Kyocera-AVX Components Corporation
Response to ECHA's Public Consultation on PFAS Restriction Proposal

1 INTRODUCTION

This submission pertains to the proposal presented by five states: Germany, Denmark, Netherlands, Norway, and Sweden (referred to as 'dossier submitters'). The proposal concerns a REACH restriction on the manufacturing, placement on the market, and usage of per- and polyfluoroalkyl (PFAS) substances. ECHA (European Chemicals Agency) defines PFAS as encompassing over 10,000 distinct molecules, each with varying hazard profiles.

The initial proposal submitted by the authorities of the dossier submitters to ECHA encompasses a broad prohibition. It includes only three exemptions without time limitations and a limited number of very specific derogations with time limits for certain applications (approximately 50 derogations have been granted, which is a relatively small number considering the impact on 10,000 substances). Furthermore, as elaborated below, there is no differentiation made between the hazard profiles of the targeted substances, their economic uses, or clearly identified risks.

This approach does not meet the high standards set by the REACH regulation and poses a threat to the capacity of crucial sectors to support a self-sustaining and net zero European economy. Furthermore, it places a substantial number of industries at serious risk, with far-reaching consequences for the supply chains of diverse sectors, including those that are strategically important and vital to society.

2 DESCRIPTION OF THE COMPANY AND ITS PRODUCTS

2.1 KAVX's mission

Kyocera-AVX Components Corporation (**KAVX**) is a leading global manufacturer of advanced electronic components engineered to accelerate technological innovation and build a better future. As a wholly owned subsidiary of KYOCERA Corporation structured to capitalize on shared resources and technical expertise, KAVX has an expansive global footprint comprised of several dozen research, development, and manufacturing facilities spanning more than 15 countries and staffed with talented personnel dedicated to innovation, component quality, customer service, and enabling a brighter future through technology.

2.2 KAVX's products

KAVX is actively involved in the manufacturing and assembly of a diverse range of components for electronic products, and electronic devices, encompassing connectors, cables, capacitors, crystal devices, and power semiconductor devices. The proposed restriction, as it stands, carries the potential to impose significant limitations on a variety of KAVX's product lines. However, this particular submission is centered on the intricate process of manufacturing associated with specific categories of these products, namely capacitors, cables and connectors.

Within the production of these KAVX products, a number of per- and polyfluoroalkyl substances (PFAS) are essential and integral to the manufacturing process (both in terms of its presence in certain production equipment, and its presence in the finished product).

In capacitors, these PFAS are polytetrafluoroethylene (PTFE), commonly recognized as Teflon, a number of proprietary fluoropolymers (which we refer to below as Fluoropolymer 1 and Fluoropolymer 2), and a PFAS solvent (1-ethoxy-1,1,2,3,3,3-hexafluoro-2-(trifluoromethyl)propane & 1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane). Further details of the uses are discussed in more detail later in this document.

In cables and connectors (which KAVX does not manufacture, but sources from third party suppliers) the relevant PFAS substances are PTFE (used in the insulation resin on RF connectors), Tetrafluoroethylene-hexafluoropropene copolymer (FPE), and Tetrafluoroethylene-Perfluoro(Propyl Vinyl Ether) Copolymer (PFA), both used for the insulation and cable jacket on RF coaxial cables.

KAVX also uses RF couplers supplied by a third party, and has been seeking clarification as to whether any PFAS are present in these couplers, but has not yet received confirmation. KAVX may therefore need to revisit this category of component in a subsequent consultation.

3 INTRODUCTORY REMARKS

The electronics sector is addressed within the proposed restriction in a notably non-comprehensive manner, particularly in terms of the proposed or potential exemptions. Only one potential derogation has been put forward for the whole electronics sector, for the semiconductor manufacturing process. This omission is notable, particularly in light of Annex XV's acknowledgment of the uncertainty concerning the feasibility of substituting, for example, fluoroelastomers, in diverse applications in the electronics sector.

Given the significance of these applications, the dossier submitters should have conducted further investigation into the potential ramifications of such a restriction in this sector. More importantly, they should have explored the actual feasibility of substitution and the availability of alternatives. Alternatively, they could have ensured a minimum period during which stakeholders could investigate the presence of alternatives, associated costs, and performance differences compared to current uses.

It is also important to highlight that the electronics sector, in addition to its inherent complexity and technical nature, produces components that are integrated into a vast array of final products spanning multiple industries and diverse applications. Identifying all these applications is a challenging undertaking. Consequently, the electronics sector faces exceptional difficulties, not only in assessing the use of PFAS and exploring potential alternatives, but also due to the intricate complexity of its value chains and the extensive range of applications.

In light of these complexities, industry needs more time to obtain and furnish comprehensive information and to achieve clarity regarding the potential extension of exemptions. Therefore, we firmly believe that the restriction should be revised to incorporate a transition period of five years, accompanied by a structured process for evaluating subsequent requests for derogations, specifically including PFAS used in the production of electronic equipment.

Furthermore, we note that the current proposal only permits a derogation period of either 5 or 12 years for specific PFAS applications following the 18-month transition period. Many of the applications within the electronics industry require an extended derogation period to identify or develop alternative materials. In addition to a longer transition period for electronics and the subsequent opportunity to request derogations following further examination, the PFAS restriction should encompass a mechanism allowing the industry to seek renewal of a derogation prior to the initial five or twelve year period have lapsing.

With regard to fluoropolymers, particularly polytetrafluoroethylene (PTFE), there is insufficient empirical evidence regarding the toxicity of these substances. Consequently, the categorization of fluoropolymers alongside other PFAS appears incongruous, especially when considering that fluoropolymers adhere to the OECD 'polymer of low concern' criteria. KVAX's supplier of certain PTFE components has published a specific review of differences in safety between fluoropolymers and non-polymerised forms of PFAS, which can be found here: https://www.zeusinc.com/blog/2019/11/21/fluoropolymers-and-non-polymerized-forms-of-pfas/.

Furthermore, these substances play a pivotal role in various applications, not only within the electronics sector but in numerous other fields, such as the safe transportation of liquids and liquefied gases in bulk across a wide spectrum of manufacturing and processing sites, many of which handle dangerous goods or potentially hazardous materials.

Further, both PTFE and fluoropolymers are characterized by their high cost and the formidable challenges associated with their conversion processes. Consequently, they are presently employed exclusively in situations where no practical alternatives exist. The success of pivotal initiatives such as the EU Green Deal and the digital transformation is intrinsically linked to the continued availability of fluoropolymers. For instance, they serve as indispensable components in critical applications like fuel cell membranes and high-frequency applications such as sensor cables. Similar considerations extend to PTFE components used in sealing applications, as no other material can guarantee enduringly low emissions. Alternative materials, in contrast, would have shorter lifespans and a higher propensity for leakage due to their diminished chemical and thermal resistance. It is of paramount importance to acknowledge that, for numerous applications, there are currently no safe alternative elastomer materials available. These materials find extensive use in exceedingly sensitive sectors, including the medical technology industry.

As underscored by a significant volume of submissions in response to this consultation, the minimal risk associated with fluoropolymers should have been subject to more comprehensive evaluation and afforded a greater number of derogations. In addition to the arguments presented in this position paper regarding various components of electronic products, we consider that the scope of the restriction concerning fluoropolymers warrants a more fundamental reevaluation.

4 COMPONENTS USING FLUOROPOLYMERS

As highlighted in the introductory section, the electronics sector has particular challenges when it comes to assessing PFAS uses and alternative options, largely due to its intricate value chains and multifaceted applications. Therefore, it is essential to recognize that more time would have been invaluable for the provision of comprehensive information during the restriction process, particularly the identification of PFAS use in components of electronic products, and the development of viable alternatives. Unfortunately, the industry was not granted the necessary time to prepare for this restriction proposal. In fact, even with extensive research, it is plausible that potential PFAS-free alternatives may not be able to meet the required functional and performance criteria, due to chemical and physical constraints. In light of this, as previously mentioned, the restriction should incorporate an initial five-year transition period and a process for processing derogation requests. Such an approach would acknowledge the intricacies of the electronics industry and the time needed for research and development.

The absence of derogations for the electronics sector may disrupt various industries and end-use sectors, including but not limited to automotive, aerospace, chemical manufacturing, and energy production (nuclear and renewable). As industries have not been afforded sufficient time to fully comprehend the current uses of PFAS in components of electronic products, and its impact on end-use products, a general derogation becomes essential for all components critical to industrial operations. This derogation should extend over a period of 12 years (in addition to the transition period), with the potential for review after this timeframe. Within this duration, industries can undertake the evaluation of alternatives and, where feasible, commence investment in PFAS-free solutions.

The electrical equipment sector contributes minimally (1%) to PFAS releases in the EU, potentially rendering the current restriction disproportionate in relation to its socioeconomic impact. The restriction should place greater emphasis on consumer and high-exposure professional uses, while permitting derogations for industrial applications lacking viable alternatives. Additionally, review periods should be integrated to adapt to evolving circumstances.

4.1 Derogation Proposal:

With all the foregoing considerations in mind, we propose an amendment to the current restriction proposal. Specifically, we advocate for the inclusion of the following derogation:

6. By way of derogation, paragraphs 1 and 2 shall not apply to fluoropolymers and perfluoropolyethers for the use in:

[ ]. applications relating to the manufacture of components of electronic products, including use in manufacturing equipment and production processes, and in the components themselves, including wires, cables and connectors, until 13.5 years after EiF.

Furthermore, it is imperative to establish a process that enables industry to request the renewal of the derogation period prior to the elapse of the 12-year timeframe. This provision is crucial to adapt to evolving circumstances and ensure the continuity of essential industrial processes.

5 REQUEST FOR SPECIFIC DEROGATIONS REGARDING CAPACITORS

In this paragraph, we will delineate specific uses pertaining to certain electronic components, particularly in the manufacturing of capacitors, which we deem essential and for which, currently, no credible alternatives exist, or the development of alternatives is not readily achievable.

5.1 Use of PTFE (Teflon) as Masking Material:

Description of Use: Protective paint, tube, or tape of tantalum is employed in the inner elements of capacitors. These serve as hydrophobic materials to mask a section of the tantalum capacitor (TAC) wafer during immersion into a manganese nitrate solution. The masked area remains free of manganese dioxide after decomposition. The primary purpose of these materials is to prevent contact between capacitor elements.

Alternatives: Currently, there is no known alternative with identical properties, specifically an alternative capable of withstanding high-temperature processing and being able to shrink to wire through heat application while also exhibiting resistance to the chemicals involved in the process. While there are material options for hydrophobic coatings, their mechanical and chemical stability must undergo rigorous testing. These tests, besides being costly, require a significant amount of time (a development and certification period of at least 5 to 10 years is anticipated).

Thus, at present, it is uncertain whether these potential alternative materials would constitute credible alternatives for these uses. Indeed, the development of alternatives would entail, at the very least, the following steps: (i) screening period to identify a suitable material with adequate stability, and (ii) adjustments to the current application and curing processes, which will likely necessitate modifications to existing equipment (entailing additional investments). Additionally, some of the products in question have applications in aerospace, military, or medical sectors, where a longer certification/approval period would be required in order to meet rigorous type approval, CE assessment and similar conformity assessment requirements. In such cases, a change in material for capacitor manufacturing will necessitate an entirely new conformity assessment application/process for the final product.

Consequences of the Absence of Alternatives: The development of alternative processes and equipment to replace the protective coating effect is still in progress, and if alternatives are found, it will be a protracted endeavour. The primary consequences include (i) an increase in production costs and the final product's price, and (ii) the likelihood of missing components in critical and essential sectors for society, such as aerospace, military, medical (including implantable and other medical devices), and automotive, among others.

5.2 Use of PTFE (Teflon) in Wet Electrolytic Capacitor Construction (Bobbins and Nests):

Description of Use: In the production of capacitors, Teflon nests and Teflon bobbins are employed to prevent unintended movement of anodes inside the cans and to provide mechanical support to the anode, especially under conditions of high vibrations and shocks, while still retaining some degree of mechanical flexibility and elasticity. Nests also serve to prevent contact between the anode and the can. These nests and bobbins must be constructed from a material that is resistant to acidic solutions and high temperatures.

Alternatives: Similar to the previous case, no direct alternatives are currently known for this application. The development of alternatives would entail a screening period to identify suitable materials with the requisite performance, with an estimated development and certification period of at least 5 to 15 years. Even if an alternative material were to be developed, it would essentially be produced as an entirely new material. Importantly, these products have military applications, which involve longer conformity assessment and certification periods for our customers. Therefore, a change in material for these products would necessitate an entirely new conformity assessment application/process for the final product.

Consequences of the Absence of Alternatives: The immediate consequence of the proposed restriction is that this element could no longer be produced, with profound implications, particularly in aerospace, military, and down-hole drilling applications.

5.3 Use of PTFE (Teflon) as Construction Material for Equipment (Fittings, Vessels, Cable Insulation):

Description of Use: Teflon is used in this application due to its ability to withstand high temperatures, resist chemicals, provide electrical insulation, and maintain mechanical stability.

Alternatives: Alternatives for this use of Teflon must have the capacity to withstand high-temperature processing and not adhere to other materials. While alternatives may potentially be available for this application, it is challenging to obtain a clear overview of the situation since this application encompasses such a wide range of uses. A sectoral analysis would be necessary, which the tight timelines of the proposed restriction, as currently formulated, do not permit.

Consequences of the Absence of Alternatives: In this case, the impact of the absence of alternatives is even more severe than in the previous cases. The inability to use Teflon for fittings, vessels, and cable insulation would pose a significant threat to almost all stages of the production process when spare parts are not available. It would also substantially increase production costs (with an impact on the end consumer) due to the use of alternatives with inferior performance.

5.4 Use of Hydrophobic Coating Before Encapsulation Using Fluoropolymer 1 (Trade Secret):

Description of Use: These materials serve as a bumper against thermomechanical stresses throughout the lifespan of capacitors and also provide moisture protective barriers. These properties ensure the required moisture sensitivity level of capacitors (resistance to cracking) and enhance their long-term performance under humid conditions. They are used in the production of capacitors.

Alternatives: Alternatives must possess not only hydrophobic properties but also suitable thermomechanical properties and sufficient chemical stability at high temperatures and under acidic conditions. Currently, no direct alternative is known for this specific application. To identify viable alternatives, a screening period to identify materials with the necessary performance would be required. The development and certification period for such alternatives are anticipated to be at least 5 to 15 years. Additionally, alternative materials may need to be developed entirely from scratch. Adjusting the current process for application and curing will likely necessitate changes in existing equipment, entailing additional investments. Importantly, these elements have applications in the automotive, military, and space sectors, which involve longer conformity assessment and certification periods for our customers. Therefore, a change in material for these products would necessitate an entirely new conformity assessment application/process for the final product.

Consequences of the Absence of Alternatives: The primary consequences of the restriction and the inability to use this type of hydrophobic coating are that products will not meet their claimed specifications. This has significant implications during the assembly of products at the business-to-business (B2B) customer level and other ramifications that are challenging to identify at this stage, particularly in terms of the service life experienced by end customers.

5.5 Use of Hydrophobic Protection of Capacitor Element with Fluoropolymer 2 (Trade Secret):

Description of Use: The uniqueness of these materials lies in their inertness, specifically their chemical and thermal stability. These properties enhance their long-term performance (electrical properties), including under harsh conditions.

Alternatives: Polyolefins may be considered as alternatives, but this is not yet certain and would require further investigation. This would involve an evaluation of performance and stability. Additionally, it would necessitate adjustments to the current process and possibly to the capacitor design to achieve the same product performance. The development and qualification period for such alternatives are expected to require at least 3 to 8 years. Importantly, these elements have applications in the automotive, military, and space sectors, which involve longer conformity assessment and certification periods for our customers. Therefore, a change in material for these products would necessitate an entirely new conformity assessment application/process for the final product.

Consequences of the Absence of Alternatives: As observed for Fluoropolymer 1, the primary consequences of the restriction and the inability to use this type of hydrophobic coating are that products will not meet their claimed specifications. This has significant implications during the assembly of products at the business-to-business (B2B) customer level and other ramifications that are challenging to identify at this stage, particularly in terms of the service life experienced by end customers.

5.6 Derogation Proposal:

In light of the considerations outlined above, and if the broader proposed derogation for the components of electronic products set out above is not possible, there must be a specific derogation for capacitors, given their essential and strategic use in an indefinite number of products, including in highly strategic and essential sectors for society. Therefore, the following amendment to the current version of the restriction proposal is proposed:

> ***6. By way of derogation, paragraphs 1 and 2 shall not apply to fluoropolymers and perfluoropolyethers for the use in:***
>
> ***[ ]. the manufacture of capacitors, including use in manufacturing equipment and production processes, and in the capacitors themselves until 13.5 years after EiF;***

Furthermore, it is imperative to establish a process that enables industry to request the renewal of the derogation period prior to the elapse of the 12-year timeframe. This provision is crucial to adapt to evolving circumstances and ensure the continuity of essential industrial processes.

6 SOLVENT FOR HYDROPHOBIC COATING (1-ETHOXY-1,1,2,3,3,3-HEXAFLUORO-2-(TRIFLUOROMETHYL)PROPANE & 1-ETHOXY-1,1,2,2,3,3,4,4,4-NONAFLUOROBUTANE):

Description of Use: This solvent is employed in the capacitor manufacturing process, specifically to keep the two fluoropolymers mentioned in the previous sections in their liquid phase, which enables them to be used for their specific applications, as detailed above.

Alternatives: At present, KAVX understands from the supplier of the fluoropolymers (which are supplied to KAVX already in the solvent), that this solvent is irreplaceable, as alternatives other than fluoropolymers have very limited solubility in solvents.

Consequences of the Absence of Alternatives: the processability of the aforementioned fluoropolymer types would not be possible, with all subsequent implications for all capacitors and applications where fluoropolymers are used in their manufacturing process.

6.1 Derogation Proposal

The proposed restriction as applicable to solvents includes only one potential derogation of 12 years plus the 18-month transition period, which is not limited to fluoropolymers and pertains to the industrial and professional use of solvent-based debinding systems in 3D printing. This is a highly specific and limited application, even though the dossier submitters in Annex XV (page 95) acknowledge that the solvent sector is "a very diverse sector with solvents used for a wide variety of applications." Therefore, it is believed that further research is needed regarding solvents, and ECHA should consider derogation proposals where there is already clear evidence of the non-substitutability of certain solvents, as in the case presented in this paragraph concerning solvents for hydrophobic coatings.

In consideration of the above, an amendment to the current restriction proposal is proposed by adding the following derogation proposal:

5. By way of derogation, paragraphs 1 and 2 shall not apply to: ***[ ]. the use of solvents for hydrophobic coatings, including use in manufacturing equipment and production processes until 13.5 years after EiF.***

7 CONCLUSION

Given the highly technical content of this contribution, we would be willing and pleased to engage in a bilateral discussion with ECHA to further explain the arguments presented in this submission. We would have liked to attach technical-scientific material in support of all the arguments presented, but the tight timeframe for responding to this public consultation did not allow for it. However, we hope that ECHA, especially in complex and highly technical sectors like that of components of electronic products, will be inclined to delve into the issues presented, both independently and with the support of interested stakeholders.