

1st Questionnaire (Clarification Questionnaire) Exemption No. 7c-I (renewal request)

Exemption for „Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound“

Acronyms and Definitions

PTC	Positive Temperature Coefficient, materials increasing their electrical resistance with increasing temperature; as PTC ceramics used in PTC resistors or PTC thermistors
PZT ceramics	Ceramics consisting of a mixture of PbZrO₃ and PbTiO₃

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

Sensata Technologies 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 13 August 2015 latest or otherwise let us know until when you can provide the requested information.

Questions

- 1) In the 2008/2009 review² of the Annex to Directive 2002/95/EC (predecessor of today's RoHS Directive 2011/65/EU), the following applications were identified for ceramics and glass containing lead:
 - i. PZT ceramics
 - ii. Dielectric ceramics
 - iii. PTC ceramics
 - iv. Thickfilm technology

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

² Gensch et al. 2009

Please relate your application to one of the above listed application fields, or, if this is not possible, add another application field.

*Bonding/adhesive glasses for pressure sensor applications (Capacitive, Resistive & MEMS)
We also make use of exempts related to Dielectric ceramics, PTC ceramics, Thickfilm technology.*

Discussion with cross industry initiative learned that status at our supplier base is already reflected in that exemption request. We would like to endorse that exempt extension request. Below answers are related to capacitive pressure sensors- were leaded glass is needed to enable accurate pressure sensor production including high performance on endurance.

- 2) You describe tests of lead-free solder glasses in a table on page 7 of your exemption request. Please resubmit your exemption request making sure that the table in the document is actually complete and adding the test criteria which the tested samples have to pass.

Characteristics	Pb glass	Zn glass	P-Sn glass	Na-Al-P-B
Affinity	Good	Not good	Not good	Good
Low melting point	Yes	No	Yes	Yes
Coefficient to thermal expansion	Good	Good	Good	Not good
Weather resistance	Good	Good	Not good	Not good

High Affinity and Equal Coefficient of Thermal Expansion is needed for proper bonding versus the counter ceramic material to guarantee maintained proper functioning of the pressure sensor. Low Melting Point is needed because of enabling the production of Sensing element. Only Pb glass demonstrated good results on all characteristics.

- 3) Please provide an estimate for the amount of lead used under your applications of lead under exemption 7c-I worldwide and in the EU. Please substantiate the estimate with a rough calculation.
There is currently a small amount of glass including lead (high used in our capacitive sensing element that resides under the RoHS directive. Estimated total amount imported into EU 100gr.
- 4) You state that you are assessing possible lead-free alternatives in a CLEPA working group. Can you please provide results relevant for applications in the scope of RoHS?
Workgroup for CLEPA also resulted in conclusions like made under answer to question 2..
- 5) Under point 7B of your exemption request you state that you cannot provide a roadmap as glass frit manufacturers shall provide lead-free alternatives. Please provide a roadmap specifying the steps and related time lines once a glass frit manufacturer would offer you a lead-free glass or any other alternative material or technology that does not require the use of lead.
We estimate it would take 3 years to qualify alternate materials once they become available, because our complex customer base also residing in the automotive industry.
- 6) You say that only lead glasses offer the required set of characteristics. Are there no applications where not all characteristics are required so that lead-free glasses or alternative tech-

nologies not depending on the use of lead can be applied?

There are no applications where not all characteristics are required – see also answer to question 2.

7) Are there any other technologies besides the use of glass for your applications, e.g. the use of metal solders or other? If so, please explain their potentials and limits.

We are not aware of any alternatives at the moment

8) You mention that there are several suppliers of glass frits. Please provide a list of these suppliers.

ESL Electrosience / Ferro / Schott / AGC / Diermat / JJG

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.