changes in materials/processes/equipment that may be necessary.

Please note that answers to these questions are to be published as part of the available information relevant for the stakeholder consultation to be carried out in the course 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 take into account that any

recommendation on the continuation or revocation of exemption can be based on publicly available information only.

References

(Carl-Otto Gensch, Öko-Institut e. V., et al. 19 February 2009) *Adaptation to scientific and technical progress under Directive 2002/95/EC: Final Report*. With the assistance of Stéphanie Zangl, Rita Groß, Anna Weber, Öko-Institut e. V. and Otmar Deubzer, Fraunhofer IZM. Freiburg: . Accessed July 14, 2015.

http://ec.europa.eu/environment/waste/weee/pdf/final_reportl_rohs1_en.pdf;

http://ec.europa.eu/environment/waste/weee/pdf/report_2009.pdf.