



Department
for Environment
Food & Rural Affairs

Glass frit binder for assembly of gas lasers: exemption for lead

15 March 2024

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We work closely with our 33 agencies and arm's length bodies on our ambition to make our air purer, our water cleaner, our land greener and our food more sustainable. Our mission is to restore and enhance the environment for the next generation, and to leave the environment in a better state than we found it.



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Introduction

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (the RoHS regulations) restricts the use of 10 hazardous substances in electrical and electronic equipment (EEE), with a view to contributing to the protection of human health and the environment, including the sound recovery and disposal of waste.

Industry can apply for exemptions to allow the supply of products using one or more of the restricted substances above the threshold limits set down in the RoHS regulations where specified criteria are met. Applications for exemptions are made to the Secretary of State under regulation 6 of the Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020 (the 2020 regulations). Any exemption that is granted can be used across industry, not just by the business that applied for the exemption. Exemptions are granted where it is determined that the necessary criteria have been met following a detailed evaluation conducted in accordance with regulation 5 of the 2020 regulations.

Following the UK's withdrawal from the EU, the function of granting, renewing and revoking exemptions were, in relation to Great Britain, transferred to the Secretary of State by the 2020 regulations, using powers in section 8 of the European Union (Withdrawal) Act 2018 (the Withdrawal Act).

Part of the evaluation process is an 8-week consultation to collect contributions from stakeholders.

A request for renewal for an exemption was submitted for lead in glass frit of X-ray tubes and image intensifiers and lead in glass frit binder for assembly of gas lasers and for vacuum tubes that convert electromagnetic radiation into electrons. The exemption entry covers the use of lead in glass frit in several technologies, such as X-ray tubes, image intensifiers, gas lasers and vacuum tubes that convert electromagnetic radiation into electrons, however, the applicant only use lead in glass frit in precision lasers, where lead oxide in glass frit is used to connect borosilicate glass to metal pieces of precision lasers.

The requested duration of the exemption is for 7 years and according to the application it would be expected to lead to the introduction of 1.4kg of lead to the GB market annually. The applicant states that no suitable substitutes have been verified to meet the technical performance required.

The exemption covers applications under category 9ind (monitoring and control instruments in industry) of electrical and electronic equipment (EEE), as covered in the 2012 RoHS regulations.

Purpose of this consultation

The purpose of this consultation is to seek views on the request for the renewal of an exemption to the substance restrictions in the RoHS regulations, to collect additional data and information, and to inform stakeholders about the application.

Geographical extent

We are consulting on proposals applicable to England, Wales and Scotland only. The Secretary of State's transferred function only applies in relation to England, Scotland and Wales.

Northern Ireland is out of scope of this consultation. This is because the [EU RoHS Directive](#) is covered under the Windsor Framework agreement with the EU. As such, the EU RoHS Directive continues to apply in Northern Ireland and Northern Ireland continues to be bound by exemption decisions made by the EU.

Audience

This is a public consultation, and we welcome all views, particularly views from the electrical and electronic equipment manufacturing and supply industry for medical devices, and relevant trade bodies, medical organisations who use the equipment in question, research institutions and universities, NGOs and public administrations.

Responding to this consultation

Please respond to this consultation in one of the following ways:

Online using the Citizen Space consultation hub at Defra <https://consult.defra.gov.uk/>

For ease of analysis, responses via the Citizen Space platform would be preferred, but alternative options are provided below if required.

By email to: rohs@defra.gov.uk or consultation.coordinator@defra.gov.uk

Please note responses must arrive by the closing date of the consultation (10 May 2024) to be counted. Unfortunately, any responses received after this date will not be analysed. To ensure your response is included in the analysis, please consider responding online via Citizen Space.

Further exchange with stakeholders will be held after the consultation has ended for those issues where further need for information or (technical) discussion has been identified.

Duration

This consultation will be open for 8 weeks from 15 March 2024 until 10 May 2024.

Confidentiality and data protection information

A summary of responses to this consultation will be published on the government website at: www.gov.uk/defra. An annex to the consultation summary will list all organisations that responded, but will not include personal names, addresses or other contact details. Defra may publish the content of your response to this consultation to make it available to the public without your personal name and private contact details (for example, your home address or email address).

If you would like anything in your response to be treated as confidential, please say so clearly in writing when you submit your response to the consultation and explain why you require these details to be kept confidential. The reason for this is that information in response to this consultation may be subject to release to the public or other parties in accordance with access to information laws. These are primarily the Environmental Information Regulations 2004 (EIRs), the Freedom of Information Act 2000 (FOIA) and the Data Protection Act 2018 (DPA).

We have obligations, mainly under the EIRs, FOIA and DPA, to disclose information to particular recipients or to the public in certain circumstances. In view of this, your explanation of your reasons for requesting confidentiality for all or part of your response would help us balance these obligations for disclosure against any obligation of confidentiality. If we receive a request for the information that you have provided in your response to this consultation, we will take full account of your reasons for requesting confidentiality of your response, but we cannot guarantee that confidentiality can be maintained in all circumstances.

If you select 'No' in response to the question asking if you would like anything in your response to be kept confidential, we will be able to release the content of your response to the public, but we won't make your personal name and private contact details publicly available.

There may be occasions when Defra will share the information you provide in response to the consultation, including any personal data with external analysts. This is for the purposes of consultation response analysis and provision of a report of the summary of responses only. This consultation is being conducted in line with the Cabinet Office [Consultation Principles](#).

Please find our latest privacy notice uploaded as a related document alongside our consultation document.

If you have any comments or complaints about the consultation process, please address them to consultation.coordinator@defra.gov.uk using the heading below:

Consultation on amendments to the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations – lead in glass frit binder

After the consultation

A summary of the non-confidential responses to this consultation and the government response will be published and placed on government websites at www.gov.uk/defra

The summary will include a list of respondents and organisations that responded, but not personal names, addresses or other contact details. However, information provided in response to this consultation document, including personal information, will be shared with the Devolved Administrations and may be subject to publication or release to other parties or to disclosure in accordance with the access to information regimes, for example Freedom of Information Act 2000 (FOIA) and the Data Protection Act 2018.

About you

A wide range of businesses, organisations and individuals are involved with or take an interest in the supply of electrical equipment. The questions below are intended to put your responses in perspective with those of other respondents.

Q1. Would you like your response to be confidential?

Yes or No.

- If you answered 'Yes', please provide your reason.

Q2. What is your name?

Q3. What is your email address?

This is optional, but if you enter your email address you will be able to return to edit your consultation response in Citizen Space at any time until you submit it. You will also receive an acknowledgement email when you submit a completed response.

Q4. Which best describes you?

Please provide the name of the organisation or business you represent and the approximate size or number of staff (where applicable). (Please select one option. If multiple categories apply, please choose the one which best describes the organisation you are representing in your response.)

- Business representative organisation or trade body
- Producer of electrical and electronic equipment
- Business end-user of electrical or electronic equipment
- Public end-user of electrical or electronic equipment (for example, NHS, educational institution)
- Distributor (including Online Marketplaces)
- Local government
- Community group
- Non-governmental organisation
- Charity or social enterprise
- Consultancy
- Academic or research
- Individual
- Other
- If you answered 'Other', please provide details:

Background

The EU RoHS Directive limits the use of specified hazardous substances in the manufacture of certain electrical and electronic products. The UK played a key role in developing the original European legislation, and the RoHS Regulations transposed the EU RoHS Directive into UK law. The RoHS Regulations limits the use of 10 substances and maximum concentration values tolerated by weight in homogeneous materials as follows:

- lead (0.1%)
- mercury (0.1%)
- cadmium (0.01%)
- hexavalent chromium (0.1%)
- polybrominated biphenyls (PBB) (0.1%)
- polybrominated diphenyl ethers (PBDE) (0.1%)
- bis(2-ethylhexyl) phthalate (DEHP) (0.1 %)
- butyl benzyl phthalate (BBP) (0.1%)
- dibutyl phthalate (DBP) (0.1%)
- diisobutyl phthalate (DIBP) (0.1 %)

The scope of the RoHS Regulations is wide ranging, covering most types of electrical and electronic equipment intended for household or commercial use. A limited list of products is

exempt, such as large-scale fixed installations, large-scale industrial tools, military equipment, items designed specifically for research and development, most forms of transport and active implant devices.

As explained above, businesses can apply for exemptions that allow the manufacture and supply of products that exceed these threshold limits where it can be proven that alternative less hazardous substances are not available or not reliable or the total environmental, health and safety impacts of the substitution would outweigh the benefits thereof. Following the UK withdrawal from the EU, the Secretary of State now has the power to determine applications for exemptions for products supplied to or in Great Britain. Businesses can apply to the Secretary of State for new exemptions and renewal of existing exemptions. A list of existing exemptions can be found in [Table 1, Schedule A2, of the Hazardous Substances and Packaging \(Legislative Functions and Amendment\) \(EU Exit\) Regulations 2020](#).

Under Regulation 5, an exemption may only be granted where the following conditions are satisfied:

1. The exemption does not weaken the environmental or health protection afforded by UK REACH; and
2. The elimination or substitution of the material or component, via design changes or use of materials or components which do not include any restricted substances, is scientifically or technically impracticable.
3. The reliability of substitute materials or components is not ensured; or
4. The total negative environmental, health and consumer safety impacts caused by substitution of another material or component is likely to outweigh the total environmental, health and consumer safety benefits of that substitution.

The exemption request

Entry 60 in [Table 1, Schedule A2](#) of the 2020 Regulations is for lead in glass frit of X-ray tubes and image intensifiers and lead in glass frit binder for assembly of gas lasers and for vacuum tubes that convert electromagnetic radiation into electrons. The exemption for category 9ind (monitoring and control instruments in industry) applications expires on 21 July 2024. The applicant, Test and Measurement Coalition (TMC) has requested a renewal for 7 years.

Granting the renewal of this exemption would lead to the continued introduction of 1.4kg of lead to the GB market annually. The applicant states that no suitable substitutes that meet the required technical performance have been identified.

Proposed change to exemption wording

No change to the exemption wording has been proposed by the applicant, even though the applicant only use lead in glass frit binder for assembly of gas lasers. It is important to understand if any other company, relying on this exemption entry wishes to continue to use lead in the other applications listed within the entry.

Details on the exemption application

Lead oxide is used in glass frit to connect borosilicate glass rods to metal components of precision lasers. The lead oxide in glass frit has properties that make it suited for the application including:

- low melting point, below 490°C, borosilicate has a maximum processing temperature of 500°C
- close match of coefficient of thermal expansion between frit glass and metal preventing damage or distortion to the glass during manufacture
- good wetting properties allowing effective sealing

The precision lasers are used in test and measurement products, specifically: Laser Interferometers and Calibration Systems (Monolithic Laser Combiners & Precision Optics), Application-Specific Test Systems and Components and, used equipment in these categories. One of the key application areas is the manufacture of semiconductors, where lasers are used for precision measurement of the alignment of etched layers, critical to integrated circuit manufacturing.

The applicant only uses lead in glass frit in precision lasers. However, the exemption entry also covers the use of lead in glass frit in several technologies, such as X-ray tubes, image intensifiers, gas lasers and vacuum tubes that convert electromagnetic radiation into electrons. The applicant does not wish to change the wording of the entry.

Alternatives and substitutes testing

According to the applicant, potential alternatives to lead that have been identified either have higher melting points than the maximum processing temperature of borosilicate glass or their coefficient of thermal expansion is too different from that of the borosilicate glass. The applicant claims that there is no suitable lead-free alternative for the product and any reduction in lead content would impact the melting temperatures and therefore the suitability of the glass frit.

This consultation aims to collect opinions on the current state of play regarding alternatives and substitutes, at a substance and a device level, and to further understand the alternatives and any limitations that the alternatives currently available might have for end users.

Socio-economic impacts

This consultation is also looking to further understand how the granting or revocation of this exemption request may impact on business, from manufacturing through to end user applications, as well as wider society and social impacts (for example, human health impacts). We welcome opinions and supporting evidence for any viewpoints associated with the socio-economic impacts of this exemption.

The applicant submitted a Socio-Economic Analysis that concluded that the total impact of a non-renewal in the EEA is monetised in the range of €15 million and €40 million . Based on the volume of lead placed on the market in the EEA versus in GB, the estimated impact of non-renewal would therefore fall in the range of 3.1 to 8.3 million GBP.

Consultation specific questions

Q5. Do you agree or disagree that the exemption under RoHS for Lead in glass frit of X-ray tubes and image intensifiers and lead in glass frit binder for assembly of gas lasers and for vacuum tubes that convert electromagnetic radiation into electrons should be renewed?

Agree

Disagree

Don't know

Please provide evidence to support your answer, explaining why you either support the applicant's request or object to it. To support your views, please provide detailed technical argumentation or evidence in line with the criteria in regulation 5 of the 2020 regulations. to support your statement.

Q6. Do you agree or disagree with the proposed length (7 years) of the exemption renewal?

Agree

Disagree

Don't know

Please provide evidence to support your answer, explaining why you either support the applicant's request or object to it. To support your views, please provide detailed technical argumentation or evidence in line with the criteria in regulation 5 of the 2020 regulations. to support your statement.

Questions 7-9 can refer to one of the multiple applications covered in the exemption entry: glass frit of X-ray tubes and image intensifiers and lead in glass frit binder for assembly of gas lasers and for vacuum tubes that convert electromagnetic radiation into electrons. Please specify which application your responses apply to. In case you wish to submit information relevant to multiple applications from the above, please respond to the consultation separately for each.

Drop-down:

- Glass frit of X-ray tubes

- *Glass frit of image intensifiers*
- *Glass frit binder for assembly of gas lasers*
- *Glass frit binder for vacuum tubes that convert electromagnetic radiation into electrons*

Q7. Do you know of alternative substances to lead in glass frit that can be used in the production of X-ray tubes and image intensifiers or lead in glass frit binder for assembly of gas lasers and for vacuum tubes that convert electromagnetic radiation into electrons?

Yes, I do know of alternative materials which do not rely on RoHS-restricted substances.

No, I do not know of alternative materials which do not rely on RoHS-restricted substances.

Please provide evidence to support your answer and if possible, links to supporting information on alternative materials and any limitations of those alternatives.

Q8. Do you know of alternative devices (with comparable features and performance), which do not rely on RoHS-restricted substances? For example, different design of gas lasers or entirely different technology that does not use lead or other RoHS restricted substances?

Yes, I do know of alternative devices with comparable features.

Yes, I do know of alternative devices, but these do not have comparable features.

No, I do not know of alternative devices.

Please provide an explanation to support your answer and if possible, links to supporting information. Please provide any thoughts on why the alternatives are or are not suitable for use by your organisation.

Q9. Are you aware of any research initiatives (past, present or planned) which are looking into possible alternatives for some or all of the application range of lead in glass frit for X-ray tubes and image intensifiers or lead in glass frit binder for assembly of gas lasers and for vacuum tubes that convert electromagnetic radiation into electrons?

Yes, I do know of research initiatives which will help in the eventual production of RoHS compliant devices.

No, I do not know of research initiatives which will help in the eventual production of RoHS compliant devices.

Please provide evidence to support your answer and if possible, links to supporting information. If you answered yes, please provide an estimate of the time required until the technology will be available for use in the market.

Q10. Can you estimate how many glass frit containing gas lasers or other equipment covered by this exemption your organisation produces or purchases per year (if applicable) in GB?

Please provide quantitative data to support your view.

Q11. As part of the evaluation, environmental impacts will be assessed. If the exemption is granted what would be the environmental impact of these lead containing products continuing to be placed on the GB market. Should the exemption not be granted please estimate possible amounts of waste to be generated through a forced substitution.

Please provide quantitative data to support your view.

Q12. Can you provide any Life Cycle Assessment (LCA) or environmental footprint estimation on the products in scope of the exemption?

Please provide any quantitative data available to support your view.

Q13. As part of the evaluation, socio-economic impacts shall also be assessed. Please estimate possible impacts on employment in total, in Great Britain and outside Great Britain, should the exemption not be granted. Please tick to indicate the main sectors in which possible impacts are expected:

- manufacturers
- supply chain (for example, distribution)
- distributors or retailers (selling devices)
- end-users
- other (please state)

Please provide any quantitative data available to support your view.

Q14. Please estimate additional costs associated with a forced substitution should the exemption not be granted, and how this is divided between various sectors:

- manufacturers
- supply chain (for example, distribution)
- distributors or retailers (selling devices)
- end-users
- other (please state)

Please provide any quantitative data available to support your view.

Q15. Please provide information you might have on the impact of a potential non-renewal of the exemption on the producers of semiconductor lithographic equipment or producers of semiconductors based in GB.

Please provide any quantitative data available to support your view.

Q16. Please summarise your view on the potential impacts on human health, if this exemption was or was not granted?

Please provide any quantitative data available to support your view.

Q17. Please provide any further information and/or data that you think is of importance to substantiate your views.