Stakeholder Contribution
Stakeholder consultation on an exemption request from the substance restrictions in electrical and electronic equipment (RoHS Directive)
Exemption request 2015-1 “Lead in thin film electronic sensor elements such as pyroelectric sensors or piezoelectric sensors”

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-2- Comments to the questionnaires

1. Pyreos states that lead-free pyroelectric sensors are all single crystal based, such as lithium tantalate, which, according to the applicant, is commercially not viable and may be technically not reliable enough to provide the proper performance of monitoring and control instruments.

a. What are the technical constraints of lead-free pyroelectric and piezoelectric sensor elements?

As asserted by Pyreos all “lead-free” pyroelectric sensors are single crystals-based and as there are limits concerning the reduction of the thermal capacity of these single crystal sensor devices due to machining (processing) reasons, their sensitivity (responsiveness) to very small or very swift variations becomes restricted.

On the other hand, lead-containing ceramic sensor devices of pyroelectric sensors used for general purposes, not only have superior device properties such as sensitivity (responsiveness) when compared with “lead-free” single crystal sensor devices, but have better machinability (processing capabilities) thus it is possible to reduce their thermal capacity and increase their sensitivity (responsiveness). For this reason, lead-free pyroelectric sensors can only be utilized in limited ranges for which their properties are applicable.

“Lead-free” piezoelectric-type sensors are inferior to those devices used for general purposes and which use lead-containing ceramic concerning both electric properties (piezoelectric coefficient, thermal properties) and wide utilization environment (temperature, voltage, frequency), which are required for use in electric and electronic equipment. Consequently, they cannot bring out properties in a broad utilization environment in a stable manner. Moreover, it is not possible to bring out the properties obtained in a laboratory level to a mass production scale in a stable manner.

b. Can such lead-free sensor elements fully replace lead-containing ones, or can they at least be used in some applications?

As explained in a. above the applicability of “lead-free” pyroelectric-type sensors as products can only be decided on a case-by-case manner according to the required properties and utilization environment. Thus their applicability cannot be determined by a specific index (parameter).

Moreover, we are not aware of examples of cases of substitution by “lead-free” piezoelectric sensors on a commercially established scale.

The Umbrella Project comprising the 4 Japan EEE Association mentions in item 4(C) of the “Exemption Request Form” for exemption 7(c)-I of the Annex III of RoHS, submitted on 16 January, 2015, that it is not possible to specify the applications for which the particular functions and properties of lead in ceramic of electric and electronic components is necessary. For details please refer to the mentioned document.

c. Can you explain in detail what it means that, as the applicant claims, lead-free sensors are commercially not viable, and/or do you have contrary information?

There are numerous issues still to be solved concerning “lead-free” sensors in order to become viable as products. Moreover, for almost all of the applications for which lead-containing electronic ceramic is utilized in the market, required properties cannot be achieved by substitution.
Within this situation, “lead-free” pyroelectric-type sensors have been put to practical use as products, however as explained in the first paragraph of a. as there are functional limitations they are only used in restricted applications for which such limitations do not turn into problems.
Even so, the judgment on whether “lead-free” pyroelectric-type sensors can be used or not has to be done on a case-by-case basis depending on the properties and utilization environment necessary for a large variety of final products.and applications for which they can be used cannot be established by a specific index (parameter).

2. Do you share the applicant’s other arguments, or are you opposed to the requested exemption? Please explain your arguments in detail.

Currently, with the exception of a few specific applications, lead-containing electronic ceramic devices are indispensable for pyroelectric-type sensors. Moreover, no promising “lead-free” device has been found in order to fulfill upcoming miniaturization and high-functionality trends for the future. It should also be added that, for piezoelectric-type sensors there are currently no perspectives for “lead-free” replacements. From this aspect we share the same assertions as the applicant.
However, we cannot find any special reason that should be mentioned from a technical viewpoint concerning the assertion by the applicant since “lead in thin film electronic sensor elements such as pyroelectric sensors or piezoelectric sensors” fall into the case of “lead in electrical and electronic components including ceramic devices”, thus being completely included in the scope of exemption 7(c)-I of Annex III of the RoHS Directive.
In the present status, it is not possible to make a judgment on the actual scope of the exemption needed by the applicant, and it should be clearly mentioned in the legal text how “lead in thin film electronic sensor elements such as pyroelectric sensors or piezoelectric sensors” as described by the applicant can be categorized apart from 7(c)-I. In such case it might be necessary to have a clear definition using sophisticated terminology agreed on academically and technical terms based on detailed technical information including that not open to the public by the applicant.
However, it may also be said that, general users (including purchasing representatives from non-manufacturing areas) not having technical knowledge concerning electrical and electronic equipment will not be able to make a judgment on the applicability of exemption by simply referring to highly sophisticated technical terminology such as this, thus creating major obstacles on the actual operation of the RoHS Directive.
That may even develop into disputes due to the difference in interpretation.
As expressed in the above view, we are convinced that “lead in thin film electronic sensor elements such as pyroelectric sensors or piezoelectric sensors” as asserted by the applicant is already covered by the exemption 7(c)-I of Annex III of the RoHS Directive, and as such insist that it should continue to be

covered by exemption 7(c)-I of Annex III of the RoHS Directive in the future as well.
As a conclusion, we agree with the basic assertion by the applicant that lead is necessary for sensors however we are contrary to the wording used in the application.

3. According to Pyreos, there are other manufacturers offering (lead-free) pyroelectric and piezoelectric sensors:

- Infratec
- Excelitis
- Panasonic
- Murata

So far, none of these other manufacturers has supported the exemption request. Is there any information as to how these manufacturers solve the issues on which the applicant bases its exemption request, or vice versa, why only the applicant would need this exemption for its sensor elements?

We are convinced that a new exemption is not necessary, due to the fact that lead included in pyroelectric-type or piezoelectric-type sensors are already exempted by 7(c)-I of Annex III of the RoHS Directive.
Regardless of the above, we do not have information indicating why only the applicant needs this sensor device exemption.