

## 1st Questionnaire Exemption No. 29 (renewal request)

### *Exemption for „Lead bound in crystal glass as defined in Annex I (Categories 1, 2, 3 and 4) of Council Directive 69/493/EEC ( 1 )“*

#### Abbreviations and Definitions

|     |                         |
|-----|-------------------------|
| EDG | European Domestic Glass |
| LCG | Lead crystal glass      |
| LEU | LightingEurope          |
| Pb  | Lead                    |

#### Background

The Oeko-Institut and Fraunhofer IZM have been appointed within a framework contract<sup>1</sup> 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.<sup>1</sup>

European Domestic Glass (EDG) and LightingEurope (LEU) have submitted a joint 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.

#### GENERAL COMMENTS

Crystal is a substance characterized by a continuous and essentially non-crystalline or vitreous inorganic macromolecular structure, which is highly insoluble and inert. Obtained by a mineralogical process, resulting in a chemical network (matrix), crystal constituents are closely linked together and are in a specific chemical environment, totally different from the initial state (raw materials). Therefore it does not occur in simple compounds such as metals or oxides. Leaching tests performed<sup>2</sup> demonstrate that crystal is classified as non-hazardous waste according to criteria from Council Decision 2003/33/EC.

Moreover, within electric appliance corresponding to our request, lead is used to be synthesized into crystal parts which do not belong to the electrical equipment. No worker exposure is foreseen even during a potential dismantling step.

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

<sup>2</sup> Cf Test reports performed by the SSV n°126917 and 126760, April 2015 (already sent).

## Questions

1. Section 4(A) "Description of the concerned application" of the exemption request dossier details various applications of relevance for which the exemption renewal is requested:

*"Fixed/portable luminaires*

*Lamps*

*Electrified mirrors*

*Horology (clocks, watches etc.)*

*Display cases*

*Digital photo frames*

*Tablet and smart phone docking stations*

*Furniture and home décor items (carrousel, tables etc.)*

*Building materials (illuminated bricks)"*

- a. Please clarify if all products in these application sub-groups, which make use of lead crystal glass (LCG) are considered EEE. (eg. are all furniture items with LCG considered EEE?)

**For some categories, all the products are EEE :**

- **Digital photo frames**
- **Tablet and smart phone docking stations**

**For some categories there are also non EEE articles, not used for the same purpose (this is obviously the case for lighting applications), such as**

- **Fixed/portable luminaires (with candles)**
- **Lamps (with candles)**
- **Mirrors**
- **Mechanic horology**
- **Furniture and home décor (carrousel, tables etc.)**
- **Building materials.**

- b. From further parts of the dossier, it is understood that the manufacture of lead crystal is of handcraft artisan nature. Nonetheless, in the above list, some articles which appear are assumed to be manufactured industrially and not through hand crafting. Please clarify what types of articles are manufactured by hand-crafting and what types are manufactured industrially.

**Chandeliers, floor lamps, candelabras, table lamps, wall sconces, luminaires are made in crystal glass. Those lead crystal glass items are mainly hand crafted even if some parts could be industrially processed. For example a chandelier required from 500 to 1,750 worked hours.**

**For chandeliers, floor lamps, candelabras, table lamps, wall sconces luminaires for the cold part, 85% of work time is hand-crafting. The additional 15% is done though an automatized tool. Equivalent additional worked hours should be taken into account for forming part – all this additional hours are hand-crafted.**

Even for items where the main blank shape is produced by machine (picture frames, clocks etc.), the manual work content is approximately 80% of the manufacturing cost.

Besides, most of the items manufactured in our factories and workshops are unique. Each of them is a creation or issued in a limited edition. There is no mass production :

- for horology, production is about hundreds per year per producer,
- for chandeliers, total production volume is a little more than a thousand per year in Europe.

You will find below an article relating the making process of a huge chandelier. For this exquisite masterpiece, 3 months of work for 15 workers have been required.

<http://www.luxe-magazine.com/7-705->

[La cristallerie Saint Louis a realise un lustre en cristal de 200 lumieres](http://www.luxe-magazine.com/7-705-La_cristallerie_Saint_Louis_a_realise_un_lustre_en_cristal_de_200_lumieres)

For furniture 100% of the working time dedicated to crystal (about 100 hours per item) is hand-crafting.

Type of work implemented are illustrated by the pictures below.

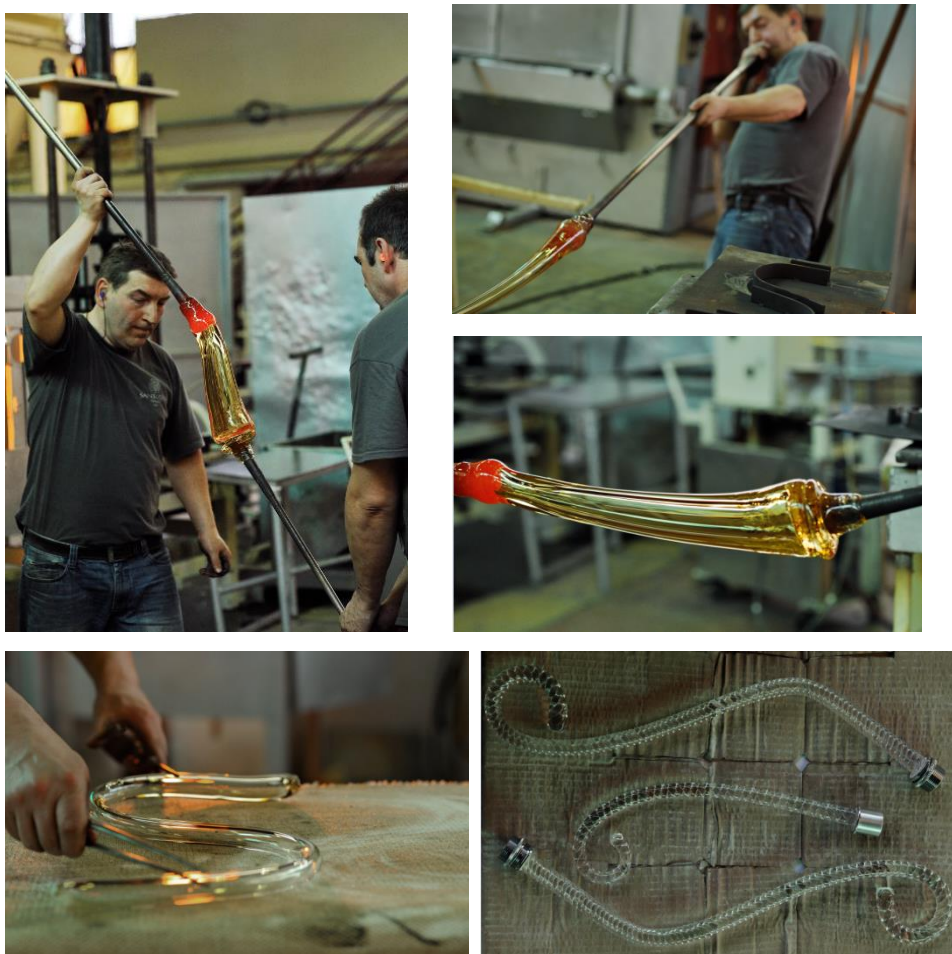
Production of a 600 mm bowl, part of a chandelier.



### Manufacture of a branch chandelier – Example 1



### Manufacture of a branch chandelier – Example 2

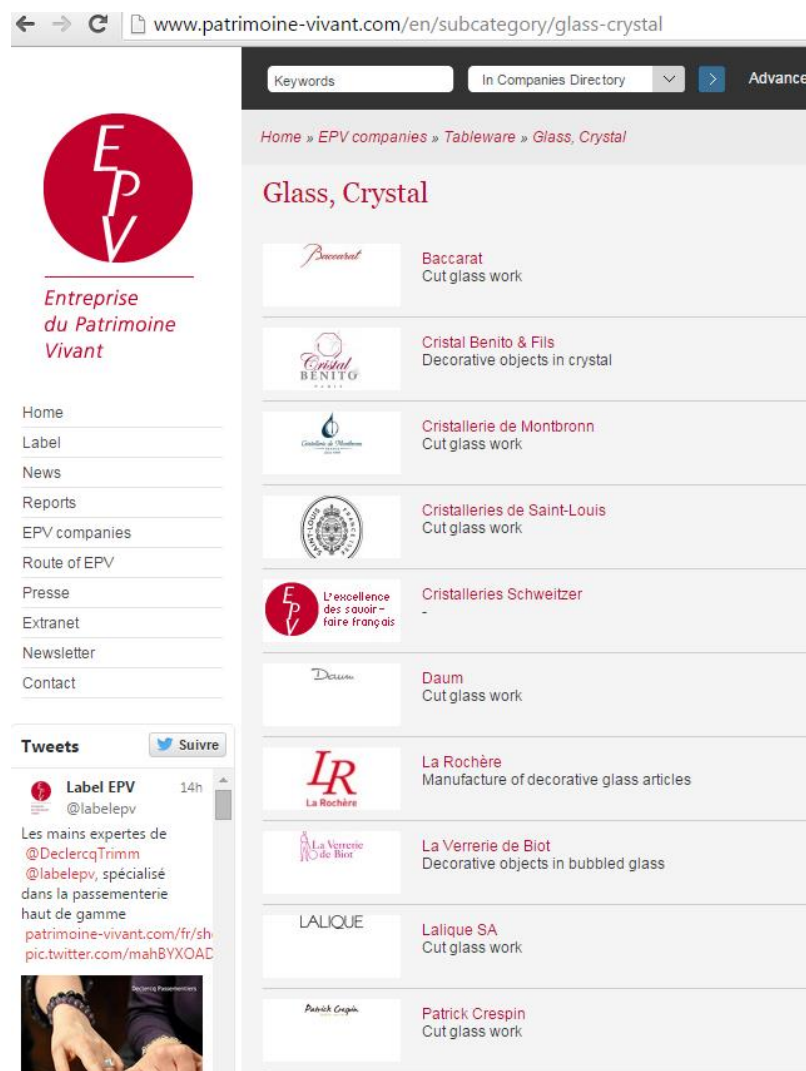




- c. Please further estimate the ratio of hand-crafted articles and of articles manufactured industrially.

As mentioned in point a), all these articles are considered as hand crafted products.

As an example, in France, such skills are recognized by a label, The *Entreprise du Patrimoine Vivant* (Living Heritage Company, or EPV) label is a mark of recognition of the French State, put in place to reward French firms for the excellence of their traditional manufacturing skills. All crystal factories in France received this Label (<http://www.patrimoine-vivant.com/en/subcategory/glass-crystal>).



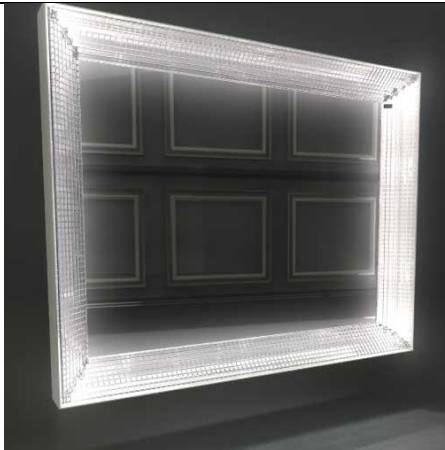

Created by the Law on SMEs of August 2<sup>nd</sup>, 2005 (Article 23), the EPV label may be awarded "to any undertaking that has economic heritage, consisting in particular of rare, renowned or ancestral skills which draw on a mastery of traditional or technically advanced techniques, and restricted to a particular geographical area".






**Similar label is covering the crystal production in Portugal :**

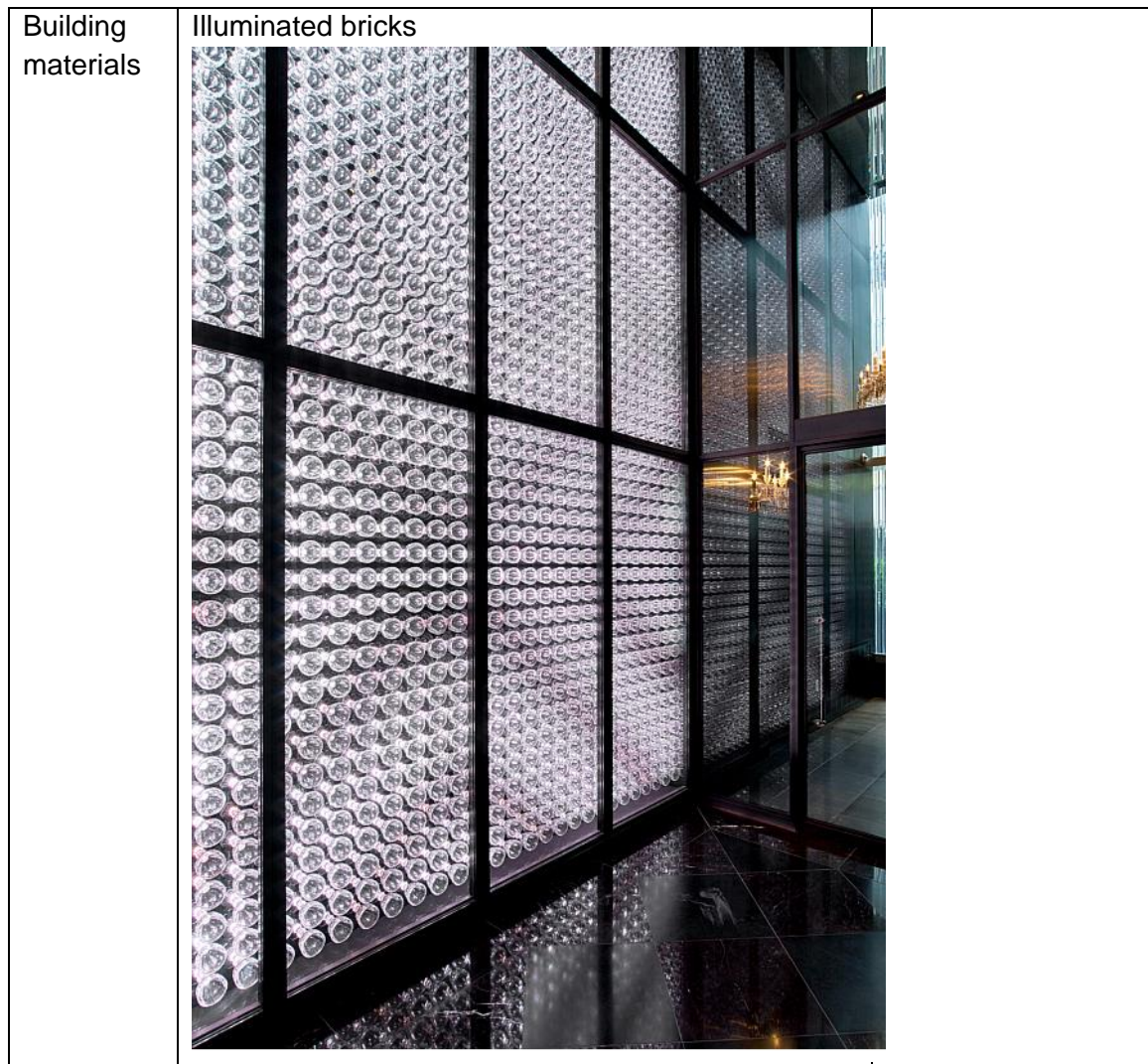
HANDMADE  
CRYSTAL



2. Most of the argumentation is understood to be based on the use of LCG in luminaires (examples, reference to hand crafting etc.).
  - a. Please provide examples for relevant articles other than lamps and luminaires (for which examples are provided in the dossier)

|                     |  |  |
|---------------------|--|--|
| Electrified mirrors |    |  |
| Horology            |  |  |

|   |  |  |   |
|---|--|--|---|
| Display cases                           |     |  | Desk Top bar with internal LED lighting         |
| Digital photo frames                    |    |  | includes electronic unit to display photographs |
| Tablet and smart phone docking stations |    |  |   |
| Furniture and home décor items          |  |  |   |



- b. Please clarify the relevance of the various unique properties of LCG mentioned, to the other product groups where these are EEE.

As for chandeliers, floor lamps, candelabras, table lamps, wall sconces, luminaires, the relevant properties of crystal in these other items is to provide a reflected and refracted internal light and/or external light to create an optimal lighting effect and aesthetic of the items via unique shapes. It is called the “rainbow effect”.

This is illustrated by the difference in dispersion compared to glass product. Without these effects, these luxury products would not sell or achieve the required margin to make manufacturing viable.

The light flow transmitted through a crystal item is bigger by a factor of at least 10%, compared to the light flow transmitted by the same item in flint glass. The energy efficiency (lumen/watt) of crystal is therefore much better than in flint glass. Less energy is required for lighting.



**Lighting effects are also useful for any kind of items and not only the luminaires.**

**Regarding aesthetic topic, Rémi Tessier, interior designer, notes that the crystal material “reveals its true beauty when light is refracted through it and transcends it by creating a subtle dialogue with our senses”. In his view it is a “noble material” because it has been “transformed by human hand” and, as such, has “a soul”.<sup>3</sup>**

3. Please clarify what the function (or functions) of lead is (are) in products and applications for which the exemption is needed.
  - a. What does the presence of lead in the LCG enable in a certain product which falls under one of the applications named in Section 4(a)(for example in some products the LCG shall have a decorative function).

**For all these products the transparency and shinning effect / rainbow effect and design are the major required functions. To ensure design, material should be workable – cooling time is therefore an essential criteria obtained thank to lead use. Shinning is related to refractive index and abbe number (dispersion).**

- b. In your answers please also clarify the relation between the functions named for different articles and between the parameters mentioned in Section 4(C).

**See answer to question a.**

4. It is explained that substitutes do not provide the same performance in relation to LCG. To demonstrate this, data is given comparing between LCG, three types of lead free crystal and soda-lime glass. Please explain how the presented performance, of the various types of crystal/glass, relates to the use of each type in different applications for which this exemption is needed. For example – how does the change in refractive index affect the function of a crystal in a luminaire? Or how does the difference in cooling time or working range affect the time and costs of manufacture for a specific product?

**In the hot process, the use of lead for the synthesis of crystal increases the working range. It reduces the viscosity of the melt for the same temperature, rendering it more fluid than ordinary glass. The viscosity of glass varies radically with temperature. This results in four practical developments :**

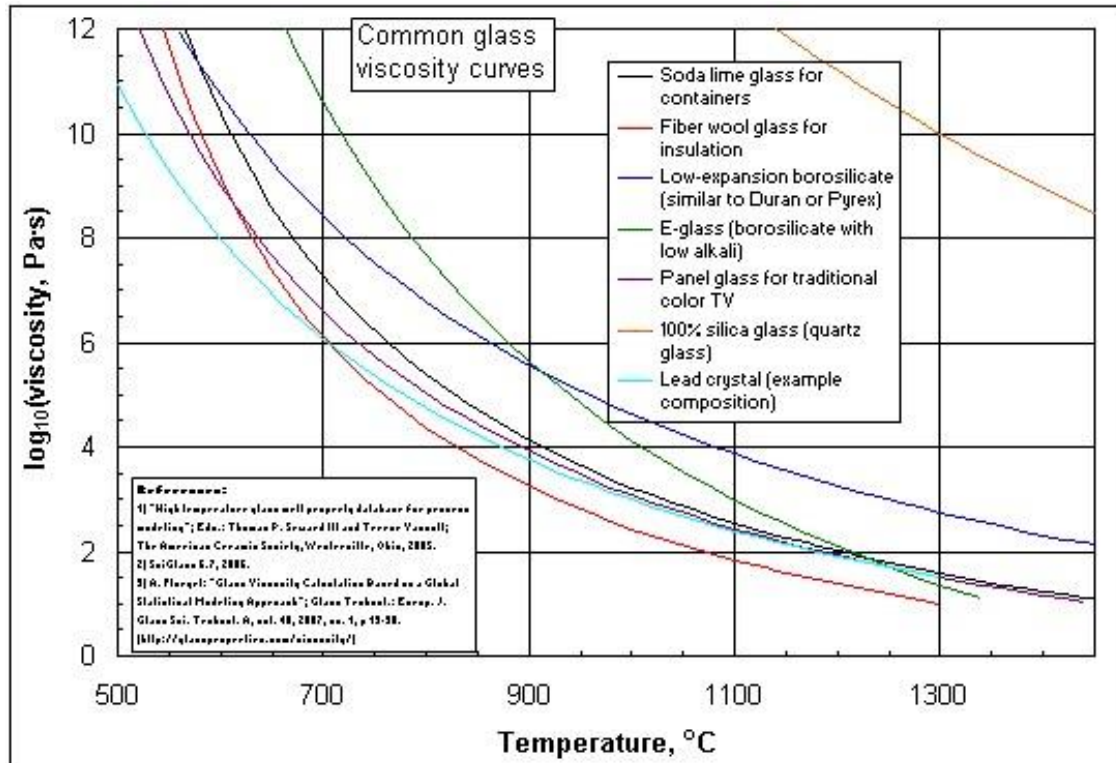
1. **Lead glass may be worked at a lower temperature, making possible the shaping of sophisticated items. Design is therefore determined by the cooling time: complex forms are not possible to produce in a glass without lead with a short**

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<sup>3</sup> Heesen Corporate Brochure.

working range – see the graph representing viscosity in function of Temperature below for several types of glass.

2. This has also a direct impact on manufacturing cost due to reheating requirements (additional energy consumption, timing and defective items).
3. Properties of the crystal is also key-factors for tools design; therefore any change in the properties may lead to major change requirements for the associated tools.



Published literature from the 75<sup>th</sup> Glass Problems conference gives the following explanation of working time differences for glass types

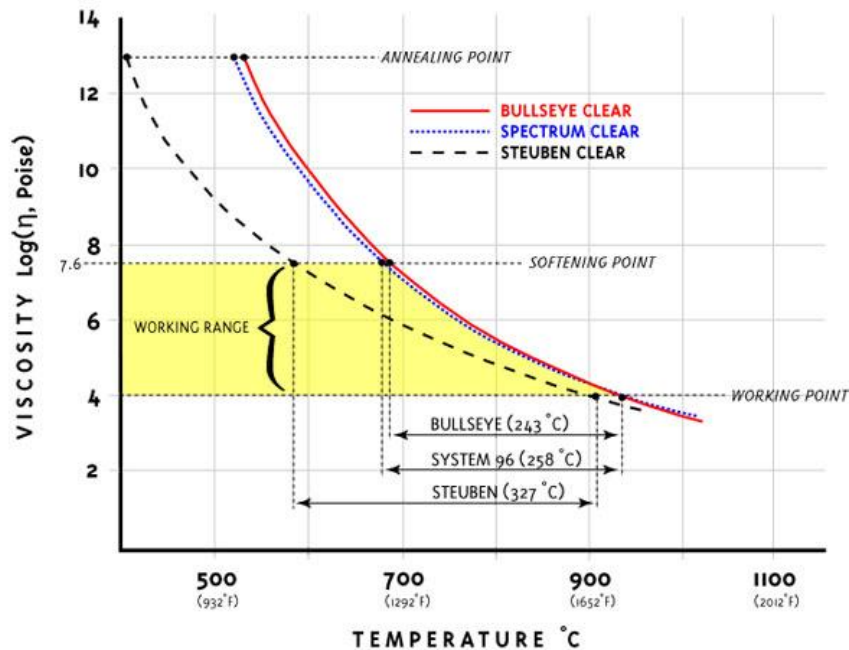


fig. 1. **TEMPERATURE vs VISCOSITY GRAPH SHOWING WORKING RANGE**  
(AS DEFINED BY THE ASTM AND AMERICAN CERAMICS SOCIETY COMMITTEES ON GLASS DEFINITIONS)

Steuben clear is a Lead Crystal Glass and spectrum and bullseye are non lead glass.

Simply stated, the working range of glass is that range of temperatures that corresponds to the point where glass just begins to soften up to the point where glass is too soft to control. The ASTM and the American Ceramics Society committees on Glass Definitions summarized the definition now widely used in today's glass industries. (see pp. 677-680 in *The Handbook of Glass Manufacture* by Tooley and pp. 72-74 in *Technical Glasses* by Volf).

**WORKING RANGE:** "The range of temperatures in which glass is formed into ware in a specific process. For comparison purposes, when no specific process is considered, the working range of glass is assumed to correspond to a viscosity range from the working point to the softening point. (4 to 7.6 Log<sub>10</sub> Poise)"

A **LONG** glass will have a significantly longer temperature range from the working point to the softening point than a **SHORT** glass.

Since glass blowers are hand working glasses in this range they are able to readily distinguish a long glass from a short glass.

5. In 4(A)c it is mentioned that "In certain cases, the ranking IEE of an electric lighting device can jump to category A (with crystal) from category B (with flint glass). In other words, less energy is required for lighting".
  - a. On the basis of this example, is it to be understood that there are crystal luminaires (with LCG or with lead free crystals) that are marked with energy performance information for the consumer?

**Consumers are well aware of the unique properties of crystal in terms of transparency and lighting refraction/reflection capacity for all the different applications.**

**A confidential study made by one of our stakeholders shows that for a light source of 30,9 lm/W, crystal give 10% more light than glass leading to a A category for crystal item and B for some glass items.**

- b. Please provide information to support this statement, for example a comparison and test results of a comparison of otherwise identical products (e.g. comparison on luminaire level and not on crystal level).

**See answer to question a**

- c. Please further explain the relevance of this aspect to other than luminaire applications where relevant.

**See answer to question a**

6. It is stated that “The ban of lead crystal in electric and electronic equipment would lead to the disappearance of some mainly lead crystal manufacturing companies.”.

- a. Please estimate how many companies manufacture EEE with LCG and how many of these would be considered SMEs.

**Estimated nb of companies manufacturing EEE with LCG**

| Country        | Crystal manufacturing Cies       | Non crystal manufacturing Cies | Estimated nb of SME |
|----------------|----------------------------------|--------------------------------|---------------------|
| France         | Order of magnitude : less than 5 | Order of magnitude : 4         | 4                   |
| Belgium        |                                  | 1                              | 1                   |
| Portugal       | 1                                | N/A                            |                     |
| Slovenia       | 1                                | N/A                            |                     |
| Czech Republic | 18                               | N/A                            | 8                   |
| Germany        | 2                                | 1                              | 3                   |
| Italy          | 2                                | about 150                      | about 150           |
| Spain          | N/A                              | 1                              | 1                   |
| Austria        | N/A                              | 1                              | 1                   |



Please note that while the crystal producers are identified, the number of companies manufacturing EEE with LCG produced by crystal manufacturers is difficult to assess. We used the Europages which refer to 486 companies of which 458 only for Italy. Investigation into the Europages site reveal that about 40% of the referred Italian companies are actually manufacturers of EEE articles with LCG and 60% are wholesalers or shops. In order not to provide an overestimation, the figure of 458 companies was divided by 3. For other countries unfortunately, less companies referenced themselves in Europages. Obviously, there are assemblers/creators and suppliers of EEE articles with LCG in other European countries, but we do not know them.

Companies report that about 40 suppliers are partially working for each lead crystal producer (metallic parts suppliers for example with dedicated surface treatment units etc.).

- b. Please estimate the total annual turnover related to the manufacture of EEE with LCG and what part of these manufactured articles are placed on the EU market and on non-EU markets.

**Confidential information – removed from public version**

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 as part 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.