

Exemption Request Form

Date of Submission: January, 19-2015

1. Name and contact details

1) Name and contact details of applicant:

Company: Bourns Inc.

Name: Cathy Godfrey

Function: Corporate EHS Manager

Telephone: 951-781-5008

email: cathy.godfrey@bourns.com

Address: 1200 Columbia Ave., Riverside, CA USA

2) Name and contact details of responsible person for this application (if different from above):

Same as above

2. Reason for application:

Please indicate where relevant:

Request for new exemption in:

Request for amendment of existing exemption in

Request for extension of existing exemption:

Request for deletion of existing exemption in:

Provision of information referring to an existing specific exemption in:

Annex III

Annex IV

No. of exemption in Annex III or IV where applicable: 7c-I

Proposed or existing wording: N/A

Duration where applicable: standard extension at minimum

Other:

3. Summary of the exemption request / revocation request

Bourns, Inc. respectively requests to extend the current exemption 7c-1, *Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors...*

Bourns continues to research and monitor potential alternatives to lead-containing glass in thick film inks/glazes used in electronic components. Thick film is a resistive and conductive film greater than 0.0001" thick resulting from firing a paste or ink that has been deposited on a ceramic substrate. These thick film inks typically contain a glass material that includes lead. With a multitude of applications and specific requirements of our customers, no single lead-free solution has been identified for all resistance values of the components. Applications where simple substitutions were possible have already been implemented. Any potential alternatives require material development, evaluation, internal process and product qualification and reliability testing to guarantee product reliability.

Lead-containing glass frits have several applications including barrier layers for stopping the migration of silver and a sealing material for hermetic packages. Glasses are typically part of a thick film formulation. Various oxides are melted together to form a glass matrix. It is also used as a sealant in hermetic ceramic and metal electronic (semiconductor and hybrid) component packages. The lead oxide is used to lower melting temperature and viscosity for processing below 550C and to raise dielectric strength. The lead oxide content of the glass can be adjusted controlling the coefficient of thermal expansion which is favorable for high sintering temperature operations. Bourns has been experimenting with various non-lead glass formulations. While success for low to mid-level resistance values have been implemented on some models, other potential alternatives are still in the design/test stage. It is not a one size fits all application.

4. Technical description of the exemption request/revocation request

(A) Description of the concerned application:

1. To which EEE is the exemption request/information relevant?

Name of applications or products: Listed are electronic components used as subcomponents in various categories of EEE. Components include Chip Arrays, Chip Resistors, ESD protectors, Transient Voltage Suppressor Diodes, Encoders, Fuelcards, Ceramic PTC Resettable Fuses, Thick Film Molded DIPs, Panel Controls, Power Resistors, Trimming Potentiometers. These electronic components are typically used on circuit boards and other internal electronics of the various categories used by our customers.

- a. List of relevant categories: possibly 1-11 depending on EEE manufacturer using electronic components as part of their assembly.
- b. Please specify if application is in use in other categories to which the exemption request does not refer: N/A

c. Please specify for equipment of category 8 and 9.

Our company does not manufacture equipment; our components may be used by manufacturers of categories 8 and 9.

2. Which of the six substances is in use in the application/product?

Pb Cd Hg Cr-VI PBB PBDE

3. Function of the substance: Lead-containing glass as part of thick film inks or encapsulating materials used on ceramic substrates or organic substrates.

4. Content of substance in homogeneous material (% weight): The homogeneous material is the glass included in the thick film ink or encapsulation (homogeneous material) which is then fired on a substrate. The lead content will vary and can range from 1-75% of the glass only. The total ink/encapsulation including the glass is generally <1% of the finished part.

5. Amount of substance entering the EU market annually through application for which the exemption is requested:

Name of material/component: components using a thick film ink or encapsulation glaze that includes a lead-containing glass matrix.

Passive electronic components Chip Arrays, Chip Resistors, ESD protectors, Transient Voltage Suppressor Diodes, Encoders, Fuel cards, Ceramic PTC Resettable Fuses, Thick Film Molded DIPs, Panel Controls, Power Resistors, Trimming Potentiometers.

Since a majority of Bourns components are sold by distribution, it is not known exactly the amount of components entering the EU that contain a leaded-glass fired on the substrate.

6. Environmental Assessment:

LCA: Not specifically for lead-containing glass.

The US Center for Disease Control includes worker exposure to lead as a health impact. Activities such as lead smelting and refining, foundry working, soldering, steel welding and cutting operations, battery manufacturing plants and lead compound manufacturing industries are some occupations that could result in workplace exposure typically by breathing lead particles. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans. There is not enough test data for organic lead sources to identify as a probably carcinogen to humans.

http://www.atsdr.cdc.gov/sites/toxzine/docs/lead_toxzine.pdf

Fortunately, worker exposure can be mitigated through safe work practices and engineering controls.

- (B) In which material and/or component is the RoHS-regulated substance used, for which you request the exemption or its revocation? What is the function of this material or component?

Lead in exemption 7c-I is the regulated substance in question. Glass frit is a substance in thick film inks used for electronic circuitry. The glass portion is comprised of vitrified oxides forming a glass matrix. The functions of the glass include a barrier to prevent the migration of silver; a sealing material for hermetic ceramic and metal component packages (semiconductors and hybrids); control for coefficient of thermal expansion used for high sintering operations.

- (C) What are the particular characteristics and functions of the RoHS-regulated substance that require its use in this material or component?

Lead oxide as part of a glass matrix is used to lower melting temperatures and viscosity for processing below 550C and to raise dielectric strength. Lead in glaze is used for passivation of thick film resistors for some legacy products that are targeted for phase out in the next 5 years. Glass is used as a sealant in hermetic ceramic and metal electronic (semiconductor and hybrid) component packages. Adjusting the amount of lead oxide in the glass allows control of the coefficient of thermal expansion.

Aside from electronic component usage, lead oxide is also used in solar cells; it acts as catalyst for contact formation between silver and silicon. Literature states that no commonly available and cost effective substitute.

http://rohs.exemptions.oeko.info/fileadmin/user_upload/Stakeholder_comments/Exemption-7a_5_Pecht_Uni_Maryland_25_March_2008.pdf

5. Information on possible preparation for reuse or recycling of waste from EEE and on provisions for appropriate treatment of waste

- 1) Please indicate if a closed loop system exist for EEE waste of application exists and provide information of its characteristics (method of collection to ensure closed loop, method of treatment, etc.)

Electronic components alone are not typically listed as EEE. These components are a subassembly part used to build the inner electronics workings of specific EEE. Electronic components at end of life are typically classified as electronic waste. In the US, the EPA classifies electronic waste as universal waste and requires specific handling. It is unknown the methods of handling/treatment globally.

(B) Please provide information and data to establish reliability of possible substitutes of application and or RoHS materials in application

(A)+(B) discussion: Research papers and journal articles discussing this issue regarding potential alternatives for leaded glass in thick film inks/glazes are available on the internet. There is no drop-in solution or a one-size-fits-all solution. Any change will take research, testing, final qualification, process changes, etc. for each specific application. Potential substitutes in these articles do not yet meet all the positive characteristics of lead-based glasses that are also cost-effective. There may be one or more alternatives to address each individual application. It appears at this time, there may be solutions but, most likely, the solutions will not be identified, tested, qualified and adapted to the process in the mid-2016 time frame.

Reviewed literature includes:

Review of High-Lead Solder and Lead-Glass RoHS Exemptions

http://rohs.exemptions.oeko.info/fileadmin/user_upload/Stakeholder_comments/Exemption-7a_5_Pecht_Uni_Maryland_25_March_2008.pdf

REACH Dossier: Exemption from registration for glass under REACH regulation n. 1907/2006/EC.

http://www.glassallianceeurope.eu/images/cont/dossier-glass-alliance-europe-on-glass-exemption-under-reach_1_file.pdf

Position paper concerning the status of the raw materials for the production of glass, as intermediates, under the EU REACH regulation

http://www.glassallianceeurope.eu/images/cont/glass-alliance-europe-statement-for-intermediates-revision-may-2012_1_file.pdf

7. Proposed actions to develop possible substitutes

(A) Please provide information if actions have been taken to develop further possible alternatives for the application or alternatives for the application or alternatives for RoHS substances in application.

We are still researching and testing alternative glasses used in thick film ink or glazes. Component manufacturers still need to supply their customers with parts that work for their applications. Many components required hermetically sealed packaging. To date, there is no solution for all applications. More time is needed for continued research.

(B) Please elaborate what stages are necessary for establishment of possible substitute and respective timeframe needed for completion of such stages.

As a component manufacturer, research and internal testing will continue. We continue to work with our customers to meet their requirements. Some legacy products may be phased out in time as technological advances in certain components occur.

8. Justification according to Article 5(1)(a):

(A) Links to REACH: (substance + substitute)

1) Do any of the following provisions apply to the application described under (A) and (C)?

Authorisation

SVHC

Candidate list

Proposal inclusion Annex XIV

Annex XIV

Restriction

Annex XVII

Registry of intrusions

Registration

2) Provide REACH-relevant information received through the supply chain.

Name of document: links to documents:

REACH Dossier: Exemption from registration for glass under REACH regulation n. 1907/2006/EC.
http://www.glassallianceeurope.eu/images/cont/dossier-glass-alliance-europe-on-glass-exemption-under-reach_1_file.pdf

Position paper concerning the status of the raw materials for the production of glass, as intermediates, under the EU REACH regulation

http://www.glassallianceeurope.eu/images/cont/glass-alliance-europe-statement-for-intermediates-revision-may-2012_1_file.pdf

(B) Elimination/substitution:

1. Can the substance named under 8(A)1 be eliminated:

Yes. Consequences? _____

No. Justification: Not at this time. While there may be substitutes for numerous applications yet to be determined, it will take time to make those determinations and to implement into production.

2. Can the substance named under 8(A)1 be substituted?

Yes.

Design changes:

Other materials:

Other substance:

No: Justification: Not at this time. While there may be substitutes for numerous applications yet to be determined, it will take time to make those determinations and to implement into production.

3. Give details on the reliability of substitutes (technical data + information): N/A

4. Describe environmental assessment of substance from 8(A)1 and possible substitutes with regard to: Not determined

1) Environmental impacts: _____

2) Health impacts: _____

3) Consumer safety impacts: _____

→ Do impacts of substitution outweigh benefits thereof?

Please provide third-party verified assessment on this: Not determined

(C) Availability of substitutes: Substitutes not determined

a) Describe supply sources for substitutes:

b) Have you encountered problems with the availability? Describe: _____

c) Do you consider the price of the substitute to be a problem for the availability?

Yes

No

d) What conditions need to be fulfilled to ensure the availability? _____

(D) Socio-economic impact of substitution: not determined

→ What kind of economic effects do you consider related to substitution:

Increase in direct production costs

Increase in fixed costs

Increase in overhead

Possible social impacts within the EU

Possible social impacts external to the EU

Other: _____

→ Provide sufficient evidence (third-party verified) to support your statement: _____

9. Other relevant information

Please provide additional relevant information to further establish the necessity of your request:

We believe this exemption may be eventually phased out as legacy parts/products phase out and as substitute glasses or other materials emerge. But in the meantime, this exemption needs to be extended for at least another review period.

10. Information that should be regarded as proprietary

Please state clearly whether any of the above information should be regarded to as proprietary information. If so, please provide verifiable justification: None of the information provided in this document is proprietary. Some information regarding successful substitute glasses developed by Bourns is excluded due to proprietary information.