



Input to Public Consultation on  
**PFAS restriction proposal**

**On behalf of**

**Continental AG  
Vahrenwalder Straße 9, 30165 Hannover  
Germany**

**Contact information**

**Head of Group Hazardous Substances Management**

**Version**

**No. 1**



## **Continental AG**

Continental develops pioneering technologies and services for sustainable and connected mobility of people and their goods. Founded in 1871, the technology company offers safe, efficient, intelligent and affordable solutions for vehicles, machines, traffic and transportation. In 2022, Continental generated sales of €39.4 billion and currently employs around 200,000 people in 57 countries and markets.

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## Executive Summary

On 22 March 2023, the European Chemical Agency (ECHA) published the restriction proposal on per- and polyfluoroalkyl substances (PFAS) that has been prepared by the five member state competent authorities (MSCA) from Denmark, Germany, Netherland, Norway and Sweden, under EU Regulation (EC) No 1907/2006 "REACH".

The unique properties of PFAS and especially fluoropolymers are the reason why they can be found in many products and applications in the automotive but also many other industries.

It's estimated that the current proposal will affect more than 10.000 PFAS (including fluoropolymers) under the premise that they are as persistent as the already regulated PFOA. This assumption by the MSCAs seems not in line compared to the classification of fluoropolymers from the OECD (Organisation for Economic Co-operation and Development) as 'polymers of low concern' (PLC), as they do not lead to a hazardous risk for human health and the environment.

A major part of this contribution is dedicated to a collection of use-cases within our processes and products. This shall increase the knowledge on PFAS uses and their criticality for the industry. We will additionally demonstrate that many use-cases are directly linked to technologies contributing to energy efficiency.

### Key messages

- Risk based approach to regulate PFAS, derogation for fluoropolymers.
- PFAS play a key role in essential technologies on the way to carbon neutral future.

# 1 Introduction

## 1.1. The Continental Group

The Continental AG is the parent company of the Continental Group. In addition to Continental AG, the Continental Group comprises 477 companies, including non-controlled companies. The Continental team is made up of 199.038 employees at 519 locations for production, research and development, and administration in 57 countries and markets. Added to this are distribution locations, with 917 company-owned tire outlets and a total of around 5.228 franchises and operations with a Continental brand presence. (1)

Continental is divided into three group sectors: Automotive, Tires, ContiTech and Contract Manufacturing.

The **Automotive group sector** offers technologies for passive-safety, brake, chassis, motion, and motion-control systems. Its portfolio also includes innovative solutions for assisted and automated driving, display, and operating technologies, audio and camera solutions for the vehicle interior as well as intelligent information and communication technology associated with the mobility services of fleet operators and commercial vehicle manufacturers. Comprehensive activities relating to connectivity technologies, vehicle electronics and high-performance computers round off the range of products and services.

With its premium portfolio in the car, truck, bus, two-wheel and specialty tire segment, the **Tires group sector** stands for innovative solutions in tire technology. Intelligent products and services related to tires and the promotion of sustainability complete the portfolio. For specialist dealers and fleet management, Tires offers digital tire monitoring and tire management systems, in addition to other services, with the aim of keeping fleets mobile, and increasing their efficiency. With its tires, Continental contributes to safe, efficient, and environmentally friendly mobility.

The **ContiTech group sector** develops and manufactures, for example, cross-material, environmentally friendly and intelligent products and systems for the automotive industry, railway engineering, mining, agriculture, and other key industries. The group sector draws on its long-standing knowledge of the industry and materials to open up new business opportunities by combining various materials with electronic components and individual services.

## 1.2. Background on PFAS restriction proposal published by ECHA

On 22 March 2023, the European Chemical Agency (ECHA) published the universal PFAS restriction proposal that has been prepared by the five member state competent authorities (MSCA) from Denmark, Germany, Netherlands, Norway and Sweden, under EU Regulation (EC) No 1907/2006 "REACH". On the same day they initiated the six-month public consultation.

In the proposal PFAS (per- and polyfluoroalkyl substances) are defined as substances which "contain at least one fully fluorinated methyl ( $\text{CF}_3$ -) or methylene ( $-\text{CF}_2$ -) carbon atom (without any H/Cl/Br/I atom attached to it)", based on the definition expressed by the OECD (Organisation for Economic Co-operation and Development).

The main concern of the lead Member State Competent Authorities regarding PFAS are their high environment persistence, significantly exceeding the very persistent (vP) threshold set out in Annex XIII of the REACH Regulation. Additional concerns emphasized by ECHA are mobility (M) of compounds, as well as long-range transport potential (LRTP), accumulation in plants, and global warming potential.

## 2 Comments on the restriction proposal

### 2.1. Substances in scope / Risk based approach

We **request a derogation** from the PFAS restriction proposal for all fluoropolymers classified as Polymers of Low Concern, which do not pose a risk for human health or the environment.

PFAS are a diverse group of substances with different properties regarding its chemical, physical, thermal, and biological behavior. Because a substance is part of the PFAS grouping it does not give any information whether this substance presents a risk to the human health or the environment. The group of PFAS itself can be divided into two primary categories 1) non-polymeric PFAS and 2) polymeric PFAS (incl. fluoropolymers). (2)

The scope of the proposed restriction comprises lots of fluoropolymers, such as FKM, PTFE or PVDF, which are classified as 'polymers of low concern' (PLC) by the OECD. The fluoropolymers which are classified as PLCs are not considered a hazard for human health or the environment. This means those PLCs do not meet the requirements defined by Article 68 (1) of the REACH regulation as empowering statute.

In addition to that, the dossier submitters have claimed that the persistency of PFAS, a hazardous property, is the main criteria for the restriction proposal. It's our understanding that a hazardous property alone cannot be trigger for such a wide-ranging restriction. A better metric is the risk, a combination of hazard and exposure.

This is also supported by a scientific study (3) which concludes that "all PFAS should not be grouped together, persistence alone is not sufficient for grouping PFAS for the purposes of assessing human health risk, and that the definition of appropriate subgroups can only be defined on a case-by-case manner".

In our conclusion, considering the different hazard profiles and use cases of fluoropolymers compared to other non-polymeric PFAS, fluoropolymers shall not be grouped together with other PFAS. If the regulator wants to address risks, which may be of concern, regulatory management options are available e.g., industrial emissions directive or the waste framework directive.

### 2.2. Impact on EU-based production

We **request a derogation** from the PFAS restriction proposal for fluoropolymers used in manufacturing equipment and their spare parts where the use does not pose a risk to human health or the environment.

This derogation shall cover the initial placing on the market as well as the secondary market.

The manufacturing of Continental products is affected by the use of PFAS in our production machines, operation equipment and material. For example, fluorinated polymers are frequently used in seals, hoses, wires, valves, coatings, control-electronics, and others. Also, associated process materials especially for high temperature and vacuum applications often include PFAS like Perfluoropolyether (PFPE) or Polytetrafluoroethylene (PTFE) e.g., lubricants. The proposed restriction of PFAS will negatively affect the manufacturing process in the EU and might lead to further relocation of the automotive manufacturing industry to non-EU countries.

Besides the already mentioned risk-based approach and the derogation for Polymers of low concern (PLC) it should be considered, that PFAS materials in the controlled environment of machines and production equipment commonly do not pose any relevant risk. Derogations must take effect where no environmentally hazardous relevant release into the environment takes place.

Especially in applications with extreme conditions (high or low temperatures, high pressure, UV radiation, high frictional resistance, aggressive chemicals, or a combination of these, there are in most cases no suitable alternatives to PFAS-containing products. The use of PFAS in machines and production equipment e.g., seals, hoses, pipes, valves, compressors, and coatings, contributes, among other things, to the safety, resource efficiency, durability, and sustainable utilization of machine and production equipment. (4)

Furthermore, a derogation for spare and used parts is necessary. Machines and production equipment is designed for long-term use in harsh environments. Ensuring that customers can safely use the equipment over many years requires regular maintenance and servicing. For this, a supply of spare parts is essential. Unless spare parts are exempted from the restrictions, current inventories of spare parts would have to be disposed of, leaving no parts available to maintain the construction equipment; repair as produced. This could therefore lead to the early disposal of machines that would otherwise be still usable if they could have been serviced. Additionally, the absence of suitable repair and maintenance services may compromise equipment safety. The regulations proposed would require users to purchase new equipment. Given the cost of construction equipment, this would pose significant burdens. (5)

Also, the trading of used machines and systems must be possible without restrictions. The value of these machines and production systems is very high and further reuse is more beneficial than decommissioning. (6)

Manufacturers of production and operating equipment are at the end of the supply chain and do have little to no transparency on their use of PFAS. In addition, a supplier query carried out by Continental showed, that most manufacturers of equipment have not identified their affectedness with respect to the restriction proposal.

## 2.3. Use of PFAS in new technologies

We **request a derogation** for the use of PFAS in new technologies if the following conditions are met:

1. Significant benefit to the society,
2. No alternative material to PFAS is available, and
3. Risk to human health and the environment is manageable as defined within the authorization process under REACH.

This derogation must also include the possibility for product and process orientated research and development.

Due to the unique properties of PFAS, it cannot be ruled out that they may have further effectiveness and efficiency potentials in many applications with significant benefit to the society. If the currently proposed restriction of PFAS will enter into force, it is to be expected that no more PFAS will be available within the supply chain for research and development activities and thus development activities will be hindered. Possible potentials can thus no longer be identified within the European Union, which could be a stagnation or even regression for e.g., sustainability and/or climate-relevant applications. A migration of all R&D activities to non-EU countries is to be expected and the EU is in danger of excluding itself from technological progress. Even if new technologies were then developed in non-EU countries, they could not be used within the EU due to the PFAS substance ban. (6)

## 2.4. Reporting requirements for Mixtures

We **request an amendment** to the proposed restriction text to limit the reporting requirements to the following roles and functions within the supply chain:

- Manufacturers and importers of PFASs, or
- Importers of PFAS containing articles as well as formulators of PFAS containing mixtures.

In the Explanatory notes to paragraph 7, the Dossier Submitters point out that manufacturers and importers often only have lack detailed knowledge on the whole supply chain, in particular if these are very complex, like in the automotive industry. Furthermore, the Dossier Submitters are of the opinion that limiting the reporting obligation only to these actors might not provide sufficient use information to enable reviewing of the derogations.

On the other hand, formulators are usually the first downstream users (DU) of a substance and already have a good knowledge of the remaining supply chain and the (end)uses of substance.

The Dossier Submitters note that a reporting by all downstream users is not considered practical nor than useful for an effective monitor of changes of the uses and quantities of PFAS and to identify concerns in specific sectors.

Due to the widespread use of PFAS it is nearly impossible to keep track with all the uses in relation to the proposed derogations. A disproportionate exchange of large volumes and even confidential information would absorb significant resources of the whole supply chain, especially for fluoropolymers and perfluoropolyether (PLC), which are not considered as hazard for the environment or the public health. Therefore, we believe that reporting requirements for PLCs are disproportionate and should be dropped completely.

The monitoring obligations should be described more specifically and should be generally discussed when the final restriction proposal is formulated by RAC and SEAC. (6)

## 3 Sector specific derogations

### 3.1. Transport/Automotive - spare parts

| <i>Text proposed in Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <i>Amendment</i>                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5.x. spare parts and remanufactured parts, whenever placed on the market, for use in the maintenance and repair of transport vehicles already placed on the market for the first time. |
| <p><b><u>Justification:</u></b> (6)</p> <p>Maintenance and repair are important factors in a vehicle's life cycle of 15 to 22 years. It is economically and technically not feasible to phase out the substances in Legacy Spare Parts.</p> <p>Spare parts for vehicles must meet the performance demands of the original part and function identically with associated systems and components to make sure that the function and safety of the vehicle is not adversely affected. The technical performance defined for these spare parts may be linked to their chemical composition. To guarantee the technical performance of the individual parts and interaction with other components an adverse chemical reaction should be avoided. The geometry of the spare parts needs to be identical to the original part in order for the components to physically fit into the required space. Interchangeability must be ensured.</p> <p>Furthermore, the use of remanufactured components as spare parts is widely common in the automotive sector. Such parts are offered by vehicle manufacturers, automotive suppliers, and independent specialized remanufacturers. In practice, an entire ecosystem was established ensuring that worn-out or defect parts (product, sub-assembly, or component / article), find their way back to remanufacturing plants via specialized logistic operators and parts selection centers. After an industrialized remanufacturing process consumers can enjoy affordable spare parts with full warranty while meeting all specifications as defined for the original part.</p> <p>With a sales volume of €4.6 billion at supplier level remanufactured vehicle parts represent about 5% of the entire spare part market in the EU with about 800 kt CO<sub>2</sub> equivalent saved per annum compared to the production of new parts. With the increased shift to electric vehicles a much higher share of components for the repair of vehicles will be remanufactured. Electric propulsion systems consist of high value components with relevant raw material content which are predetermined for circular use via remanufacturing. This includes among others electric motors, inverters, and battery management systems.</p> <p>Therefore, in the interest of a flourishing circular economy it is relevant that all products which are already in the market can be remanufactured without any restrictions or conflicts with other regulations. The current proposals for PFAS ban will no longer allow existing processes for remanufacturing with the consequence to make the circular use of components impossible or economically no longer feasible.</p> <p>The issue of spare parts has been addressed in the End of life Vehicle Directive (2000/53/EC) in 2005 with the Council Decision 2005/438/EC. Preconsideration (2) states: "As product re-use, refurbishment and extension of lifetime are beneficial, spare parts need to be available for the repair of vehicles which were already put on the market on 1 July 2003". Subsequently, all new material restrictions in the ELV Directive have a 'repair as produced' exemption for spare parts that were not originally designed to be compliant with the new material restrictions. This argumentation is widely accepted within authorities and has been used e.g., in the phthalate-restriction REACH Annex XVII Entry 51.</p> |                                                                                                                                                                                        |

## 3.2. Input on application specific derogations for the transportation sector

### 3.2.1. Data collection

In the Automotive Industry the International Material Data System (IMDS) was established in 2000 to report declarable and restricted substances in materials and articles along the supply chain. Declarable substances are added to the Global Automotive Declarable Substance List (GADSL) which is contractually binding. Each actor in the supply chain is obliged to disclose regulated substances according to a defined reporting threshold. Typically, the reporting threshold is above a concentration of 0.1% related to the homogeneous material.

Since several years PFAS are part of the GADSL.

- For specific sub-groups of PFAS, namely PFHxA (C6), PFOA (C8), C9-C14-PFCAs, PFHxS (C6) and PFOS (C8), a reporting obligation applies below 0.1%. This refers mainly to nonpolymeric PFAS.
- Since August 2022 all automotive-relevant PFAS (nonpolymeric and polymeric PFAS) are declarable if “Intentionally added including degradation byproducts”.
- Currently, the GADSL contains 2.910 individual PFAS that are described by a CAS RN or a US TSCA Accession Number.

Based on the PFAS group entry in the GADSL, all affected (active) purchased materials and components were identified via IMDS analytics. In addition to this, a where-used analysis was conducted to identify all affected products (finished parts) which are sold by Continental Automotive Technologies.

Based on this where-used analysis result, we conducted a targeted supplier survey and a comprehensive screening of public stakeholder input.

#### IMDS analytics

Based on the IMDS analytics we have identified 86 individual PFAS which were found in purchased materials, predominantly **PTFE** as well as FKM, PFPE, FVMQ, ETFE. It is important to mention that process chemicals are generally not reported via IMDS as they do not remain in the final composition. Impurities, which remain in the final material (cured state), are reported via IMDS.

We conclude: Polymeric PFAS are reported quite well via IMDS, especially above a concentration of 0.1%. But there is a risk that nonpolymeric PFAS e.g., PFHxA, PFBS, which might be used in very low concentrations by upstream users, **are not reported properly** along the supply chain. The very low restriction threshold of 25 ppb proposed by the dossier submitter might be challenging for material manufacturers which are the foundation of the whole IMDS reporting system. Therefore, we request a **general duty to declare future restricted substances** in mixtures and articles so that the impact on the sector “transport” and “electronics” could be evaluated properly. We assume that new reporting obligations can only be implemented via the planned REACH revision.

IMDS data are currently not available for the majority of aftermarket products and end-of life spare parts. Therefore, we have not yet been able to identify any further PFAS use cases for these products, and it cannot be ruled out that part of the active product range contains PFAS. The analysis will continue for the affected products without IMDS data, and the responsible suppliers will be contacted.

#### Supplier survey

Method:

We have informed our global automotive supply chain on the initiated PFAS restriction process several times. Further, we selected 305 suppliers to participate in a PFAS survey to gather more data on

- PFAS alternatives and substitution,
- Restriction Options and Derogations,
- Socio-economic impact without derogations,
- Emissions and safe use and
- PFAS in production process.

Key suppliers were pushed to provide input.

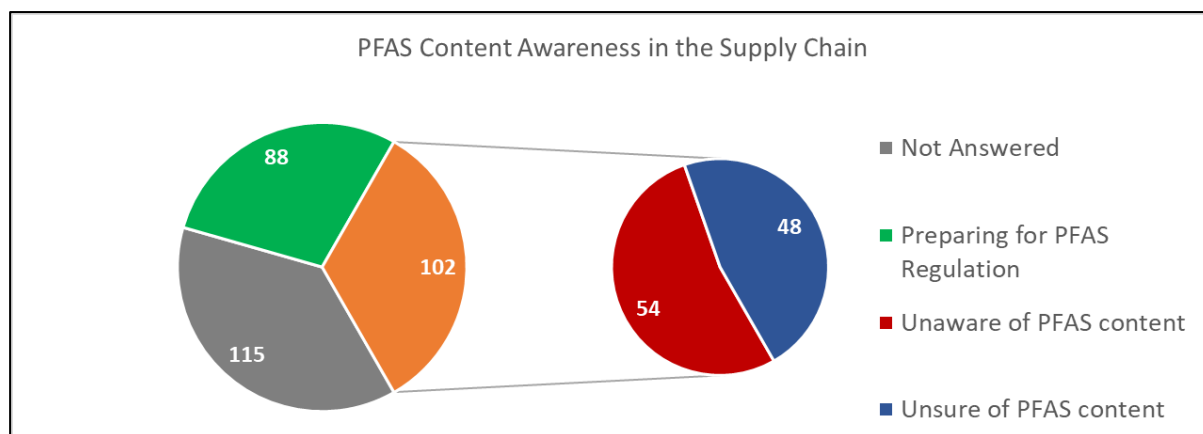


Figure 1: Supplier survey statistics

Survey results and key messages:

#### A) PFAS Alternatives:

For the suppliers stating that they are working on PFAS-free alternatives, or have alternatives almost ready for market, there are two main tenors:

- 1) None of the available PFAS-free materials cover all the functionalities covered by the originally used PFAS materials. This means specific materials will have to be used, which are adapted to each application. According to suppliers, the alternatives perform better than PFAS in some specific areas, but much worse in others.
- 2) Many of the available and tested PFAS-free alternatives do not perform as well in several areas. Suppliers say that Customers will have to adapt (lower) the requirements for the components. Where requirements cannot be lowered, derogations will be needed.

#### B) PFAS Awareness within the Supply Chain:

33% of the suppliers marked as having PFAS in their products by Continental are not preparing for the PFAS regulation: they were either unaware of or unsure of the PFAS content in their products.

Many of these suppliers confused the proposed PFAS restriction with existing regulations on PFOA or REACH SVHC requirements.

38% did not answer the supplier survey on alternatives materials and preparation for the restriction - leaving us blind to a large portion of the supply chain and pointing towards further unpreparedness within the suppliers.

#### C) Consequences of the Restriction:

36% of the suppliers preparing for the PFAS regulation state that without derogations, their development timeframes will become longer.

Reasons given by the suppliers: Extended development times due to the search for PFAS alternative materials, the production and testing of prototypes, the redesign of all concerned products and the re-validation and documentation with the customers.

Most suppliers, even those already working on PFAS alternatives, expect this timeframe to be longer than the start of the PFAS restriction. Without derogations, they would have no alternative products ready in time for the restriction start.

51% of the suppliers preparing for the proposed PFAS Regulation state that they are foreseeing or have already encountered significant difficulties in the development and supply of PFAS-free materials and products.

Reasons and details given by the suppliers are listed below:

- No foreseeable PFAS-free alternatives for some applications
  - Leads to stop of the supply of these products, parts and spare parts
  - Leads to shortage of parts and products for these applications
  - Leads to stop of production, loss of business and jobs in the impacted industries
- Necessity to develop custom-made solutions for each single application, since there are no "one-size-fits-all" / "drop-in" alternative materials for PFAS materials used, especially PTFE
  - Leads to unavailability of products if the restriction comes into force before the search for PFAS alternative materials, the production and testing of prototypes, the redesign of all concerned products and the re-validation and documentation with the customers are ready.
  - Leads to extensive time and cost for redesign and re-validation
  - Leads to increasing prices for products containing alternative materials
- Supply of alternative materials not available on the necessary scale
  - Leads to increasing prices for alternative materials
- Unclear regulatory landscape of PFAS, with unclear outcome of the consultation, three different definitions for PFAS (USA, EU, OECD) and no available substance-list of concerned PFAS (OECD-list only contains 4,700 out of 12,000)
- Unclear regulatory landscape for alternative materials
  - No planning certainty, because alternative materials might also become subject to restriction in the near future

In addition, a survey at equipment suppliers was conducted but with limited feedback. Therefore, our main conclusions are based on an inhouse assessment and stakeholder feedback which was published on the ECHA website.

## **Stakeholder screening**

Method:

To gather data for all automotive applications it was necessary to screen and evaluate the stakeholder input which was made public on the ECHA website. Input from associations, direct and indirect suppliers, and customers (OEMs) were collected.

Results:

Generally, we could identify high-quality input from stakeholders for the following use cases: Electronics and semiconductors, lubricants, PTFE membrane, sealing fluoropolymers and textiles.

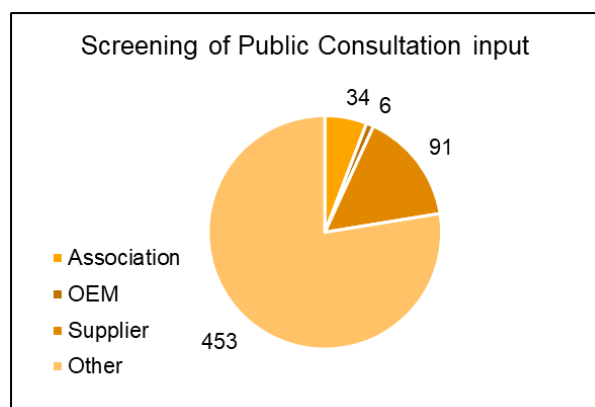


Figure 2 Screening result of valuable Public Consultation input (1 Sept. 2023)

### 3.2.2. Emissions

#### Manufacturing phase

PFAS are handled with care and in accordance with applicable regulations regarding hazardous chemicals, occupational health and safety, as well as emissions to the environment. Nonpolymeric PFAS are used only in closed loop systems (see chapter 4.1.7).

#### Use phase

There are no relevant emissions of polymeric PFAS into the environment during use if not stated otherwise in the below-mentioned use cases. We would like to refer to the statement from ACEA (7) and VDA (8).

#### Recycling phase

PFAS-containing automotive parts are collected and handled in accordance with applicable regulations e.g., Waste Framework Directive (WFD) 2008/98/EC, ELV Directive 2000/53/EC and WEEE Directive 2012/19/EU.

If the components cannot be repaired or directly reused, they are treated as waste in material or thermal recycling. A recent study by Conversio has shown that at its end-of-life approximately 85% of all fluoropolymers end up in waste-to-energy recovery incinerators. In these processes, the polymeric PFAS contained in articles are either broken down into their original components or mineralized so that the PFAS properties are lost.

Latest studies confirm that fluoropolymers at their end of life when incinerated under representative European municipal incinerators conditions do not generate any measurable levels of PFAS emissions and therefore pose no risk to human health and the environment. (9), (10), (11)

### 3.2.3. Socio-economic impact

#### Sales Volumes

A projected volume X of the Automotive group sector sales in 2023 contains PFAS in the product.

This is based on the projected number of X sold parts in 2023 which are affected by PFAS and the total number of X products expected to be sold and shipped to our customers.

The impact downstream in the value chain cannot be evaluated, but it could be seen in the *chip shortage crisis* caused during the Corona-Pandemic, that even missing a single chip in a car can stop OEM-production lines. Since the products delivered to our customer are highly complex and customized specially for the use case and purpose, it is unlikely that our customer can on shorthand substitute the components delivered by Continental Automotive.

The projected sales are a conservative estimation and were identified by PFAS in subcomponents via the IMDS (International Material Database) as described in previous section; potential PFAS in processes in use in the Continental supply chain could not be covered. Prominent examples are PFAS in the Semiconductor manufacturing processes or PFAS in vapor bases soldering. This is in detail pointed out by ACEA. (7)

### **Affected parts in the product portfolio**

In many different products - sold and produced in 2023 - PFAS content could be identified in the product.

Different products (PFAS affected and non-PFAS affected) have been produced and will be sold in 2023.

Multiple of the products are directly affected by PFAS and would need product adaptation to become PFAS-free. Since in later mentioned use cases no "drop in"-replacement is available, PFAS-free-changeover means in this case, product development, industrialization (changes in the product need likely adaptation in the production process) at Continental and suppliers, validation at our customer.

Even if it is assumed, the product change to be PFAS-free is not limited by technical and economical facts (but there are technical and economical limits see below), it is not feasible to perform these changes in time.

## 4 Application specific derogations

### 4.1. Application in the transportation sector

#### 4.1.1. Use case Seals and Hoses

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <i>Amendment</i>                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6.x seals and hoses containing only PFAS Polymers of Low Concern.                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5.x seals and hoses where the use takes place under highly demanding conditions, or the use is needed for proper and safe functioning or safety of equipment. |
| <p><b><u>Justification (VDA):</u></b> (6)</p> <p>Fluoroelastomers such as FKM, FFKM and FVMQ as well as some other classes of fluorinated plastics such as PTFE or PVDF are used in demanding seal and hose applications. The materials are either used as bulk materials, or as single layers in multi-layer constructions or as coatings. While some applications will disappear with the end of ICE technology others are not related to ICEs and will remain important components also in e-powertrain vehicles. Also new products are currently being developed in the field of electric drives.</p> <p>Examples for important seals and hoses used in current ICE technology made from or using Fluoroelastomers, PTFE or other fluorinated plastics are valve stem seals, crank shaft seals, fuel injector seals and generally the majority of seals used on the fuel circuit, intake manifold seals, oil seals and O-rings for engine and transmission, fuel pump seals, high temperature coolant seals, oil separation membranes, timing and drive belts, fuel hoses, turbo charger hoses, hose lines for DEF lines and DPF/GPF control lines. Components that are phasing out with the combustion engine cannot simply be converted. Due to the de facto phase out of combustion-engine vehicles in 2035 OEMs have no longer the testing capacity and the old development teams have already been disbanded.</p> <p>Examples for important seals and hoses not related to ICE technology are seals for thermo-management such as newly developed dielectric cooling fluids for active battery cooling, seals for compressors e.g., in air conditioning, air springs or fuel cells, oil seals and O-rings in e-engine and e-transmission, brake vacuum hoses and thrust washers.</p> <p>Besides seals and hoses Fluoropolymers such as PTFE and PDVF are used as coatings or tribological additives also in thermoplastic bearings, electronic coolant distribution modules, dosing valves for AdBlue and electric actuators in gears and bearings.</p> <p>Fluoropolymers are used in all the cases mentioned because of the following unique properties or combinations thereof: high temperature and media stability (fuels, acids, bases, high performance lubricants such as motor and gear box oils, hydraulic fluids), excellent wear resistance and low friction properties, corrosion resistance and permeation tightness. It is important to note that fluoropolymers are among the highest priced polymers and there is a significant gap to other classes of polymers. They are therefore only used today in applications for which there are no technical alternatives.</p> <p>Replacing fluoroelastomers, PTFE or PVDF in sealing and hose applications with other polymer classes always comes with a loss of performance and/or a significantly reduced lifetime of the respective component.</p> |                                                                                                                                                               |

This loss of functionality easily leads to premature component failure, causing leakage and associated safety issues, as well as emissions of the respective fluids to the environment.

Complex and expensive core systems such as the engine, transmission or the fuel system pose a high risk of serious damage if a seal or hose fails, which can result in the entire vehicle breaking down.

Other polymer classes are more permeable to liquids and gases than fluoropolymers and therefore lead to emissions of functional fluids such as fuels, coolants, or lubricants.

Seals used in dynamic applications which renounce the use of fluoroelastomers, and PTFE are subject to premature wear due to higher abrasion and cause increased fuel/energy consumption due to increased friction.

Therefore, seals and hoses need to be replaced regularly as a preventive measure, necessitating frequent and expensive service intervals. In many cases, replacing a seal or hose is entirely not feasible.

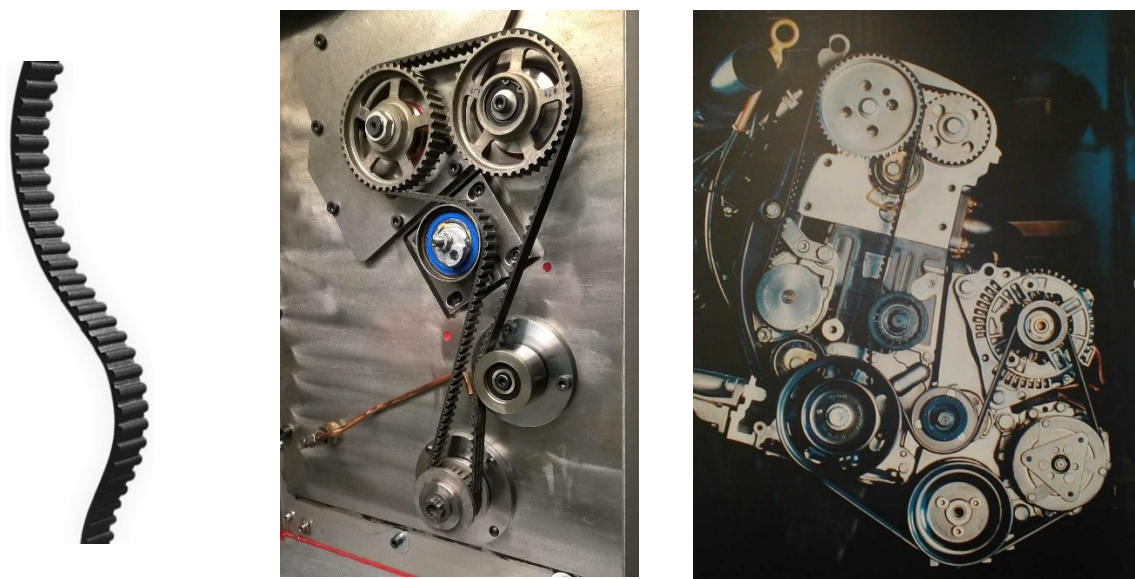
To ensure proper functioning, fundamental engineering changes on motor vehicles currently in production are based on type approval processes implemented by national transport authorities of EU member states. If possible, a single material change in such a scenario affords up to eight years in average from initial request to fully validated approval. Ensuring continuous production of proper functioning vehicles under such an extensive change regime requires a review no later than 13.5 years after EiF.

### 4.1.2. Use case Timing Belts

| <i>Text proposed in Annex XV report</i>                                                                                                                         | <i>Amendment</i>                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.s. lubricants where the use takes place under harsh conditions, or the use is needed for safe functioning and safety of equipment until 13.5 years after EIF. | 5.s. lubricants where the use takes place under harsh conditions or the use is needed for proper and safe functioning and safety of equipment. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EIF. |

#### **Justification:**

A timing belt (also known as toothed belt, cogged belt, cog belt or synchronous belt) is a flexible belt with teeth molded onto its inner surface. Toothed belts are usually designed to run over matching toothed pulleys or sprockets. The application for timing belts is driving the camshaft(s) of four-stroke engines. To ensure that the control times are precisely observed, there must be no change in the angular position of the camshaft and crankshaft.



*Figure 3: (From left to right) Timing belt; timing belt in a schematic transmission system; timing belts in a vehicle engine as transmission system.*

Generally, PTFE is utilized as a very thin layer covering the tooth of the timing belt. Conditions within the combustion engine are very harsh with high temperatures and high forces on the belt, leading to constant abrasion. To minimize the abrasion which usually leads to product failure, current technical state of the art is the use of PTFE as heat resistance lubricant.

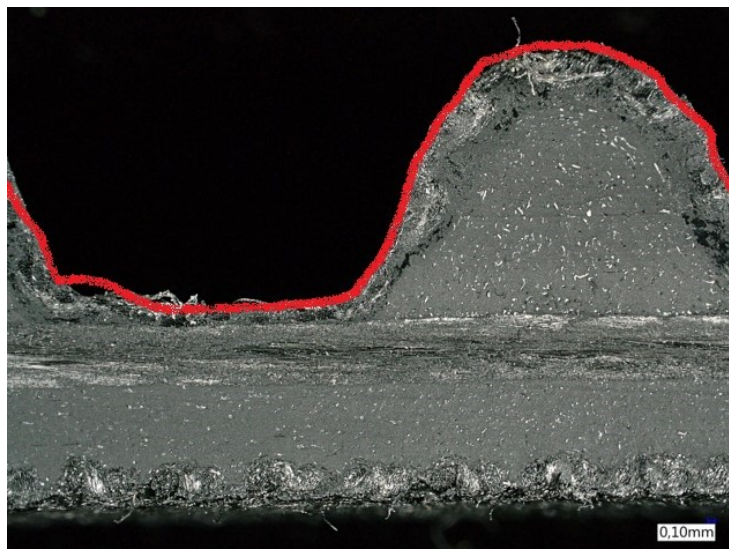


Figure 5: Timing belt microscopic picture, profile view. Red line is indicating where PTFE is located as coating layer protecting the tooth surface.

Combustion engines with timing belts as power transmission system have higher fuel efficiency compared to systems with metal chains, which are the closest alternative to timing belts. Being restricted to use engine technologies with metal chain systems would increase the fuel consumption which comes hand in hand with higher CO<sub>2</sub>-emissions. Also, as most car manufacturers stopped the development of new combustion engines, a nonfunctional timing belt leads to a limited possible utilization of present engine models, leading to less variety in available vehicles on the market and possibly a shortage for certain vehicle sizes. Timing belts are also necessary as spare parts (wearing part) to ensure a vehicle can be used over the whole planned lifetime. An unavailability of timing belts on the spare part market would lead to increased scrapping of vehicles or a scrapping before the planned end of life, causing increased environmental burden. Also, household with lower income could be excluded from individual automotive mobility as used vehicle availability would be limited.

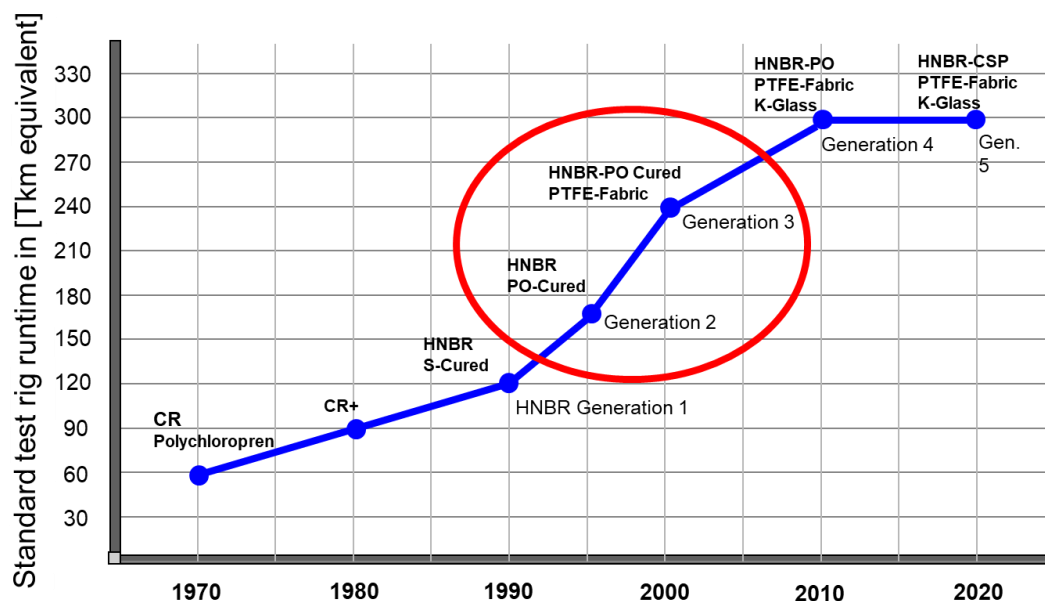
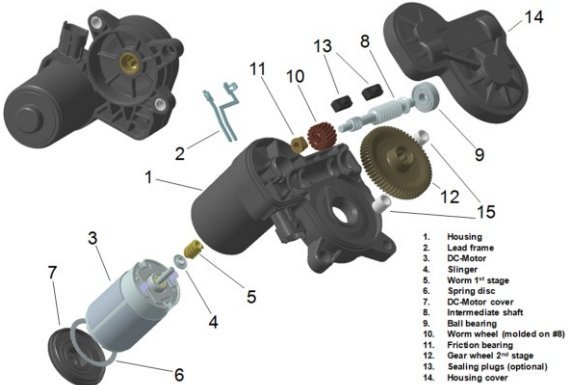
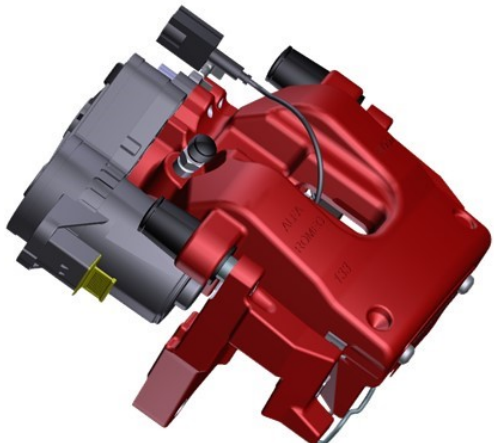


Figure 4: History of performance increase of automotive timing belts, note the increase by introduction of PTFE from Generation 2 to Generation 3

Combustion engines in the automotive industry will continue to be sold at least for more than 10 years in the European Union and possibly even longer in other regions of the world. Also, a timing belt must be replaced within the lifetime of a vehicle as otherwise one risks a destruction of the engine, creating a need for automotive timing belts as spare parts for more than 30 years. As alternatives to PTFE come at the risk of a lower product performance, customers would choose the better performing, PTFE containing transmission belts leading to losing market shares on all markets outside the EU. This would create overcapacities in manufacturing locations within the EU, followed by either relocation of production lines to non-EU countries or closing lines completely leading to the loss of workplaces.

### 4.1.3. Use case Lubricants (PFPE and PTFE)

| Text proposed by Annex XV report                                                                                                                                               | Amendment                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.s. "lubricants where the use takes place under harsh conditions or the use is needed for safe functioning and safety of equipment until 13.5 years after EIF;"               | 5.s. lubricants where the use takes place under harsh conditions or the use is needed for proper and safe functioning and safety of equipment. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Gearing for park brake actuator (all moving parts incl. bearings are lubricated) (12)</p> |  <p>Electric actuated parking brake (12)</p>                                                                                                                                                 |

#### **Justification:**

**Function:** Lubrication in harsh conditions on electromechanical actuators, this ranges from use in mechanical and electrical parking brakes, brake booster, electronic brake system (ABS / ESC), air suspension, air compressor units, stepper motors in instrument clusters, motor in head up display, ignition lock, washer pump motors.

The boundary conditions like (mostly simultaneously) in the use phase: high efficiency: for plain bearing where roller bearings cannot be applied as well as for roller bearings, high temperature, lifetime maintenance, durability / lifetime maintenance free, chemical stability, insoluble in water.

Another use important case is coating to prevent damage during assembly. This applies especially for elastomer sealings during assembly process. Various EPDM seals used in brake systems are coated with PTFE for the mounting process. Any damage during assembly would lead to leakage and low of function up to total failure of the brake system. Mineral based lubricants cannot be used in conjunction with EPDM for material compatibility reasons e.g., swelling / shrinkage of EPDM.

Polymeric PFAS found in lubricants:

- **PTFE**
- Ethene, tetrafluoro-, homopolymer (PTFE)
- **Perfluoropolyether (PFPE)**
- 1-Propene, 1,1,2,3,3,3-hexafluoro-, oxidized, polymd. (PFPE based)
- Ethene, tetrafluoro-, oxidized, polymd. (PFPE based)
- FEP
- PCTFE

- Propene, 1,1,2,3,3,3-hexafluoro-, polymer with 1,1-difluoroethene
- Hexafluoropropene, oxidized, oligomers, reduced, fluorinated

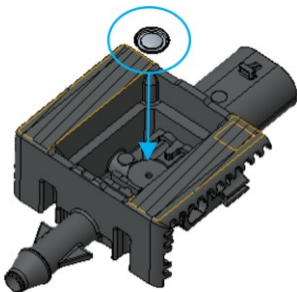
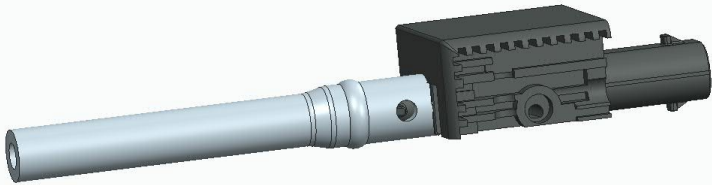
Applications: Air Suspension, Booster, Brake Caliper, Compressor assembly, Conventional ABS/ESC system, Electronic Control Unit (Seat Control Unit), Head-Up Display, Ignition Lock, Hydraulic Electronic Control Unit (HECU), Instrument Cluster, One Box Brake Systems (MK Cx), Pneumatic Seat System, Rear axle Caliper, Rear axle drum brake, Washer reservoir pump.

Alternatives: As pointed out by ACEA (7) and Klueber (13) there is currently no PFAS-free lubricant available with similar performance. All currently used lubricants are based on PFPE (Perfluoropolyethers) and/or PTFE (Polytetrafluoroethylene). Mineral oil-based lubricants cannot cover the range of PFAS-lubricants.

Derogation: The dossier submitters have already proposed a derogation. In some cases, the proposed derogation will not be sufficient and consequently a time-unlimited derogation with a review clause should be implemented instead.

Socio-economic impact: All lubricants play an important role where relative movement between components occur. This applies to actuators of all sizes in automotive application and therefore a significant part of electromechanical actuators cannot operate at similar performance, this will range from lower reliability to non-functional.

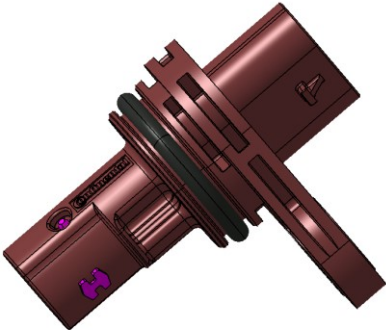
## 4.1.4. Use case PTFE membrane

| Text proposed by Annex XV report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Amendment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogation are marked for reconsideration after the Annex XV report consultation:</p> <p>6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers, or goods until 13.5 years after EiF].</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>6.x. automotive vents based on PTFE membranes as pressure compensation elements. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> <p>6.o. applications affecting the proper functioning or safety of transport vehicles, or affecting the safety of operators, passengers, or goods. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> |
|  <p>PTFE membrane as pressure compensation element, with sealing against liquids (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  <p>Pedestrian Protection System (12)</p>                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b><u>Justification:</u></b></p> <p><b><u>Function:</u></b> PTFE membranes are used as pressure compensation elements in all sealed electronic control units. The membrane enables breathing of gas but does not allow any liquids or contamination to enter.</p> <p>The primary function of PTFE membrane in sealed electronic control units is to protect the internal components from moisture, dust, and other contaminants while allowing the exchange of gases to equalize the pressure inside and outside the unit. The membrane acts as a breathable barrier that prevents water and other liquids from entering the unit while allowing air and other gases to pass through. This feature is essential in electronic control units as it helps to prevent corrosion, condensation, and other issues that can affect the performance and reliability of the unit.</p> <p>Application of PTFE membranes are in use in: ABS ECU, ADCU Unit, Booster assembly, Electronic Control Unit, Conventional ABS/ESC system, Electronic Brake System, Fuel Supply Unit, Hydraulic Control Unit (HCU), Hydraulic Electronic Control Unit (HECU), Instrument Cluster, Intelligent Antenna Module, Lidar Sensor, Motorcycle EBS, One Box Brake Systems (MK Cx), PWM Applications, Radar Sensor, Rear Axle Drum brake EPB-Si, Repair kit, PSAT (Pressure Sensor), Transmitter.</p> <p><b><u>Alternatives:</u></b> It can be assumed that reliability for all electronic functionalities will be significantly affected e.g., functions for safety, efficiency and other). As described by (7), (14), and (15) there is currently no alternative material with similar performance due to chemical and physical reasons.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

Automotive products need to be protected in a reliable and durable way. Open venting solutions (like tubes) do equalize pressure but cannot protect against liquid intrusion, which would lead to component failure. They are currently no viable alternatives for PTFE. (15)

Derogation: There is no derogation or potential derogation proposed by the dossier submitter. Due to the fact that there are no viable alternatives known at this time we proposed two options: either PTFE membranes are part of the transport vehicle safety derogation (6.o) or an independent derogation should be established (refer to VDA (8).

### 4.1.5. Use case Sealing

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                               | <i>Amendment</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogation are marked for reconsideration after the Annex XV report consultation:</p> <p>6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers or goods until 13.5 years after EiF].</p> | <p>6.x. seals and hoses containing only PFAS Polymers of Low Concern. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> <p>5.x. seals and hoses where the use takes place under highly demanding conditions, or the use is needed for proper and safe functioning or safety of equipment. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> |
|  <p>O-Ring (12)</p>                                                                                                                                                                                                                                 |  <p>Engine and transmission speed sensor (12)</p>                                                                                                                                                                                                                                                                                                                                                                              |

#### **Justification:**

Function: Sealings are used in various applications and components. In general, they separate media. Either enclosing liquids or gases in a chamber or containing intrusion of dust and contaminants from parts and components, which would be harmed by the contamination. The separation can be done in static conditions (gasket) or in dynamic environment sealing between moving parts.

Application examples are: Air Suspension, Backup Battery, Brake Booster assembly, Brake Caliper, Compressor assembly, Electronic Control Unit, Display Solution, Engine Speed Sensor, Fuel Supply Unit, Headlamp Cleaning Nozzle, Instrument Cluster, Intelligent Antenna Module, One Box Break Systems, Pneumatic Seat System, Resonator, Sensor.

Polymeric PFAS found in or on sealings:

- **PTFE**
- Ethene, tetrafluoro-, homopolymer (PTFE)
- FAA
- **FKM**
- FMQ
- FVMQ
- Perfluoropolyether (PFPE)
- 1-Butene, 4-bromo-3,3,4,4-tetrafluoro-, polymer with 1,1-difluoroeth...
- 1-Propene, 1,1,2,3,3,3-hexafluoro-, polymer with 1,1-difluoroethene ... (FKM-based)

- Benzamide, 3,3'-((2-chloro-5-methyl-1,4-phenylene)bis(imino(1-acetyl-2-oxo-2,1-ethanediyl)azo))bis(4-chloro-N-(2-(4-chlorophenoxy)-5
- Polyethylene oxide, mono(3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl) ether
- Propene, 1,1,2,3,3,3-hexafluoro-, polymer with 1,1-difluoroethene (FKM-based)
- Siloxanes and Silicones, Me 3,3,3-trifluoropropyl, hydroxy-terminated
- Siloxanes and Silicones, Me 3,3,3-trifluoropropyl, Me vinyl, hydroxy-terminated

Alternatives: Seals containing fluoropolymers and fluoroelastomers combine unique properties in regards of temperature and chemical stability. Alternatives do not meet the same level of performance as pointed out in by European Sealing Association (16), Wallstabe und Schneider (17) and ACEA (7). Using alternative materials would result in reduced sealing performance, this would cause significant lower durability and reliability, leading to higher service and maintenance cost.

Supplier A cannot give alternatives and timing.

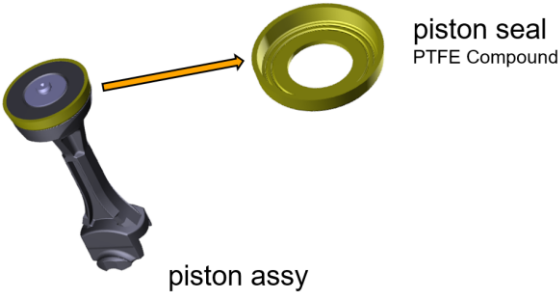
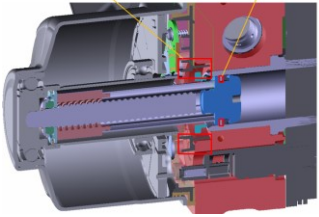
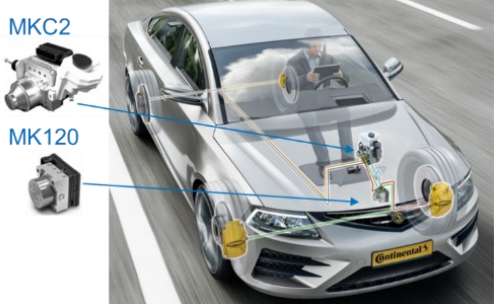
Supplier B states as follow: Supplier B has initiated the development of alternative solutions a long time ago. We offer such solutions already today successfully. It must be noted that some alternatives are solutions for specific applications conditions and may not offer the same breadth in the applications windows as the fluoro-polymers. It is therefore essential to consider the specific applications in detail.

Supplier C has no existing alternative, or alternative with degraded performances, especially durability.

Supplier D responded on known alternatives: for FKM rubber, however, currently there is no replacement for current FKM rubbers containing PFAS.

Derogation: Since PFAS-free alternatives are not available yet we propose to consider the potential derogation 6.o.

## 4.1.6. Use case PTFE components for sliding elements and plain bearings

| Text proposed by Annex XV report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Amendment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogation are marked for reconsideration after the Annex XV report consultation:</p> <p>6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers or goods until 13.5 years after EiF]</p>                                                                                                                                                                                                                                                                                                                                  | <p>6.o. applications affecting the proper functioning or safety of transport vehicles, or affecting the safety of operators, passengers, or goods. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> <p>6.x. sliding elements, including plain bearing, where the use takes place under harsh conditions, or the use is needed for proper and safe functioning and safety of equipment. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> |
|  <p>piston seal<br/>PTFE Compound</p> <p>piston assy</p> <p>PTFE seal in Air Supply Unit</p>   <p>PTFE in Electronic brake system</p>                                                                                                                                                                                                                                                                         |  <p>CAirs Air Supply Unit</p> <p>EBS = Elektronik brake systems</p>  <p>Electronic brake systems</p>                                                                                                                                                                                                                                                                                                                                     |
| <p><b>Justification:</b></p> <p><u>Function:</u> PTFE, PVDF, PFA are used in applications where relative movement occurs between two elements. Typical applications for rotational movements are plain bearings. Other are linear relative movements, here the function is a combination of guiding and sealing e.g., acting as piston in air supply units or ABS/ESP systems. Other use case are gears and spindle where the effect is a combination of sliding, rotating, and rolling.</p> <p>Electronic brake systems contribute to the following superior vehicle functions:</p> <ul style="list-style-type: none"> <li>• ABS – Anti Lock Brake System</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

- ARP – Anti Roll over Prevention
- EHP – Electro Hydraulic Parking Brake
- ESP – Electronic Stability Program
- FBS – Fading Brake Support
- HAS – Hill Start Assist
- RBA – Rain Brake Assist
- TCS – Traction Control System
- TSA – Trailer Stability Assist

Non-exhaustive list of application: Air Suspension, Booster assembly, Compressor Unit, Conventional ABS/ESC system, Hydraulic Control Unit (HCU), Hydraulic Electronic Control Unit (HECU), Instrument Cluster, Motorcycle EBS, Multimedia Systems, One Box Brake Systems (MK Cx), Radio, Rear Axle Piston Caliper EPB-Ci, Repair kit, Sensor, Steering, Wheel Unit.

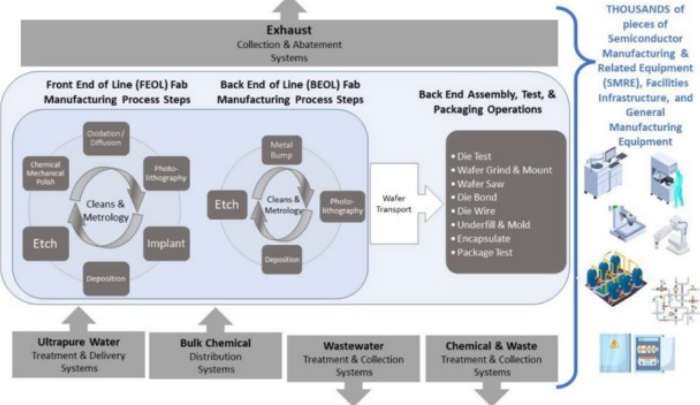
As pointed out in detail (18) fluoropolymers are used in plain bearing applications due to their unique properties that are low coefficient of friction (COF), a large range of service temperature, excellent damping properties (low stiffness) and very good chemical stability. Alternatives are not fully cover described key properties.

Own Continental data on PTFE in sealing systems (ABS/ESP-pumps) indicates that even small property changes in current PTFE material can leads to failure. More than 30 years of development history in these forementioned sealing systems could not discover alternative materials.

Alternatives: Using alternative materials would result from lower efficiency (friction performance) to early failure. This would cause significant lower durability and reliability, leading to higher service and maintenance cost.

Derogation: Since PFAS-free alternatives are not available yet we propose to consider the potential derogation 6.o.

### 4.1.7. Use case Semiconductor manufacturing process

| Text proposed by Annex XV report                                                                                                                                                                                        | Amendment                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogations are marked for reconsideration after the Annex XV report consultation:</p> <p>5.ee. [the semiconductor manufacturing process until 13.5 year after EiF]</p> | <p>5.ee. the semiconductor manufacturing process. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p>                                     |
|  <p>Semiconductor manufacturing process (19)</p>                                                                                      |  <p>Photolithography machinery (19)</p> <p>Figure 10-1 ASML Latest Extreme Ultraviolet Photolithography Exposure Tool.<sup>79</sup></p> |

#### **Justification:**

Semiconductors are essential in today's automotive industry for controlling a wide variety of functions and machineries. Semiconductors are elementary components for control units (engine control, safety such as ABS, ESP, air conditioning, etc.), sensors (ultrasonic sensor, rain sensor, radar sensor, etc.), infotainment (navigation, multimedia, radio, etc.), actuators (windscreen wipers, windows, etc.) and, indispensable for the transformation of mobility, the so-called power electronics. (8)

**Functions:** Based on (20), (21)], and (19): Polymeric and nonpolymeric PFAS are used in the frontend and backend processes of the semiconductor manufacturing, namely photolithography, plasma etching and wet chemistries. The semiconductor manufacturing is one major upstream manufacturing process of the automotive industry.

1) Photoresists and anti-reflective coatings for specific applications also contain mostly PFAS, as their chemical and physical properties (wetting agent and photoactive, combined with chemically inert behavior) are necessary.

Photoacid generators (PAGs, such as sulfonium and iodonium acid salts with fluorinated anions), which are essential components of the chemically amplified resists (CARs) used today. When exposed to ultraviolet (UV) light, they generate so-called superacids, which cause the solubility change of the photoresists.

2) Plasma etching is a material-removing process. PFAS substance is included in etching gas (often low-molecular-weight PFAS) which is generating a highly reactive, etch-active plasma. The resulting plasma reacts with the wafer surface and cleans it or creates structures.

3) Adhesives used in backend process containing PTFE fillers which are used for electrically insulation, stress reduction, moisture absorption, corrosion prevention.

4) PFAS in production equipment (valves, seals, pipe linings) to handle highly aggressive media like hydrofluoric acid, alkalis).

5) PFAS in embedded power semiconductor chips to control thousands of volts requires sophisticated PFAS-based assembly techniques to produce safe and durable products. PFAS hydrogen fluoride ethers (HFE) are used for cleaning during past soldering process. PFASs are used as adhesion promoters to fix subcomponents of power modules before the next permanent assembly steps. A non-adhesive PFAS film is required as a demolding aid to allow removal of the components from the press cavity during molding process. Electrically insulating and non-flammable properties of PFAS are also used to safely handle current up to 10kV. To date, only chemically inert PFAS can be removed without leaving residues, allowing further assembly of the test components, and an insulating environment allows testing of these voltage classes without fear of ignition. (19), (22)

Alternatives: Based on (20), (21)], and (19): There are no potential alternatives known at this time.

- Photolithography: no potential alternatives known at this time
- Wet chemistries: no potential alternatives known at this time
- Plasma Etch / Wafer Clean: no potential alternatives known at this time

Supplier A confirmed that they do not see to find alternatives within the set time frame.

Derogation: Based on a temporary derogation (13.5 years) from EoF only makes sense if alternatives are available and this is more than doubtful even after the expiry of the proposed 13.5 years. A general prohibition on the use of PFAS would currently make semiconductor manufacturing in Europe impossible, as most of them cannot be replaced by alternatives according to current knowledge even in long term.

- General derogation:
  - 3 – 4 years with non-PFAS alternative
  - 3 – 10 years with non-PFAS alternative and process change
  - 5 to more than 25 years w/o non-PFAS alternative
- Photolithography:
  - Majority: 15 to more than 20 years
  - For photoacid generators (PAGs) more than 25 years
- Wet chemistries
  - 3 to 15 years after a suitable alternative has been identified.
- Plasma Etch / Wafer Clean:
  - No viable alternatives for fluorocarbon chemistries are known.

The direct supplier A confirmed that „the derogations proposed in the current Restriction Dossier are not sufficient to cover the need of PFAS”.

Emissions: Due to process control (spin coating, development, stripping, or ashing), the main part of PFAS used in Photolithography process is destroyed or ends up in the solvent waste, which is properly disposed of. Only a very small proportion is ultimately found in wastewater.

By far the largest proportion of the PFAS gases used in plasma etching process either already react in the plasma chamber or are systematically burned off in the downstream abatement process. This means that only a small proportion of PFASs is emitted via the exhaust air.

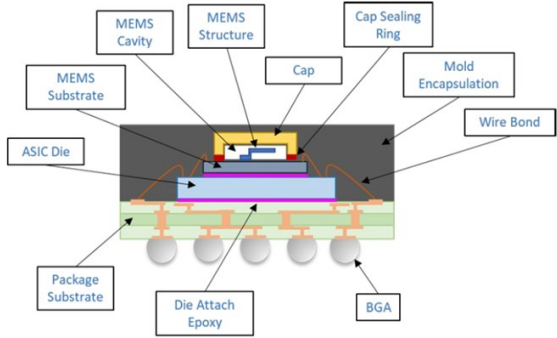
PFAS used in adhesives remains in the product and does not change throughout the service life.

Socio-economic impact:

Semiconductors are essential for Continental Automotive and the complete society. As stated by VDA (8), "Automotive electronics is one of the most important components for today's mobility and the mobility of the future."

The supplier A stated: "If no derogation will be made, supplier will not be able to produce anymore."

#### 4.1.8. Use case Semiconductor advanced packaging (ICs - MEMS sensors (pressure sensor), ASICs)

| Text proposed by Annex XV report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Amendment                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Figure 8-2 An example MEMS package.</p> <p>Structure of a MEMS sensor (21)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  <p>Airbag Control Unit (12)</p>                                                          |
| <p><b>Justification:</b></p> <p><b>Function:</b> A semiconductor package encloses one or more semiconductor devices or integrated circuits protecting the device from the environment. The package connects the semiconductor to the printed circuit board (PCB), dissipates heat and provides protection from the surrounding environment particularly from moisture, shock/vibration, dust, etc.</p> <p>Assembled packages go through multiple package types, to form three dimensional integrated circuits. Older technologies still use subsequent thermal and chemical steps to produce, therefore thermal and chemical stability in the assembled package is important.</p> <p>Examples of applications are Electronic Control Units.</p> <p>Specific use cases:</p> <p>A PFPE-containing glue is used to attach sensitive MEMS (Microelectromechanical systems) to pressure ports. Required characteristics are: unique combination of wide application temperature range, resistance to chemicals and mechanical properties (stability). (9)</p> <p>PFAS in NTC: function could not be verified.</p> <p>PFAS in Varistor: function could not be verified.</p> <p><b>Alternatives:</b> Substitution only partially possible by glass solders with lead (Pb) content. Also, the substance lead (Pb) is regulated by several regulations (RoHS, ELV, REACH) and is not available as PFAS-replacement for environmental reasons.</p> |                                                                                                                                                                             |

For the vast majority of package related uses of adhesives, in MEMS and Thermal Interface Materials System (TIMS), die overcoats, encapsulants and underfills, die passivation and substrate polymer there are no viable alternatives to the PFAS being used.

Derogation: For a few older die attach adhesive applications alternatives can be expected in the very near future (1+ year). However, for most adhesives and encapsulants it is expected to take from 10 to more than 13 years to identify and implement PFAS-free alternatives.

For some of these technologies, alternatives have been sought for 18 years without success. For these uses it is likely that the alternatives assessment will take more than 20 years to find viable PFAS-free chemistries or technologies and 6 years to implement.

### 4.1.9. Use case Printed Circuit Boards (PCBs)

| <i>Text proposed by Annex XV report</i>                                                                                                                   | <i>Amendment</i>                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                             | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Populated printed circuit board (12)</p> |  <p>Radar Sensor (12)</p>                                    |

#### **Justification:**

Function: PFAS can be used in rigid, flexible and hybrid PCBs. Polymeric PFAS e.g., PTFE and PFA, are used as a fiber-reinforced fluoropolymer layer in Printed Circuit Boards (PCBs) and fulfill the following functions: (based on Rogers (23) and IPC (24))

- Stable dielectric constant
- Heat resistance
- Chemical resistance
- Non-stick and low frictional properties
- Water and oil repellent
- Low dissipation factor i.e., reduced signal loss.

Non-exhaustive list of application: Radar Sensor

Alternatives: Disadvantages of traditional FR-4 laminate material (glass-reinforced epoxy):

- Signal loss is higher,
- No stable impedance achievable: not possible for circuits require stable impedance e.g., High Frequency (HF)),
- Dielectric constant changes too strongly with temperature for applications that involve a wide range of temperatures,
- Absorbs moisture,
- Not suitable for applications where a high dielectric constant is necessary e.g., radios, antennas, filter circuits, power amplifiers, high-speed digital PCBs.

Therefore, PTFE-based laminates are the material of choice. All other laminate materials show disadvantages in at least one crucial requirement.

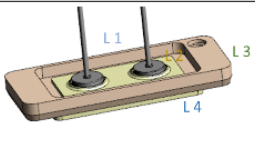
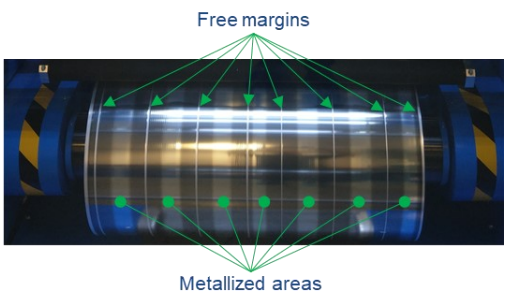
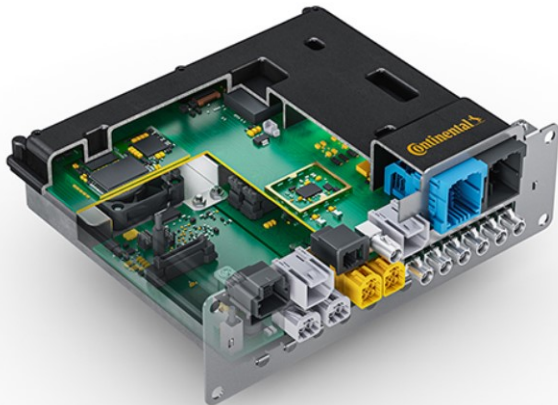
Sub-supplier A assessed PFAS-free alternatives (FR4 (epoxy), Thermoset-PBD and Thermoset-PPO) and came to the following conclusions: Fluoropolymers are the only material that delivers all the required key properties:

- High frequency range ( $\leq 77$  GHz),
- maximum operating temperature (MOT)  $> 130^{\circ}\text{C}$ ,
- Flame retardancy (FR) and
- Formable.

Supplier B has introduced a PFAS-free alternative.

Derogation: Sub-supplier A requires a minimum of 5 years to develop an alternative and additionally 5-10 years to scale to commercial levels and demonstrate reliability.

## 4.1.10. Use case Capacitors

| Text proposed by Annex XV report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Amendment                                                                                                                                                                   |                         |         |                              |         |                      |         |                              |                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------|------------------------------|---------|----------------------|---------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |                         |         |                              |         |                      |         |                              |                                                                                                                                         |
| <table border="1"> <tr> <td>Layer 1</td><td>Terminals copper tinned</td></tr> <tr> <td>Layer 2</td><td>Polytetrafluorethylen (PTFE)</td></tr> <tr> <td>Layer 3</td><td>aluminum lid (99,8%)</td></tr> <tr> <td>Layer 4</td><td>Polytetrafluorethylen (PTFE)</td></tr> </table>  <p>PFAS sealing capacitors and isolating wires (9)</p>  <p>Metallized foil with free margins (9)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Layer 1                                                                                                                                                                     | Terminals copper tinned | Layer 2 | Polytetrafluorethylen (PTFE) | Layer 3 | aluminum lid (99,8%) | Layer 4 | Polytetrafluorethylen (PTFE) |  <p>Cockpit HPC (High Performance Computer) (12)</p> |
| Layer 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Terminals copper tinned                                                                                                                                                     |                         |         |                              |         |                      |         |                              |                                                                                                                                         |
| Layer 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Polytetrafluorethylen (PTFE)                                                                                                                                                |                         |         |                              |         |                      |         |                              |                                                                                                                                         |
| Layer 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | aluminum lid (99,8%)                                                                                                                                                        |                         |         |                              |         |                      |         |                              |                                                                                                                                         |
| Layer 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Polytetrafluorethylen (PTFE)                                                                                                                                                |                         |         |                              |         |                      |         |                              |                                                                                                                                         |
| <p><b><u>Justification:</u></b></p> <p><b>Function:</b> Capacitors are used to give specific functions to electronic systems. Together with active components, they make it possible for any electronic device to function. Capacitors are usually mounted on Printed Circuit Boards (PCBs), either mounted directly on the surface (SMD technology) or fixed with leads (wires) using through-hole-technology.</p> <p>PFAS are used to seal capacitors against the environment (mainly PTFE) and, in particular, to ensure the following requirements:</p> <ul style="list-style-type: none"> <li>• Temperature stability,</li> <li>• Electrical insulation,</li> <li>• Chemical resistance against aggressive media (for example electrolytes),</li> <li>• Resistance against climatic influences (e. g. moisture, wetness, and dust),</li> <li>• significant increase in lifetime due to prevention of molecular electrolyte diffusion through the capacitor lid,</li> <li>• Connection options by soldering high-temperature stable insulated cables to the respective terminals.</li> </ul> |                                                                                                                                                                             |                         |         |                              |         |                      |         |                              |                                                                                                                                         |

PFPE is also used as process aid in the manufacturing process of film capacitors to define unmetallized area. Required characteristics: unique combination of electrical parameter and heat resistance.

Examples of applications are Electronic Control Units.

Alternatives: Information based on (12)

Supplier A stated that they are currently developing PFAS-free alternatives.

Supplier B stated (12): Alternative solutions are only partially available for some specific applications, for some no alternative is known at all.

Manufacturers of electronic components, working in conjunction with their materials and equipment suppliers, must typically proceed through multiple stages of research, technology integration, prototyping, and manufacturing ramp-up to achieve a product or process change effectively.

Many materials are unique and have specific technical requirements making it extremely challenging to find a viable alternative. For many of the uses of PFAS containing materials, no known alternatives exist.

Derogations: Capacitors are part of the sub-use electrical and electronic components and should be derogated until viable alternatives are available. (9)

Supplier B stated (12): The indicative timelines to develop, qualify, and implement alternatives fall into the following broad categories:

- If a non-PFAS alternative exists and is already commercially available,
  - and no alterations to the infrastructure are necessary and it is demonstrated that the alternative provides adequate performance for a specific application, it typically takes 1 – 2 years to perform the required manufacturing trials, validation according to reliability standards like **AEC-Q200 and/or IEC 60068** and successfully implement the alternative into high-volume manufacturing. In addition, customer- or application-specific validations of 6 months are common. For further official approvals and certifications that may be necessary e.g., with UL or VDE, a further 6 and 12 months may be required.
  - If it is necessary to make alterations to manufacturing tools, products, processes, or facilities before the alternative can be introduced successfully, it may take 3 – 10 years or more to successfully implement the alternative.
- For certain applications, it is currently not possible to show that a PFAS-free alternative has the same specific properties. In such cases, it may even be necessary to invent and synthesize new chemicals, and/or develop alternative approaches to component manufacturing providing the required performance. Given that inventing new chemicals is an open-ended process without a specified timeline or guarantee of success, it may take 5 to more than 25 years to find suitable alternatives which then can be implemented.
- It is possible that in some cases it is found that a PFAS-free alternative is not able to provide the necessary chemical function. Where it is not possible to invent a PFAS-free alternative, it may be necessary to abandon the integrated circuit device structure and replace it with an alternative device structure that has the same performance. In some cases, the use of non-PFAS alternatives is prevented by the fundamental laws of chemistry and physics.

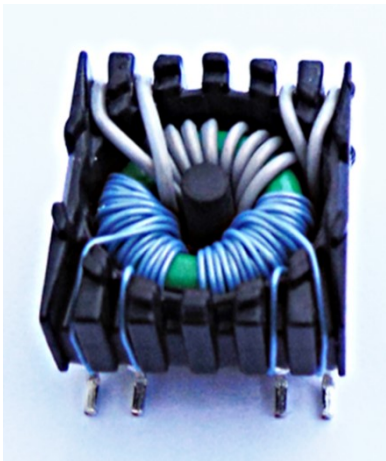
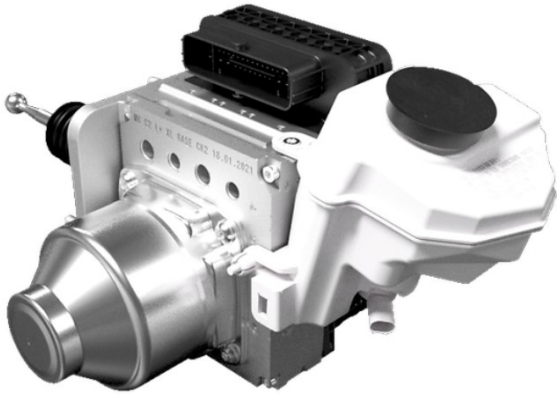
Socio-economic impact: Supplier A stated that the PFAS restriction will lead to skill shortage, higher costs, increased number of suppliers, increased energy consumption at manufacturing process and longer lead times. (12)

Supplier B stated (12): In general, we see production of many electrical and electronic equipment to become impossible in the EEA (European Economic Area) due to lack of machinery, spare parts, and auxiliary materials. We consequently fear the shutdown of a huge number of production facilities in the EEA, even if PFAS is not contained in the product. Overall, we expect the unemployment rate to increase significantly throughout the EEA.

There are already some companies that have announced their intention to withdraw from the PFAS manufacturing market. We expect the global supply chains to be interrupted due to lack of material and suppliers for the remaining exempted PFAS uses.

At the very least, PFAS-free materials, if available at all, can be expected to increase in cost and have longer lead times, and at least in the short term, the number of suppliers is limited, and production capacity is constrained.

## 4.1.11. Use case Inductors

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <i>Amendment</i>                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Transformers (inductor) using PFAS insulated wire, Source: (9)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  <p>Electronic brake system, One Box Design (12)</p>                                      |
| <p><b><u>Justification:</u></b></p> <p><u>Function:</u> Inductors are used to give specific functions to electronic systems. Together with active components, they make it possible for any electronic device to function. Inductors are usually mounted on Printed Circuit Boards (PCBs), either mounted directly on the surface (SMD technology) or fixed with leads (wires) using through-hole-technology.</p> <p>PFAS are used in cable insulations of inductors e.g., ETFE, to ensure the following requirements:</p> <ul style="list-style-type: none"> <li>• High temperature performance (up to 260°C),</li> <li>• Electrical insulation; dielectric strength,</li> <li>• Safety requirements according IEC Standards,</li> <li>• Resistance against climatic influences e.g., moisture and wetness,</li> <li>• Good mechanical properties e.g., winding tension.</li> </ul> <p>Required characteristics: unique combination of electrical parameter and heat resistance.</p> <p>Examples of applications are Electronic Control Units.</p> <p><u>Alternatives:</u> PVC or PP are already in use as wire insulation for low temperature applications, but they cannot be used if high operating temperatures (&gt;105°C) are required. Polymers like PEEK or Polyimide are suitable for high operating temperature but have different mechanical and/or electrical properties compared to fluorinated polymers.</p> <p><u>Derogations:</u> Inductors are part of the sub-use electrical and electronic components and should be derogated until viable alternatives are available. (9)</p> |                                                                                                                                                                             |

## 4.1.12. Use case Resistors

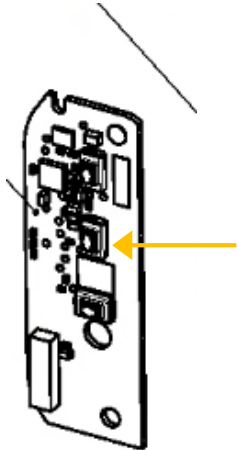
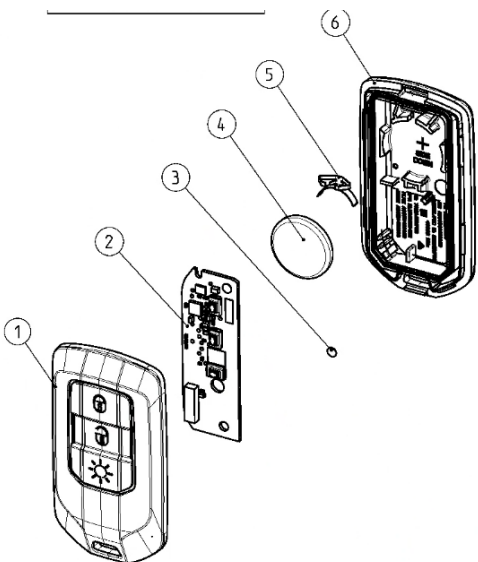
| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Amendment</i>                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Source: (25)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  <p>Electronic Control Unit<br/>e.g., Body Control Module (assembled PCB) (12)</p>        |
| <p><b><u>Justification:</u></b></p> <p><u>Function:</u> Resistors are used to give specific functions to electronic systems. Together with active components, they make it possible for any electronic device to function. Resistors are usually mounted on Printed Circuit Boards (PCBs).</p> <p>Polymeric PFAS are used in functional coating of resistors and are the only coating materials that can simultaneously provide and express multiple functions required for the proper functioning of electrical and electronic equipment in various environments, such as</p> <ul style="list-style-type: none"> <li>• low refractive index,</li> <li>• low dielectric constant and</li> <li>• low dielectric loss tangent,</li> <li>• electrical insulation,</li> <li>• oil repellency,</li> <li>• water repellency,</li> <li>• heat resistance,</li> <li>• chemical resistance,</li> <li>• weather resistance,</li> <li>• mold release and</li> <li>• optical protection i.e., for optical sensors, lenses and so on. (26)</li> </ul> <p>Examples of applications are Electronic Control Units.</p> <p><u>Alternatives:</u> No information available.</p> |                                                                                                                                                                             |

Derogations: Resistors are part of the sub-use electrical and electronic components and should be derogated until viable alternatives are available.

## 4.1.13. Use case Fuses

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <i>Amendment</i>                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Fuse (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  <p>Electronic Control Unit<br/>e.g., Power Body Control Module (12)</p>                 |
| <p><b><u>Justification:</u></b></p> <p>Function: Polyswitches, also called polyfuses or multifuses, use thermoplastic materials in the organic polymer matrix that gives the fuse its functionality. Currently, PVDF is in use as a thermoplastic PFAS.</p> <p>Changing to a different polymer changes the functionality of the fuse: heating and expansion characteristics are different, causing the device to trip at a different current and to reset differently when cooling down.</p> <p>Examples of applications are Power Body Control Units.</p> <p><u>Alternatives:</u> PFAS-free materials exist e.g., thermoplastic PE (Polyethylene), but time is needed for full changeover in the portfolio.</p> <p><u>Derogation:</u> A supplier stated that a minimum of 6.5 years transition period is necessary for full changeover (12). Additionally, there are re-developments needed at Continental to implement a change-over, which typically take up to 5 years after a product-specific alternatives have been identified. Therefore, a transition period of 13.5 years is required.</p> |                                                                                                                                                                             |

#### 4.1.14. Use case Switches

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <i>Amendment</i>                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Switches on a PCB (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  <p>Transceiver assembly (Key FOB) (12)</p>                                              |
| <p><b><u>Justification:</u></b></p> <p><u>Function:</u> Variety of switches: Hazard switches, power seat switches, power window switches, sliding door switches. PFAS are used in switch due to two main reasons: (26), (27)</p> <ol style="list-style-type: none"> <li>1.) PFAS (PTFE) in sliding parts of switches:           <p>Fluoropolymers fulfill multiple functions such as excellent self-lubrication (low coefficient of friction), electrical insulation property, chemical resistance, releasability, heat resistance and flame retardancy are used in sliding elements in mechanical section of EEE and its components to function normally in various environments. In addition, some components are required to maintain their indispensable sliding characteristics over a long period of time under severe conditions such as high temperature, high pressure, high voltage, and high friction. Fluoropolymers are the only materials that resist such severe conditions, and substituting other materials is impracticable.</p> </li> <li>2.) Functional coatings: main functions:           <ol style="list-style-type: none"> <li>1. Optical function,</li> <li>2. High speed communication and transmission function,</li> <li>3. Sliding function in mechanical section,</li> <li>4. Safety and safety functions,</li> <li>5. Functional surface.</li> </ol> </li> </ol> <p>Application examples are: key less entry / FOB systems</p> <p><b><u>Alternatives:</u></b></p> |                                                                                                                                                                             |

Referring to 1.): The Non-PFAS alternatives mentioned in the ANNEX XV RESTRICTION REPORT cannot be used as they exhibit the worst performance.

Referring to 2.): Fluorine compounds are the only coating materials that can simultaneously provide and express multiple functions required for the proper functioning of electrical and electronic equipment in various environments, such as low refractive index, low dielectric constant and low dielectric loss tangent, electrical insulation, oil repellency, water repellency, heat resistance, chemical resistance, weather resistance, mold release, and optical protection i.e., for optical sensors, lenses, and so on.

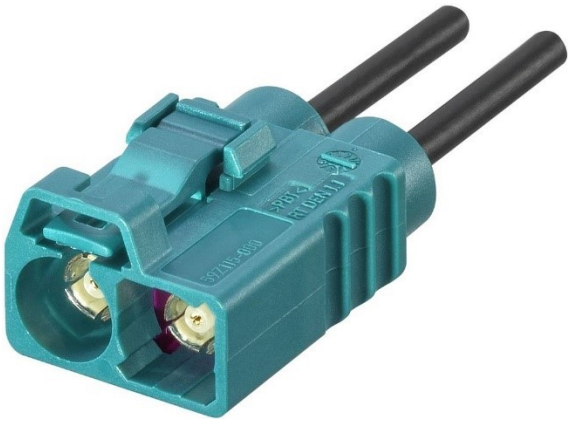
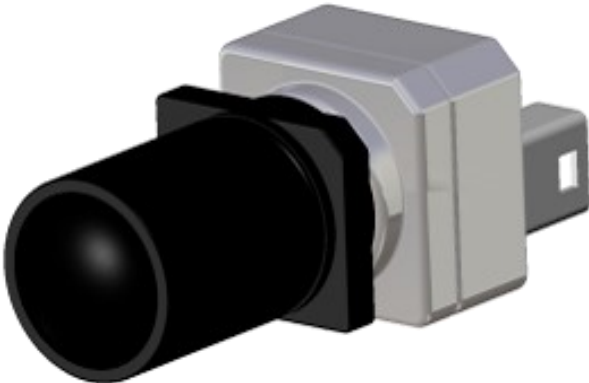
In addition, JAPIA (27) assessed potential alternatives and came to the following conclusion: There are no alternatives to PTFE sheets and PTFE-based adhesive tapes that have the flexibility suitable for switches and the necessary functions of water repellency, stain resistance, and reflow resistance. There is no evidence that new materials with these properties will be developed in the future.

 : Physical property value not achieved

| Feature              | Required characteristics                         | Material |       |         |         |           |         |
|----------------------|--------------------------------------------------|----------|-------|---------|---------|-----------|---------|
|                      |                                                  | PTFE     | PET   | PE      | PP      | PI        | PPS     |
| water repellency     | Contact angle to H <sub>2</sub> O<br>90° or more | 120-130  | 65-90 | 100-115 | 105-115 | 65-75     | 100-110 |
| antifouling property | Must be a non-porous film                        | ✓        | ✓     | ✓       | ✓       | ✓         | ✓       |
| Flexibility          | Tensile strength<br>20Mpa or more                | 20-35    |       | 19-39   | 35      | 82        | 162     |
|                      | Elongation<br>100-500%                           | 200-400  |       | 10-1200 | 700     | 2         | 1.3     |
| Reflow resistance    | Melting point<br>260°C or more                   | 327      | 256   | 120-140 | 160     | > 500(Tg) | 277     |

Derogation: Since PFAS-free alternatives are not available yet we propose to consider the potential derogation 6.o.

#### 4.1.15. Use case Connectors (male/female)

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <i>Amendment</i>                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Connector (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  <p>Satellite Camera (12)</p>                                                             |
| <p><b><u>Justification:</u></b></p> <p><u>Function:</u> Connectors are parts used for electrically connecting or disconnecting circuits etc. They can connect and disconnect by hands or with simple tools without requiring special tools or processes such as soldering. PFAS fulfills several the functions in the connector; seals elements to prevent intrusion of contamination and liquids; low friction to lower assembly forces, High Frequency (HF) damping properties.</p> <p>Non-exhaustive list of application: Satellite Camera, Electronic Control Unit, Multimedia Unit, Instrument Cluster, High Performance Computer, Antenna Modules</p> <p><u>Alternatives:</u></p> <p>Supplier A stated that they are not aware of a single replacement insulation material that does not belong to the PFAS group (Insulators with <math>\epsilon_r = 2.05</math> dielectric constant), because the characteristic impedance is depending on the value of the dielectric constant.</p> <p>Supplier B states: If there is no derogation for connectors this will have a very big impact: loss of business as there are no alternative with the right functionality known.</p> <p>Supplier C stated that he is not aware of any alternatives. A PFAS-free alternative will imply more waste and more energy consumption. In the second input same supplier stated that 3 years for a complete portfolio change from supplier side. He claims to use alternatives for PTFE in the future. But: no one-size-fits-all solution is available. Instead, every application will have to be substituted with a specific material, depending on the requirements.</p> <p><u>Derogation:</u> Therefore, a transition period of 13.5 years is required.</p> |                                                                                                                                                                             |

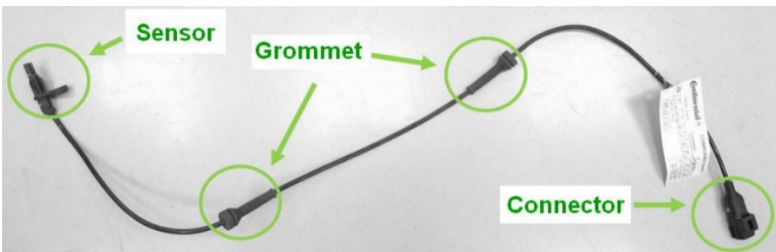
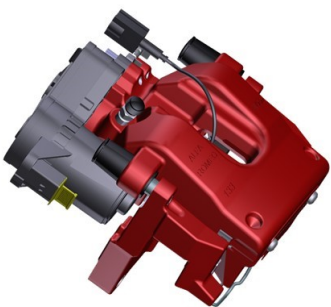
Socio-economic impact: Based on the feedback from our supplier survey we conclude that a missing derogation will lead to the following negative impact:

- loss of business,
- innovation will be hindered,
- Depending on the substitution material, it will result in larger or heavier connectors, more costly materials and materials that are more difficult to process,
- This requires R&D effort and redesign downstream of the supply chain → high costs.

Supplier A stated: We have considered a lot of difficulties. Probably significant price increase by low and medium quantities.

Larger carbon footprint: Since PEEK, SPS, PBT, and LCP have a higher dielectric constant than PTFE, the connectors, cables etc. will need to be larger in size to still achieve the desired characteristic impedance of the transmission channel. Larger connectors do mean heavier connectors, which in turn means more waste of resources, and more weight that vehicles will have to carry around. Thus, the result of the switch away from PTFE will inevitably lead to a higher carbon footprint.

## 4.1.16. Use case Wires and cables

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                          | <i>Amendment</i>                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                    | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.                                                                      |
|  <p>Cable, close to sensor (12)</p>  <p>Cable for pad wear indicator (12)</p> |  <p>Wheel speed sensor (12)</p>  <p>Electric parking brake caliper (12)</p> |

**Justification:**

**Function:** Polymeric PFAS are used in the insulation material of wires and cables e.g., PTFE, PFA, ETFE, FEP.

Fluoropolymers are high value polymers due to their unique characteristics, as they are

- virtually chemically inert,
- non-wetting,
- non-stick and
- highly heat resistant.

Cable with PFAS shielding can be found in the application of: front brake caliper, rear brake caliper, Instrument Cluster, Intelligent Antenna Module, Multimedia Systems, Multimedia Unit, Satellite Camera.

A major cable supplier A provided a detailed assessment on PFAS functions in and technical requirements:

| Application | Material | Automotive need | Why FLPOL / required properties | Potential alternatives | Market Driver | Standards |
|-------------|----------|-----------------|---------------------------------|------------------------|---------------|-----------|
|             |          |                 |                                 |                        |               |           |

|                                                              |                      |                                                                                                           |                                                                                                    |                                            |                                                                   |                                   |
|--------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------|-----------------------------------|
| <b>NOx Sensors/</b><br>Catalysator/<br>Sensor                | PTFE                 | Euro 6 NOx emission reduction – Sensor is placed direct at Exhausting/Motor System                        | Combination of temperature, mechanical stress, and media resistance                                | There are no direct substitutes for FLPOL. | Meeting Euro exhausting norms, reduce emissions, Motor management | Similar to: ISO 6722-1; ISO 19642 |
| <b>SCR heating</b><br>cables for the<br>AdBlue feed<br>lines | ETFE/FEP/<br>MFA/PFA | Euro 6 NOx emission reduction<br>Direct need for heating cables is to avoid freezing of the AdBlue system | Combination of temperature and media resistance e.g., to AdBlue                                    | There are no direct substitutes for FLPOL. | Meeting Euro exhausting norms, reduce emissions, Motor management | Similar to: ISO 6722-1; ISO 19642 |
| <b>BVA (Brake</b><br>wear indicator)                         | FEP/PFA/<br>PTFE     | Safety system – to warn the user of a vehicle that the brake pad is in need of replacement                | A high temperature resistance is required                                                          | There are no direct substitutes for FLPOL. | Safety System, proactive maintenance, early warning               | Similar to: ISO 6722-1; ISO 19642 |
| <b>Transmission,</b><br>cable in ATF                         | ETFE/ FEP            | Cable in gearbox, often immersed in hot, aggressive transmission fluid                                    | Combination of temperature and media resistance e.g., to ATF hot oil                               | There are no direct substitutes for FLPOL. | Provide function over a long time, less maintenance               | Similar to: ISO 6722-1; ISO 19642 |
| <b>Fuel Tank</b><br>Sensor/ Pump                             | ETFE                 | Cable for fuel level Sensor, and for pump to transport fuel to motor                                      | A high fuel/media resistance is required                                                           | There is only one material, Polyamide.     | Provide function over a long time, less maintenance               | Similar to: ISO 6722-1; ISO 19642 |
| <b>Windscreen</b><br>Washer heating                          | MFA/PFA              | Direct need for heating cables is to avoid freezing of the washer system                                  | Combination of temperature, mechanical stress, and media resistance e.g., to alcohol and hot water | There are no direct substitutes for FLPOL. | Provide function over a long time, less maintenance               | Similar to: ISO 6722-1; ISO 19642 |

**Alternatives:**

According to Axon Cable, it is not possible to achieve similar performances with others existing materials due to physical reasons. (28)

| <b>Potential alternative to Fluoropolymers (FEP/PFA/ETFE, PTFE)</b>           | <b>Products or product groups examined</b> | <b>Technical feasibility (performance, technical characteristics, etc.)</b>                                                    | <b>Economic feasibility (cheaper, more expensive, reason)</b> |
|-------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Polyethylene (PE)<br>Polypropylene (PP) and others Polyolefin-based materials | Wire and Cables                            | Limited temperature use (<100°C), Poor Flexibility (Elastic Modulus >1000Mpa), Not Flame retardant for dielectric applications | This is not an alternative product                            |

|                                                                              |                 |                                                                                                                                                                                 |                                    |
|------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| PVC                                                                          | Wire and Cables | Limited temperature use (<100°C), Low volume resistivity <10E+14 ohm.cm, High (poor) Dielectric constant (>4)                                                                   | This is not an alternative product |
| Glass / Ceramics / Mica                                                      | Wire and Cables | Very stiff (Elastic Modulus >5000Mpa), Low volume resistivity <10E+13 ohm.cm, Low Breakdown Voltage, Poor Ductility (Elongation at break <10%), Susceptible to Humidity / water | This is not an alternative product |
| Polysulfones (PSU, PPSU, PPS, and Polyetherketones (PEEK, PEKK, PEKEKK, PEK) | Wire and Cables | Limited temperature use (<180°C), Very stiff (Elastic Modulus >3000Mpa), Too High dielectric constant ( $\epsilon > 3$ ), Amorphous polymers susceptible to stress cracking     | This is not an alternative product |
| Polyimides                                                                   | Wire and Cables | Very stiff (Elastic Modulus >3000Mpa), High (poor) dielectric constant ( $\epsilon > 3$ ), Susceptible to Arc tracking, Susceptible to hydrolysis                               | This is not an alternative product |

Gebauer & Griller Kabelwerke (29) elaborated the following on alternatives: “Fluoropolymers (such as ETFE, FEP and PFA) are very expensive and difficult to work with (complex processing). Therefore, they are only used when no other alternatives are available. Fluoropolymers have an almost universal resistance to aggressive media, can withstand high mechanical and thermal load, show unreachable dielectric properties, have a very good flexibility and no other material can guarantee long term low emissions, as well as they are extreme durable. The fulfilment of the combination of these very challenging requirements makes Fluoropolymers indispensable. There are no materials on the market, neither known nor under development, which can fulfil the combination of high thermal resistance (~200 °C), high flexibility, high mechanical resistance, and high chemical resistance (e.g., cables for RCCB switches and Heating cables for chemical tanks).”

JEITA et al. (26) assessed the following potential PFAS-free materials:

- Silicone materials
- FEPM, PFPE,
- Polyetheretherketone (PEEK),
- Mica,
- EPDM,
- Polyvinyl chloride (PVC),
- ceramic based polymer.

And concluded the following: In cable insulation materials, mechanical, thermal, volume resistance and electrical properties are important, and the alternatives listed as alternatives have low resistance to any of these properties and cannot replace them in applications where they need to be met simultaneously, and fluorinated materials need to be used. For example, silicone has low resistance to mechanical properties (susceptible to tearing/abrasion), PEEK has low electrical properties, mica is hard and not suitable as a cable, etc.

Supplier B (12) stated on potential alternatives:

- Silicone materials - they lose their mechanical properties with aging. Outgas during operation takes place, which leads to delamination and weak points in the insulation layer. They cannot achieve the required service life. (Based on (30))
- PEEK - flexural flexibility at extreme temperatures insufficient. (Based on (31))

Nonpolymeric PFAS would lead to lower temperature resistance, lower chemical resistance, poorer flexibility.

Derogation: Therefore, a transition period of 13.5 years is required.

Socio-economic impact: The impact on a missing derogation is explained in an impact assessment by Axon.  
(28)

Supplier B (12) stated that a ban of polymeric PFAS will lead to a “Production and delivery stop” and that “tested and released component (are) no longer available”. Further, “Vehicles in operation can no longer be supplied with the necessary spare part in case of wear. The safety-relevant functionality of the brake monitoring would no longer be given for new vehicles and vehicles in operation.”

## 4.1.17. Use case Small batteries

| <i>Text proposed by Annex XV report</i>                                                                 | <i>Amendment</i>                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                           | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Coin cell (32)</p> |  <p>Remote keyless entry (12)</p>                                                         |

**Justification:**

Function: (33), (12) "Small batteries" means batteries used in Automotive, that are not batteries for electric vehicles (EVs), and not starter batteries. Examples:

- Battery in E-Call system,
- Battery in Tire pressure sensor,
- Battery in Entry System (Key-FOB).

Both rechargeable and non-rechargeable (primary) cells use PFAS for several key functionalities within the battery.

Example for Use in primary (non-rechargeable) Lithium cells: PTFE is used as the binder material for the positive electrode in Lithium primary batteries to provide three main functions:

1. Mechanical cohesion between the positive electrode particles to enable electrode integrity during cell assembly and throughout the lifecycle of the battery storage and use,
2. Lubricant to allow the electrode particles to slide over each other during electrode formation (compression) giving uniform electrode density that is important to consistent battery performance and longevity,
3. Lower water absorption during mixing (PTFE is a hydrophobic material) and more complete drying during electrode baking - low moisture content is critical in Lithium chemistry.

Alternatives: There are no information on PFAS-free alternative available at this time.

**Derogation:**

1) According to RECHARGE (33): For the below uses where there are no alternatives available today, the battery industry requires derogation periods of at least 13.5 years for each:

- Use of PVDF as the binder of the active material masses,
- Use of PTFE as the binder of the active material masses (Alternative non-PFAS have been found to fail due to performance and manufacturability issues),
- Use of PFAS in electrolytes,
- Use of PTFE & FEP in gaskets & washers in chemically aggressive environments,
- Use of PFA, VDF, HFP, FKM in gaskets in high performance batteries which require very thin high-performance gaskets,
- Use of PTFE / PVDF in solid electrolyte/ gel polymer in solid-state batteries,

2) According to RECHARGE (33): Derogation / Transition periods of 6.5 years required for:

- PTFE and PVDF in coatings on the separator,
- Use of PTFE, FEP, PFA, VDF, HFP, FKM in valves gaskets and washers where the properties defined above are not required.

Emissions: According to RECHARGE (33):

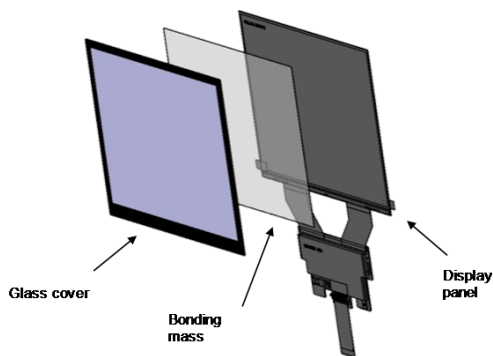
- During battery manufacturing: On empty bags and equipment used on manufacturing process.
- During battery use: under normal and reasonably foreseeable conditions of use, no end-user of this battery will be exposed to any chemical substances. No PFAS emissions are foreseen during battery use.
- During battery recycling: No unintended and uncontrolled PFAS emissions are foreseen during battery recycling.

Supplier A confirmed that a 13.5 year derogation is required due to disadvantages of the PFAS-free material.

Socio-economic impact:

Supplier A stated: It will be virtually impossible to supply batteries to the market. Impact on your sourcing and your supply chain is expected. If PFAS are prohibited without derogations “the long-term reliability of the battery will be lost”.

## 4.1.18. Use case Displays and optical elements

| <i>Text proposed by Annex XV report</i>                                                                   | <i>Amendment</i>                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                             | 6.x. electrical and electronic components. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF. |
|  <p>Glass Cover (12)</p> |  <p>Digital Instrument Cluster (12)</p>                                                   |

**Justification:**

Functions:

Automotive Interior displays are state of the art technology for driver information systems. High contrast, brightness, and readability are crucial for safety.

Applications: Instrument Cluster, Digital Cluster, Infotainment, Display Unit, Multi Display Unit, Tachograph.

1) Information based on (26) and (12)

| Functions and properties required for EEE | Characteristic of parts and materials to achieve their functions and properties of EEE | Performance requirements for materials (PFAS)                                                          | (e.g.) Specific parts or components that accomplish the functions or characteristic of EEE                                                 |
|-------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Optical function                          | No interference of light transmission (Transparency)                                   | Low refractive index, High transmissivity<br>+ Water and oil repellency, Flexibility, Flame retardancy | Optical fiber, Optical Lens, LED, Monitor/Panel, Fiberglass, Optical adhesive, Protective coating material, Anti-reflective material, etc. |

|                                                    |                                                                                                              |                                                                                                                |                                                                                                     |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Display function<br>(Liquid crystal display / LCD) | Low voltage drive and fast response<br>(Low anisotropic refractive index and low viscosity)                  | Low anisotropic refractive index, Low viscosity, Low voltage drive<br>+ Heat resistance, Durability            | Liquid crystal panel (TV, various monitor), etc.                                                    |
| Anti Finger Print                                  | No interference of light transmission (Transparency), abrasive resistance, low friction, low surface tension | Matched refractive index, High transmissivity, Low friction coefficient, Water and oil repellency, Flexibility | Coating on glass cover for display, Coating on protective plastic film (laminated on display cover) |

2) Information based on Supplier A. PFAS in LCD Panels: What are liquid crystals? Substances with a PFAS moiety have properties between liquids and solid crystals. Liquid crystal may flow like a liquid, but its molecules may be oriented in a crystal-like way.

Properties:

- Very low water solubility/vapor pressure
- No surface-activity feature
- Electronegativity of Fluorine leads to electrical dipole of molecule.
- Due to very specific properties all substitution efforts not successful

Why do Liquid Crystal Displays Need PFAS?

Need for FFS LCDs on Automotive applications: In comparison to other LC technologies FFS features a combination of:

Alternatives: One display supplier stated that they are not aware of viable PFAS-free alternative materials as these materials do not deliver the right functionality, are not available on the market or there are too high development costs.

One stakeholder is testing alternative material IC/PCBA/Photoresistance/LC for application in their panel product, but they see higher defect rate and worse display effect. Using PFAS-free alternative will result in more waste (worse display effect, higher defect rate, etc.) and longer development timeframes. (12)

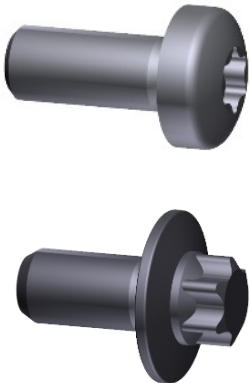
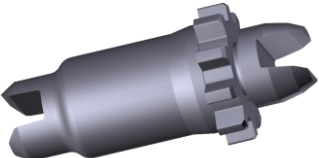
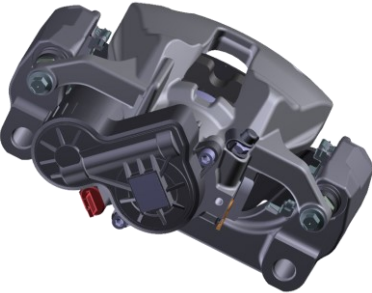
Derogation: Displays are electrical and electronic components (EEE) for which no derogation or potential derogation has been proposed by the dossier submitter. Currently no viable alternatives are identified so that we propose a derogation of at least 13.5 years.

Socio-economic impact: For the time being, PFAS-free components will greatly affect product performance e.g., the advection of photoresist will decrease, leading to a decrease in the display effect of the screen. In addition, the anti-static effect of POL will deteriorate, which will cause higher defect rate of our screen, etc.

Statement of our supplier: If no derogations were to be granted, all the jobs in the EU would be lost at our company.

If LCD displays are not exempted and no PFAS-free alternatives could be found the switch to much more expensive OLED displays would be the last option. The full socio-economic impact cannot be estimated by us.

## 4.1.19. Use case Coating of fastener (coated fastener, friction stabilizer)

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                               | <i>Amendment</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogation are marked for reconsideration after the Annex XV report consultation:</p> <p>6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers or goods until 13.5 years after EiF].</p> | <p>6.o. applications affecting the proper functioning or safety of transport vehicles, or affecting the safety of operators, passengers, or goods. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> <p>5.s. lubricants including low friction coating where the use takes place under harsh conditions, or the use is needed for proper and safe functioning and safety of equipment. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF;</p> <p><i>In this case “low friction coating” means dry lubricants as sliding coatings and is part of the above stated derogation.</i></p> |
|  <p>Fixation screws (12)</p>  <p>Adjuster assembly (12)</p>                                                                                                     |   <p>Drum brake, Disc brake EPB (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b><u>Justification:</u></b></p>                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

Function: PTFE and PVDF coatings of fastener (thread, screw, nut, washers) provide a technical surface with defined friction properties. The friction coefficient shall have a small and process reliable window, which is important to enable at given screwing torque a dedicated clamping force for the fastener without overloading the system.

This narrow friction window shall be stable for different material combinations (counter surfaces) and functional conditions. Further on under different temperature conditions, especially critical at temperatures > 150°C, or down to -40°C which frequently at many locations in the car e.g., engine compartment, chassis.

A narrow friction window as well under thermal load is as well crucial to prevent the screw joint from unscrewing due to low friction and thermal aging, damage. This would cause a failure due to lose of self-locking of the screw.

A loosening or missing screw on e.g., chassis components like disc or drum brake, or wheel fixations screws, can lead to a significant reduced function up to a total failure/damage of the brake system and vehicle. Another failure mode in Electronic Control Units are unscrewed fasteners causing short cut and therefore a mail function of this Control Unit.

The sensibility of screwing systems has been encountered during the change-over to Cr-6-free surfaces and showed that beside the technical capability of a conversion in the technical surface, use case specific testing and release processes take a significant time and effort. Another change-over of the coating on fastener will take several years, after the feasibility of a technical solution was established.

A reliable screwing system cannot be ensured by lowering the maintenance intervals and retightening screws, a screwing connection must be ensured for lifetime.

The following technical standards for fasteners apply:

- German VDI/VDE 2962 on "Minimum requirements for applications of fastening systems and tools",
- ISO 25201-7,
- VDA 235 -104.

Application examples are: Air Suspension, Booster, Brake Caliper, Compressor assambly, Control Unit, Conventional ABS/ESC system, Electronic Control Unit (Seat Control Unit), Head-Up Display, Hydraulic Electronic Control Unit (HECU), Instrument Cluster, One Box Break Systems (MK Cx), Pneumatic Seat System, Rear Axle Caliper FNc, Rear axle drumbrake Dse, Rear Axle Drumbrake EPB-Si, Rear Axle Fist Caliper EPB-Ci, Rear Axle Fist Caliper FNc.

Alternatives: Screw supplier A stated that: "We can already substitute some of them. Trials are currently underway for other products". As a potential alternative an inorganic/organic sealant with PE-was was mentioned. The main issue at the moment is that the PFAS-free coating is not persistent enough to withstand a technical cleaning process. For several applications technical cleanliness is required.

Supplier B stated that they are working on alternatives as well, but no PFAS-free material was introduced and validated in the market.

Supplier C stated: There are alternatives under investigation but not available today. All known alternative materials, e.g., additives, and their combination, show at temperatures  $\geq 150^{\circ}\text{C}$  an obvious thermal degradation and unstable and too low friction coefficient.

The supplier C stated that alternative solutions are under development for two years (but not concluded), additional development time is estimated with 2-4 years and additional certification 2.5 years, on top Continental would need validation and approval process of 2-3 years. This adds up to minimum of 6.5 years.

Supplier B stated: "We are working internally and with our suppliers to identify PFAS in our products. We are also implementing an action plan to address current and future regulatory developments".

Derogation:

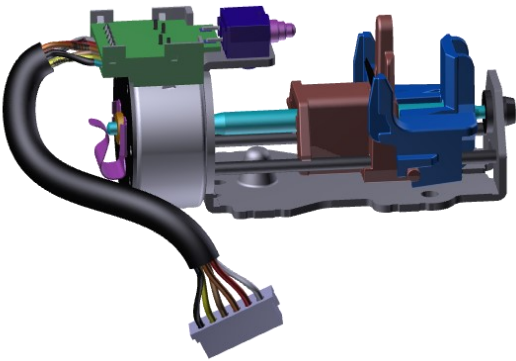
It can be concluded and equally stated by VDA (8) a replacement of PTFE coating for fastener has not been found and a timing to achieve this replacement can only be estimated. Based on four supplier statements, we conclude that at least 13.5 years for safety relevant or thermally exposed screw joints are required.

## 4.1.20. Use case Friction material in brake pads

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <i>Amendment</i>                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogation are marked for reconsideration after the Annex XV report consultation:</p> <p>6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers or goods until 13.5 years after EiF].</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>6.o. applications affecting the proper functioning or safety of transport vehicles, or affecting the safety of operators, passengers, or goods. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> |
|  <p>Friction lining material (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  <p>Fist brake caliper (12)</p>                                                                                                                                                                      |
| <p><b><u>Justification:</u></b></p> <p><u>Function:</u> PFAS have the ability to adjust and stabilize friction performance and improves especially the noise characteristics.</p> <p><u>Alternatives:</u></p> <p>Supplier A: There is a potential PTFE-free friction material available for new projects.</p> <p>Supplier B: PFAS free material exists in friction materials, but with PFAS materials perform better noise characteristic and is majority used in NAO (non-asbestos organic) friction materials.</p> <p>Supplier C: Polypropylene exists as alternative, but with worse noise performance using PFAS-free raw material in mixture. A lot of effort and time required to achieve expected requirements.</p> <p>As a conclusion currently no alternative is technical feasible to fulfill current requirements and final consumer expectation.</p> <p><u>Derogation:</u> If no derogation for spare parts is granted, the potential derogation 6.o must be applied.</p> <p><u>Socio-economic impact:</u> Running projects cannot be changed anymore. Without proper derogation our brake system cannot be delivered.</p> |                                                                                                                                                                                                                                                                                         |

Supplier A stated that without derogation this would have a high impact on their company. More people and more hours of studies are needed to change to PFAS-free materials. Further, the typical development timeframe of 12 months would highly be impacted (extended).

## 4.1.21. Use case Thermoplastic components

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Amendment</i>                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogation are marked for reconsideration after the Annex XV report consultation:</p> <p>6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers or goods until 13.5 years after EiF].</p>                                                                                                                        | <p>6.o. applications affecting the proper functioning or safety of transport vehicles, or affecting the safety of operators, passengers, or goods. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> |
|  <p>Adjusting Unit (with several sliding elements) (12)</p>  <p>EPB-CI plastic gear (12)</p>                                                                                                                                                                                            |  <p>Head-up Display (12)</p>  <p>Electric parking brake (12)</p>                                                |
| <p><b><u>Justification:</u></b></p> <p><u>Function:</u> In applications, where relative movement occurs (sliding or rotational), but a separate plain bearing cannot be integrated due to limited space, assembly requirement or economical reasoning. In these applications thermoplastic materials is modified with PFAS e.g., POM + PTFE, PPS+PTFE, PA6+PTFE, PA66+PTFE. PTFE is added to gain desired friction performance and wear characteristics.</p> |                                                                                                                                                                                                                                                                                         |

And at the same time the function is to maintain the overall characteristics of the base thermoplastic e.g., mechanical properties. Adding wet lubricants would cause e.g., contamination issues, cannot be ensured over lifetime or a correct application of the wet lubricant cannot be ensured during the assembly process. PTFE acts therefore as dry lubricant.

Non exhaustive end applications are: Active Accelerator Pedal, Booster assembly, Digital Cluster, Display, Head-Up Display, Air Suspension, Backup Battery, Compressor Assembly, Control Cluster, Conventional ABS/ESC system, CPS Chassis Position Sensor, Electronic Control Unit, Head-Up Display, Motorcycle EBS, Multimedia Systems, One Box Brake Systems (MK Cx), Radar Sensor, Rear Axle First Caliper EPB-Ci, Reservoir assembly, Sensor, Electric Power Steering.

Alternatives: Since PFAS-free alternatives are not available yet, we propose to consider the potential derogation 6.o.

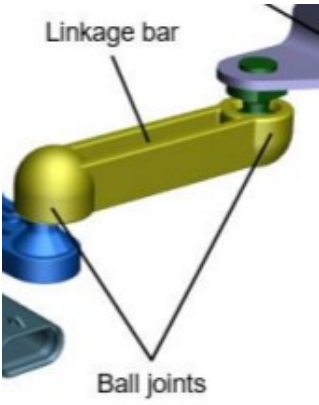
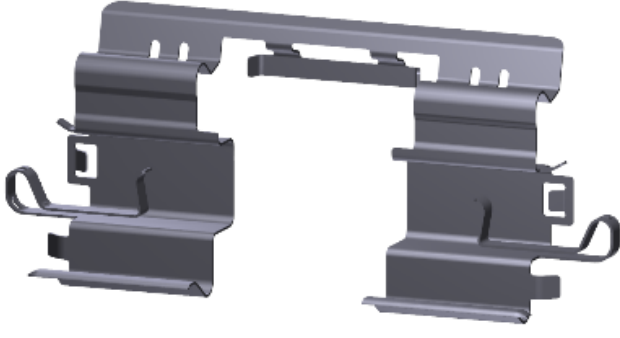
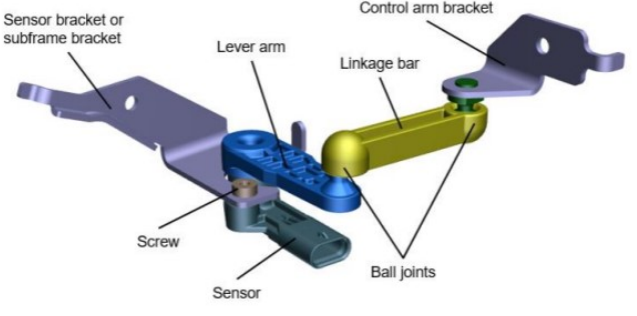
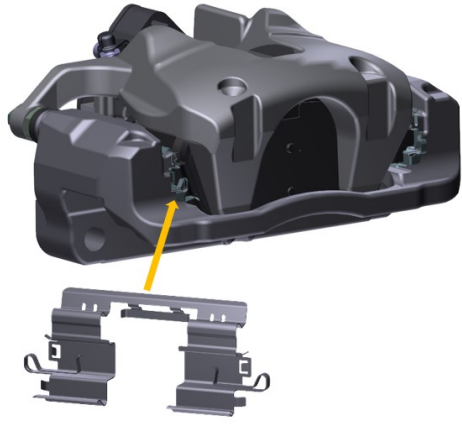
Supplier A stated that they are not aware of a PFAS-free alternative for their POM+PTFE material.

Supplier B stated that there are alternatives for PFAS emulsifier-free FKM in research. We only use the polymer; the research must be done by the polymer manufacturers inside of the chemical industry. Alternative materials are not available according to the connected material specifications.

Derogation: Currently no viable alternatives are identified so that we propose a derogation of at least 13.5 years.

Supplier B stated: "our material usage of PFAS related products is 10%.

## 4.1.22. Use case Coating on metal components

| Text proposed by Annex XV report                                                                                                                                                                                                                                                                                                      | Amendment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogation are marked for reconsideration after the Annex XV report consultation:</p> <p>6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers or goods until 13.5 years after EiF].</p> | <p>6.o. applications affecting the proper functioning or safety of transport vehicles, or affecting the safety of operators, passengers, or goods. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5years after EiF.</p> <p>5.s. lubricants including low friction coating where the use takes place under harsh conditions, or the use is needed for proper and safe functioning, and safety of equipment. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> <p><i>In this case “low friction coating” means dry lubricants as sliding coatings and is part of the above stated derogation.</i></p> |
|  <p>Linkage bar with coating (12)</p>  <p>Pad clip brake caliper (12)</p>                                                                                       |  <p>Figure 1: Sensor assy (sensor with brackets and linkage bar)</p> <p>Chassis position sensor (12)</p>  <p>Brake caliper (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**Justification:**

Function: reliably guaranteed adjustment of the coefficient of friction with narrow friction window during wide temperature range at use phase and during assembly.

Non exhaustive examples (several different sold parts have PFAS as top coating on metal), mostly Zinc flake baking with additional topcoat e.g., known as GEOMET® Plus VL, or DELTA-PROTEKT® + Delta Seal GZ treatment):

- In the case of a chassis position sensor PTFE-coating delivers low and constant friction between linkage and ball stud.
- In case of pad clip the coating ensures low friction for pad movement during air gap adjustment and finally low drag torque at off braking and higher CO2 emission.
- In case of fixation clips the coating causes low friction forces at assembly preventing damage on the assembled parts and therefore avoids contamination (scratching) in the assembled unit.
- Other examples are coating of spring elements, here the low friction coating prevents acoustic deterioration at movements.
- PTFE is added to a coating material during an industrial process.

Non exhaustive end applications are: Front and rear brake caliper, Brake pads, low friction damping shims, pad clips, brake shoes for drum brake, Air suspension, Pneumatic Seat System, Radar Sensor, ABS/ESC System.

**Alternatives:**

Supplier A stated the following: Screening and identification of alternative raw materials (waxes) has been a very high priority for our R&D department for two years now. Waxes, additives, and their combination are already showing first success in increasing the friction coefficient, surface homogeneity, workability of the finished product (settling, scrambling, clumping, scratching).

In harsh conditions wet lubricant in the specific use cases cannot be applied due to contamination issues and / or lifetime lubrication is need.

**Derogation:** Several different Continental products contain PFAS coating (12), this shows the complexity. The PFAS functions are in this case very diverse and therefore need application specific development, validation, and release, which is resource and time consuming.

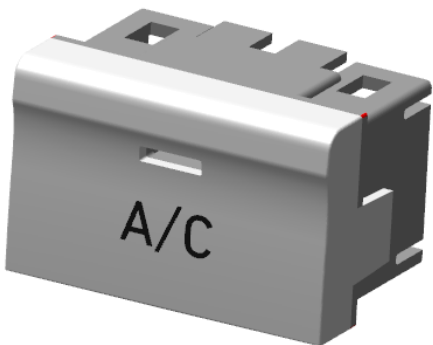
Since PFAS-free alternatives are not available yet, according to our supplier, also as stated from Nissan (34) in regards of surface coatings, we propose to consider the potential derogation 6.o. As a minimum a transition period of 6.5 year after EiF is required to change to PTFE-free coatings.

**Emission:** The PFASs are firmly embedded in the coating, so there is no release if used properly. Unfortunately, we do not have any data on loss rates due to weathering or abrasion. There is no contamination towards the environment.

**Socio-economic impact:**

Supplier A stated: In the event of a ban on PFAS, an unexpected number of raw materials will therefore no longer be manufactured and thus no longer be usable. Replacing these in an estimable time frame represents a considerable effort in terms of personnel in R&D, application technology and production. Previously unknown amounts of PFASs in raw materials are being disclosed by suppliers slowly.

## 4.1.23. Use case Coating on Thermoplastics

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <i>Amendment</i>                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No derogation</p> <p>The following potential derogation are marked for reconsideration after the Annex XV report consultation:</p> <p>6.o. [applications affecting the proper functioning related to the safety of transport vehicles, and affecting the safety of operators, passengers or goods until 13.5 years after EiF].</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>6.o. applications affecting the proper functioning or safety of transport vehicles, or affecting the safety of operators, passengers, or goods. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF.</p> |
|  <p>Marking of Button (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  <p>Climate control panel (12)</p>                                                                                                                                                                   |
| <p><b><u>Justification:</u></b></p> <p><u>Function:</u> Based on VdL (35) and VSLF (36), mainly PTFE is used in paints and coatings. They deliver important properties to coatings, such as scratch and abrasion resistance, as well as thermal and chemical resistance, which are essential for the specific end uses. They are used in anti-friction coatings for the automotive, mechanical engineering and cutting equipment industries, as well as in non-stick coatings.</p> <p>Application examples are: AFFP Active Accelerator Pedal, Digital Instrument Cluster, Display Solution, Climate Control Unit, Electronic Control Unit for passive Start and Entry System, Electronic Control Unit for Remote Keyless Entry System-Transceiver, Analog Instrument Cluster, Multimedia Systems, Start Stop Button / Switch.</p> <p>Some of the compounds are only used in very small quantities but are of great technical importance. This applies, among other things, to the areas of powder coatings, industrial coatings, automotive and corrosion protection.</p> <p><u>Alternatives:</u> In these safety-relevant applications, no adequate alternatives are currently available, nor can they be found and established within the planned transition period. (35)</p> |                                                                                                                                                                                                                                                                                         |

Derogation: Since PFAS-free alternatives are not available yet we propose to consider the potential derogation 6.o.

## 4.2. Applications in the industry sector

### 4.2.1. Use case Hoses

| <i>Text proposed in Annex XV report</i> | <i>Amendment</i>                                                                                                                                                                                                                             |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                           | <p>5.x. hoses where the use takes place under highly demanding conditions, or its use is needed for proper and safe functioning or safety of equipment;</p> <p>6.x. hoses containing only PFAS considered to be Polymers of Low Concern;</p> |

#### **Justification:**

The unique properties of fluoroelastomers and -plastics are essential for its application in hoses specifically designed for applications in the following sectors:

- petro- and chemical-industry,
- food and pharma industry (incl. drinking water applications).

The materials (FEP, PTFE, PVDF, THV, FKM) are used as an inliner made of fluoroplastics or fluoroelastomers because of their extraordinary physical and chemical behaviors.



*Figure 6: A hose with its multi-layer design. © ContiTech Deutschland GmbH*

The function of the fluoroplastic is the direct contact layer in rubber hoses. The very good barrier (low permeation), chemical resistance, high flexibility, the high melting point, the anti-adhesive effect, and the food- and drinking water approval makes these fluoropolymers the first-choice materials.

Flexible, anti-adhesive food- and drinking water hoses which could be steamed and sterilized with aggressive chemicals for cleaning are needed (also in bigger dimensions). Furthermore, low permeation is important in case of lowering fuel lost or contamination of media. The extraordinary resistance of fluoropolymers increases drastically the life span of the articles. We consider this to be more environment friendly (reduced waste) than the short-term use of alternative hoses.



*Figure 7: Multi-Layer Hose*

Flexible hoses which are resistant to high temperatures and pressures in the offshore oil and gas industry are needed to resist the corrosive, abrasive, and gas attack of the conveyed mediums in exploration and production oil facilities (acids, hydrocarbons, hydrogen sulfide, water, alcohols). In some cases, the international customers specify the use of certain fluoropolymers for these applications.

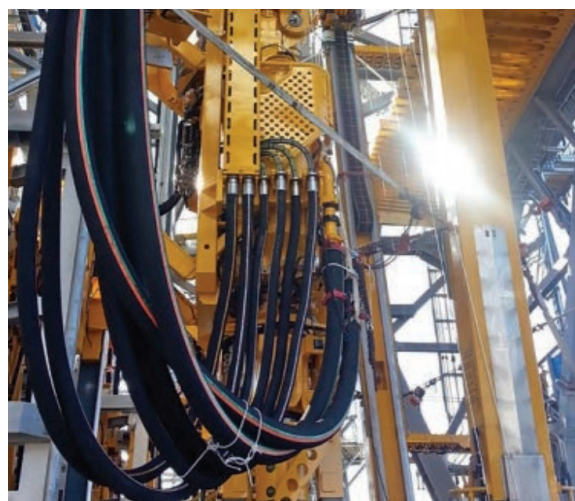
Hoses used for the above-mentioned applications must comply with several important regulations, e.g.:

- (EC) No 1935/2004, (EC) No 2023/2006, (EU) No 10/2011, KTW-BWGL, DIN EN 16421, DIN EN 16820
- DIN EN 12115, DIN EN ISO 6134.
- API Spec. 7K, API Spec. 16C, API Spec. 17J, API Spec. 17K

Trials with common alternative materials did not lead to comparable and good results. For most applications no alternative materials are available. Because alternatives are too stiff (not for flexible hoses), too high in migration (permeation/extraction), have a too low melting point, are not enough chemical resistance, show problems at extrusion, have a high smell/odor, or show adhesive characters (issue for the cleaning process).



*Figure 8: Use Case: Hose 1*



*Figure 9: Use Case: Hose 3*

The fluoropolymers are not or in some cases only hard to replace (under the condition of less performance, lifetime). Universal chemical resistance is not replaceable. In case of replacement: product and/or environmental safety would become a critical topic.

The design of a new hose would take ~ 2-5 years. Long feasibility testing is necessary from potential alternative (granulate/rubber) to final hose. Strict procedure in case of drinking water, petroleum and oil & gas hoses and customer validation (automotive market).

It is not granted that our customer will accept the proposed alternative (because of high risk when using alternative materials in chemical industry- e.g., in case of conveying concentrated acids and bases). Only the pure approval process for a new material would take time around 1-2 years.

The impact of the market without fluoropolymers would be a shutdown of certain product lines (with loss of respective sales) but to continue other operations (no plant resizing or shutdowns). Another possibility is the move of operations to non-EEA countries (if fluoropolymers would be allowed in non-EEA countries). Substitution with products not using fluoropolymers from inside the EEA and supply of products from outside the EEA.

Re-enter the market would only be possible with comparable performing products and price. If non-EEA fluorine products are available on the market (may be even cheaper in price than our alternative) re-enter would be excluded. Products with special (EEA) approvals could easier re-enter the market.

The ban would also have a direct impact on our final customer because:

- they are forced to stop production too, because they wouldn't be delivered with needed hoses (if no alternative materials are available), and
- the higher prices because they must buy more often new hoses because of lower life span of the products.

The ban would have a direct impact on the ability of global oil and gas producing companies to safely operate at full capacity, affecting their ability to extract oil from wells and delivering oil to mid-stream consumers and ultimately the consuming public for any products from oil or gas.

### 4.2.2. Use case Personal protective equipment

| <i>Text proposed in Annex XV report</i>                                                                                                                                                                                                             | <i>Amendment</i>                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.b. Textiles used in personal protective equipment (PPE) intended to protect users against risks as specified in Regulation (EU) 2016/425 Annex I, Risk Category III (a) and (c) until 13.5 years after EiF;                                       | 5.b. textiles used in personal protective equipment (PPE) intended to protect users against risks as specified in Regulation (EU) 2016/425 Annex I, Risk Category III (a) and (c);                                       |
| 5.c. Textiles used in personal protective equipment (PPE) in professional firefighting activities intended to protect users against risks as specified in Regulation (EU) 2016/425 Annex I, Risk Category III (a) - (m) until 13.5 years after EiF; | 5.c. textiles used in personal protective equipment (PPE) in professional firefighting activities intended to protect users against risks as specified in Regulation (EU) 2016/425 Annex I, Risk Category III (a) - (m); |

#### **Justification:**

Our products containing PFAS are used for in chemical protection suits. They offer protection against toxins, chemicals, and gases. Hazardous substances such as chlorine, chlorinated hydrocarbons and ammonia are unable to penetrate the barrier layer. A high resistance to acids and lyes, together with excellent tear resistance, guarantees and ensures the highest possible level of safety.



Figure 10: Chemical protection suits © ContiTech Deutschland GmbH

The use of PFAS is essential to ensure the safety for its users. These suits are used in emergencies where time is often a critical factor and a detailed knowledge on the chemicals present cannot always be guaranteed. Because of that a protection suit is needed which protects against a large variety of chemicals.

### 4.2.3. Use case Sealing/gasket

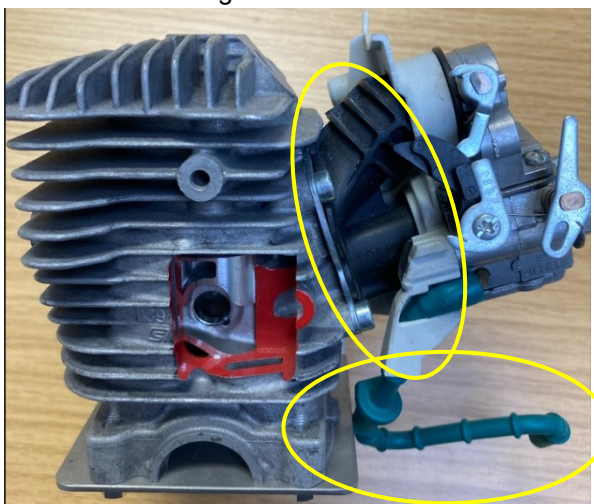
| <i>Text proposed in Annex XV report</i> | <i>Amendment</i>                                                                                                                                                                                                            |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                           | <p>5.x. seals where the use takes place under highly demanding conditions, or the use is needed for proper and safe functioning or safety of equipment;</p> <p>6.x. seals containing only PFAS Polymers of Low Concern;</p> |

#### **Justification:**

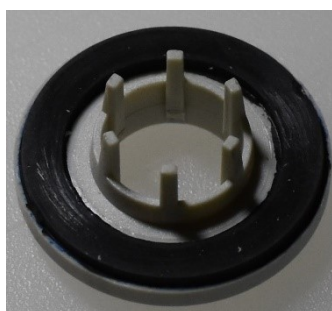
For our applications the raw material of choice is FKM. This polymer of low concern ensures the resistance against the temperatures up to 200 °C and the resistance against oil / fuel.

Sealings are used in industries where highly demanding conditions can occur. Due to the wide range of applications, we are only able to provide some use cases as an example:

#### 1) Seals within an engine

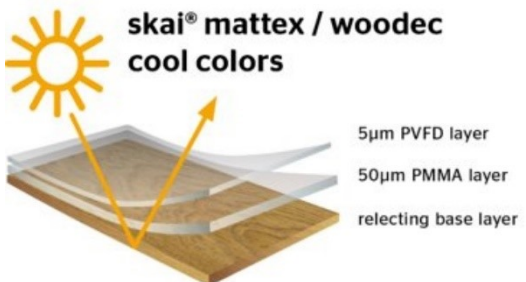
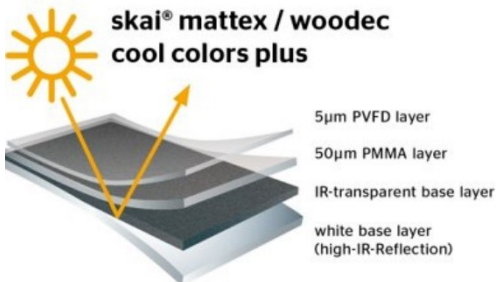


#### 2) Other applications



Replacing FKM in these applications with other polymer classes always comes with a loss of performance and/or a significantly reduced lifetime of the respective component.

#### 4.2.4. Use case Surfaces for exteriors

| Text proposed in Annex XV report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Amendment                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6.x. ss an outer layer for surface film applications; |
| <p><b>Justification:</b></p> <p>Polyvinylidene fluoride (PVDF), CAS no. 24937-79-9, is used as the outer layer for some of our surface applications. The product with the PVDF layer is 100% recyclable in the closed recycling loop.</p> <p>Due to the low water vapor permeability, hydrolytic degradation mechanisms are significantly slowed down, which contributes to a longer service life of the complete construction element. This also allows the product to be used in any climatic zones (including warm and humid).</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>Figure 11: Example for surface application 1</p> </div> <div style="text-align: center;">  <p>Figure 12: Example for surface application 2</p> </div> </div> <p>Most dirt can be removed with only simple, mechanical cleaning (wiping), no chemicals are necessary. This drastically increases the attractiveness of film coating of components (windows, doors, or gates) for our customers. Because the removal of many residues of e.g., construction chemicals on a foil surface without PVDF layer is not possible without permanent damage and consequent replacement/renewal of the components.</p> <div style="text-align: center;">  <p>Figure 13: Conti® mattex exterior surface © Konrad Hornschuch AG</p> </div> <p>Maintenance work is almost zero, which makes a lifetime of the product at e.g., the window of 30-40 years, and makes the product a sustainable product. In addition to that is the benefits for public constructions: graffiti can be removed without problems; no renovation or replacement of the product is necessary.</p> <p>Based on our knowledge an alternative material is not available.</p> |                                                       |

## 4.2.5. Use case Foils and fluorinated rubber

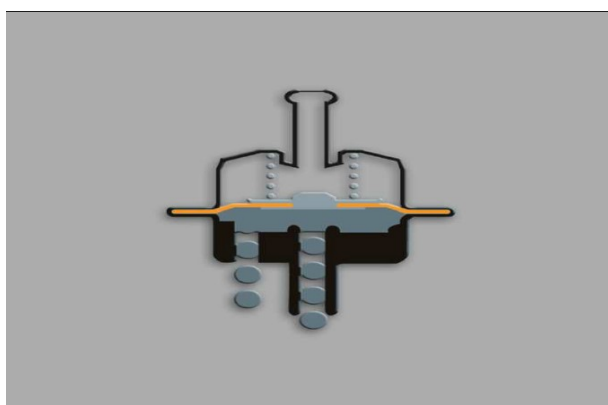
| <i>Text proposed in Annex XV report</i>                                                                                                                           |                                                        | <i>Amendment</i>                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                     |                                                        | 6.x. fluoropolymers (FP) used in from of films, rubber/rubber compound and fabric coating for diaphragms and elastomer sheeting; |
| <b><u>Justification:</u></b>                                                                                                                                      |                                                        |                                                                                                                                  |
| We use FPs in the following applications and forms:                                                                                                               |                                                        |                                                                                                                                  |
| Fluoropolymer                                                                                                                                                     | Description of the article(s)                          | sector(s) of end use                                                                                                             |
| PTFE Foil                                                                                                                                                         | Gas storage membrane                                   | Gas holder                                                                                                                       |
| FEP Foil                                                                                                                                                          | Chemical protection suite                              | Personal protection equipment                                                                                                    |
| Fluorinated Rubber                                                                                                                                                | Sheeting, Membranes                                    | Industrial                                                                                                                       |
| Product                                                                                                                                                           | Short description of the product                       | Industrial, Professional, Consumer use (or a combination thereof)?                                                               |
| FKM Sheeting                                                                                                                                                      | Sheeting                                               | Industrial                                                                                                                       |
| Laminate of textile, foil and elastomer                                                                                                                           | Chemical Protection Suites                             | Industrial                                                                                                                       |
| Membranes for fuel systems and industrial applications                                                                                                            | Membranes                                              | Industrial                                                                                                                       |
| Assembled product out of laminate (textile, foil and elastomer)                                                                                                   | Gas storage membranes                                  | Industrial                                                                                                                       |
| Products with hydrophobized textiles                                                                                                                              | Printing Blankets, bag for face mask                   | Industrial, Professional                                                                                                         |
| Laminate of textile, foil and elastomer                                                                                                                           | Membranes                                              | Industrial                                                                                                                       |
| Silicone Sheeting                                                                                                                                                 | Sheeting                                               | Industrial                                                                                                                       |
| Laminate of textile and elastomer                                                                                                                                 | Expansion Joint                                        | Industrial                                                                                                                       |
| Laminate of textile and elastomer                                                                                                                                 | Silicon Folding Bellow                                 | Industrial                                                                                                                       |
| Laminate of textile and elastomer                                                                                                                                 | Vapor Seal (Separating Plate for Cargo Area in Planes) | Aerospace                                                                                                                        |
| We don't have a substitution in case of chemical and heat resistance and permeability, as well hydrophobic properties in the mentioned applications and products. |                                                        |                                                                                                                                  |
| Existing products cannot be replaced as the chemical and heat resistance is not as high as for FP.                                                                |                                                        |                                                                                                                                  |
| <b>Diaphragms</b>                                                                                                                                                 |                                                        |                                                                                                                                  |

Diaphragms need to provide excellent sealing properties in a wide pressure and temperature range together with excellent fuel and permeability resistance.

Membranes based on fluorinated rubber (FKM) or fluorosilicone rubber (FVMQ) maintain sealing properties against different fuels over a broad temperature range which cannot be fulfilled by other rubber materials. The properties of FKM and FVMQ based membranes are unique.

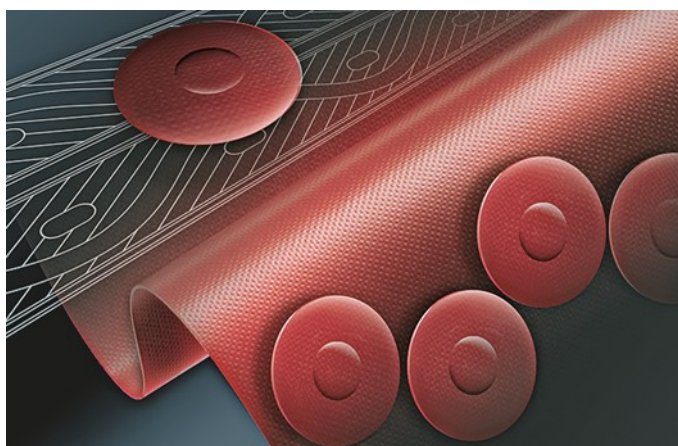
Examples for Diaphragms produced by ContiTech surface solutions elastomer coatings that require FKM or FVMQ:

Fuel pressure regulators ensure the ideal / constant pressure of the fuel that is transferred from the fuel pump to the injection nozzles. A spring-loaded diaphragm controls the flow of fuel through a valve. This also controls the pressure in the line leading to the injectors.



A Roll-Over Valve is a safety device that hinders fuel leakage in the instance of a vehicle roll over. A patented "peel away" float seal provides excellent re-opening characteristics. The float seal is tolerant to horizontal and vertical movement.

A Fill Limit Vent Valve (FLVV) prevents overfilling of the tank during a refueling event. Once the fuel tank has reached its maximum fill level the FLVV will close. Throughout the refueling event fuel vapor can escape through the FLVV to the canister.



If the use of alternative materials would be necessary for e.g., FKM, a replacement only by using different rubber materials would be possible. Only one material would not provide similar properties and not meet the same requirements as FKM based membranes. Which means there is no direct alternative existing.

Other rubber materials do not provide the same combination of temperature, permeation, fuel, and media resistance in general. In addition, other rubber materials do not maintain their properties under here required operation conditions like fluorinated rubbers.

In case a replacement would be considered the product safety would become a critical topic for us as a company and our customers. We could not guarantee the product safety anymore and the customer would be forced to shut down their production as they cannot produce safe products that withstand demanding operating conditions.

### **Elastomer Sheetting**

Elastomer sheetings are processed into high-precision static and dynamic seals as well as other products such as scrapers, lining materials, suspension components, floor coverings and cutting underlays. Depending on requirements elastomer sheetings are based on FKM or silicone rubber. Silicone rubber based sheetings contain in some cases PTFE powder to increase the processability and green strength of the according rubber compound. No other or alternative compound ingredient exists which provides the same efficiency and performance regarding anti stickiness and improved green strength.



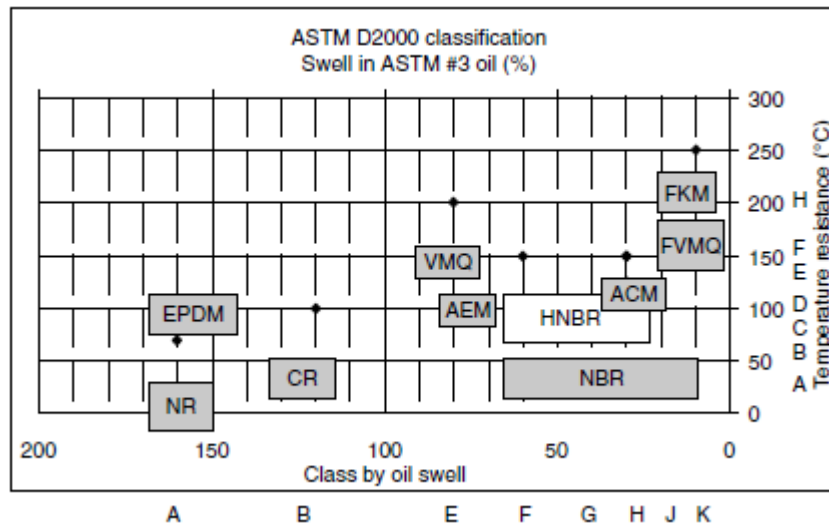
Our customers cut seals and gaskets out of the sheeting. The requirements depend on the application and in case of FKM a combination of high chemical and temperature resistance is required.

For applications where silicone based sheetings are used high temperature resistance is required as well but chemical resistance is different (very often lower) compared to FKM.

The above-mentioned examples are just a few applications where FKM is needed as a raw material group. More products with corresponding applications are existing within elastomer coatings where FKM and fluorinated silicone rubber (FVMQ) are used and required.

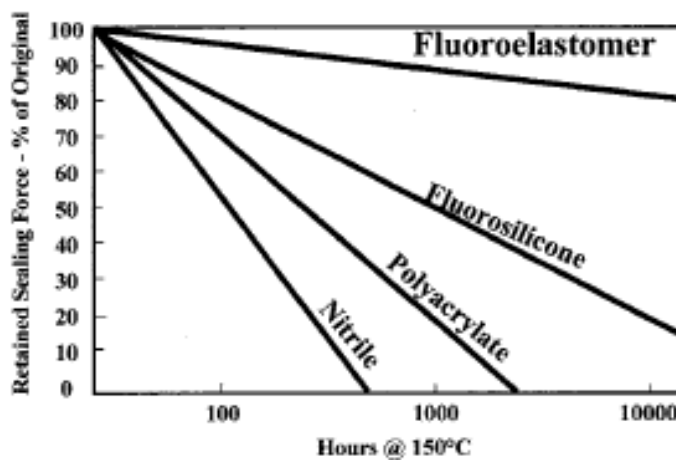
The same advantages and properties of fluorinated rubbers are needed and required for these applications as already mentioned above.

The following picture illustrates the unique combination of properties of fluorinated rubber: (37)



Our applications e.g., diaphragms and sheetings, require in most of the cases the combination of temperature and oil or chemical resistance in general. The customer requirements are in these cases only met by fluoroelastomers or fluorinated silicone rubber.

The next picture shows the retained sealing force at 150°C for different elastomers and clearly demonstrates the unique properties of fluoroelastomers: (38)

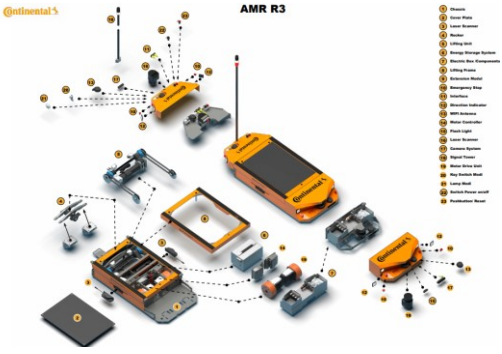
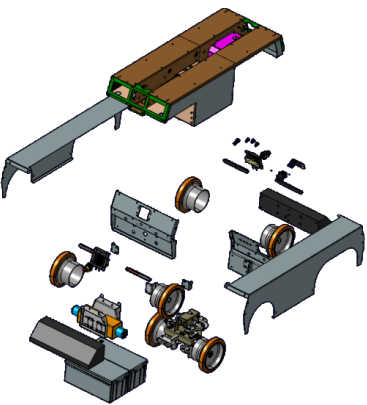
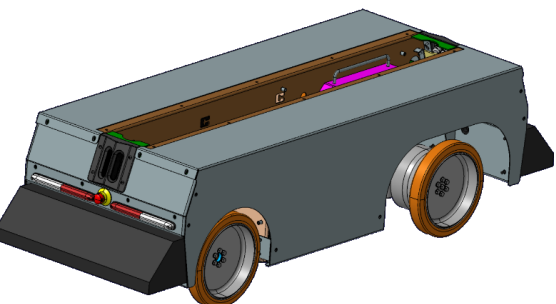


As already said, we offer amongst others elastomer sheetings based on FKM. Our customers cut different seals and gaskets out of the sheet material and need in many cases a temperature resistance of 200°C or even higher. Fluoroelastomers exhibit much longer effective performance in seal applications at elevated temperatures. This is only one example regarding critical properties for sealing applications where only FKM or FVMQ provide the required performance.

Important to note is that FKM and FVMQ are not used by our customers because of convenience. If our customer would have the choice to use alternative materials, they would directly replace them simply due to the high price of FKM and FVMQ based materials.

FKM and FVMQ based materials are required in our applications and they refer to high consequence applications. In addition, it has been ignored by EU regulation authorities that worldwide agreements and regulations are existing that already identified fluoropolymers e.g., FKM, FFKM, FVMQ, PTFE, etc. as polymers of low concern. As consequence these polymers should not be subject to the same regulation as volatile PFAS.

## 4.2.6. Use case Intra logistic cargo and agriculture robots

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Amendment</i>                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5.x. applications affecting the proper functioning of cargo handling (Ships' derricks; cranes, including cable cranes; mobile lifting frames, straddle carriers and works trucks fitted with a crane);                                                                |
|  <p>1. Intralogistics (12)</p>  <p>2. Agriculture (12)</p>                                                                                                                                                                                                                                                                                                                                                               |  <p>1. Intralogistics (IL)</p>  <p>2. Agriculture (AG)<br/>AMR Autonomous mobile robot (12)</p> |
| <p><b><u>Justification:</u></b></p> <p>Function: The AMR (Autonomous mobile robot) is a highly complex transportation device and therefore shares most applications of PFAS use cases which are applicable for the use cases in Transport Application 4.1.</p> <p>In addition, the AMR is powered by a Lithium-Ion battery and Lithium-Iron-Phosphate battery.</p> <p>The battery is using PVDF as a binder.</p> <p><b><u>Alternative:</u></b> Currently there is no known alternative for PFAS in Lithium-Ion battery and Lithium-Iron-Phosphate battery, please refer to RECHARGE (33)</p> |                                                                                                                                                                                                                                                                       |

Socio-economic impact: AMR products are currently in the phase of market introduction, a PFAS ban would in worst case lay off employees of this product segment.

### 4.3. Manufacturing and process chemicals

#### 4.3.1. Use case Non-stick coating in the tire manufacturing process

| <i>Text proposed in Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Amendment</i>                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6.x. non-stick coatings and parts in the manufacturing of tires and their semi-finished goods. This derogation shall apply perpetually but may be reviewed regularly by the Commission after EiT; |
| <p><b><u>Justification:</u></b></p> <p>Highly specialized machineries are essential to manufacture tires and to prepare different kinds of semi-finished products required in tires production such as: rubber sheets and profiles, rubberized textiles, and steel cord.</p> <p>Although no PFAS are used as raw material to produce tires, the machinery used for the different stages in the manufacturing process (preparation of dipped cords and semi-finished goods, tire building, moulding, curing, demoulding) requires strong anti-sticking and anti-friction properties due to the adhesion tendency of uncured rubber mixtures and dipped textile cords to other materials and surfaces. PFAS coatings consisting for example of PTFE (polytetrafluoroethylene), PFA (perfluoro alkoxy copolymer) and FEP (fluorinated ethylene propylene copolymer) are providing these required properties over a long period of time and in a very effective manner. These characteristics allow to reduce the amount of resources used to achieve anti-sticking and anti-friction properties, the maintenance effort during the production of tires and contribute to the overall objective of maximize resources usage in line with the objectives of Green Deal.</p> <p>One example for usage of PFAS coating in the tire manufacturing process is the tire building machine where the unvulcanized tire is created out of many semifinished rubber parts. A non-stick or anti-friction coating of no more than 250 µm is necessary to guarantee process stability and/or to avoid rubber sticking at different machine elements such as guiding, roller, different types of tooling e.g., building drum, cutting device, and application table. In addition, and as an alternative to PTFE coated metal parts, there are high performance PTFE plastic parts used in tire building and preparation area. These parts have anti-stick or anti-friction properties as well and are used for the same purpose as metal parts which are coated with PTFE.</p> |                                                                                                                                                                                                   |

Another example is the tire mold in which the tire is shaped and vulcanized. In these and comparable applications, a non-stick coating of less than 50 µm is necessary to be able to remove the vulcanized tire from the mold, which accounts for maximal 400 kg of PFAS used per year. This becomes even more difficult due to the highly shaped tread pattern of modern tire profiles necessary to reach critical performances, such as wet grip, rolling resistance and noise, the three of them being subject to grading classes for passenger car and truck tires. The PTFE layer can be used to produce several thousands of tires before the tread compound of the tire sticks to the mold and cleaning as well as coating renewal is necessary. In case of an uncoated mold only very few tires can be cured before the mold has to be disassembled for a major cleaning. Typically, the maximum number of curing cycles is around 10% of the cycles that can be achieved with a coated mold. Every cleaning requires significant amounts of energy for heating of the mold parts and creates CO<sub>2</sub> from the use of dry ice as cleaning medium. The coating of the mold is bonded to the mold surface and is not transferred to the cured tire (like known PTFE-coated bakeware). The re-coating of a tire mold takes place when the coated surface is fully covered with residuals from the uncured tires and shows no anti-stick properties anymore. The coating from the mold is removed and waste is collected for controlled disposal prior to the application of a fresh coating. A ban of PFAS for these applications would drastically increase the maintenance effort during tire production and limit the usage of high-performance rubber compounds which are inevitable to achieve the high safety requirements for modern tires.

The coatings for the several applications are applied with the methodology of chemical vapor deposition, powder coating or bonded lacquer coating in controlled conditions in an encapsulated chamber. These chambers do work under strictly controlled conditions on industrial sites only to minimize risk of environmental exposure of PFAS.

Despite research efforts (literature review, laboratory tests in cooperation with suppliers) at present, no substances other than PFAS have been identified that demonstrate the same anti-sticking and anti-friction properties.

To find alternatives for fluoropolymers used in tire manufacturing several R&D steps need to be conducted:

- Identification of substance candidates meeting the technical requirements
- Regulatory compliance & ESH assessment to guarantee safety of potential alternatives
- Machine and process development
- Industrialization and field testing
- Internal approval and certification
- Homologation by customers
- Manufacturing roll-out and launch

The overall estimated total minimum development and approval time is at least 15 years to complete the necessary transition activities. This is only an assumption and review clauses are needed during the R&D phase.

The ban of PFAS within a short time frame without alternatives neither being identified nor available would have a disruptive impact on the European tire manufacturing industry and negatively affect the productivity of the tire manufacturing process in the EU. This might lead to relocation of the tire manufacturing industry to non-EU countries.

The PFAS restriction would have a direct impact e.g., on the production of machines and machine parts for the tire manufacturing process in our locations in Germany and Czech Republic as well as our mold manufacturing facilities in Germany and Czech Republic. These business-critical technologies and applications have an expected direct or indirect impact on every tire currently being produced in all our tire manufacturing plants located in Germany, France, Romania, Slovakia, Czech Republic, and Portugal. Overall, more than 20.000 people are employed in these locations. Compared to that, the total amount of PFAS used in the manufacturing process is comparably small and handled as well as disposed by professional users on industrial sites in a controlled manner.

For this reason, we request an unlimited derogation for the use of fluoropolymers as non-stick coatings and parts in the manufacturing of tires and their semi-finished products, which may be reviewed by the commission after EiF of the legislation.

### 4.3.2. Use case Isolation of pipes

| <i>Text proposed in Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <i>Amendment</i>                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7.x. insulation jackets for hot surfaces for the protection of workers and energy savings; |
| <p><b><u>Justification:</u></b></p> <p>In ContiTechs production processes heat is necessary to cure our rubber parts. In our facilities we use mostly water steam. This is causing that our armatures, pipes, flanges, and production equipment having a high temperature.</p> <p>Hot surfaces must be insulated to protect employees from burns at contact. Further to reduce the ambient temperatures in production areas and to improve the temperature distribution in our processes. Beside the already mentioned reasons the application of insulation material reduces ContiTechs energy consumption.</p> <p>We are already using different insulation materials depending on the surface, the condition, and the available space. First and foremost, if possible, insulation with mineral wool is carried out.</p> <p>In cases of complex geometries and/or low available space or high maintenance frequency e.g., valve racks or locally at machines) individual insulation jackets are carried out. These jackets consist of three layers: inner and outer cover made of Polytetrafluoroethylene (PTFE), CAS no. 9002-84-0, impregnated E-Glass fabric and the filling of E-Glass.</p> <p>The PTFE impregnation has a weight share of less than 4% in relation to one m<sup>2</sup> of the total insulation jackets.</p> <div style="display: flex; justify-content: space-around;">   </div> <p>Figure 14: Sample pictures of insulation with grey E-Glass insulation jackets of valves within a valve rack (left) and an autoclave (right)</p> <p>Energy savings of up to 84% have been calculated and measured for a test setup, with an DN20 double-blind-flange heated up to 200°C (ambient temperature 20°C, slight air movement, insulation thickness 30mm, surface material: steel painted).</p> |                                                                                            |

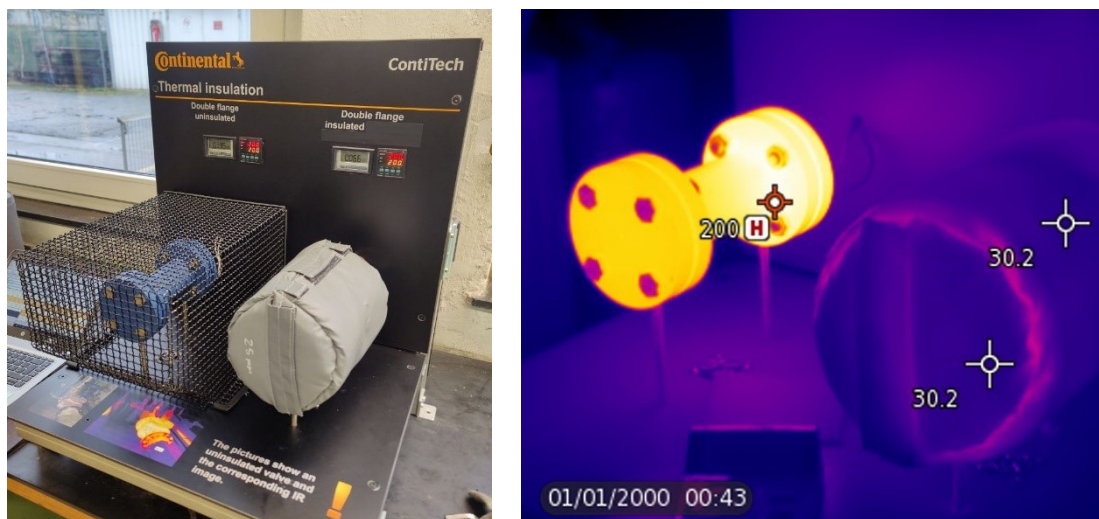


Figure 15: Test setup for measuring energy savings by insulation

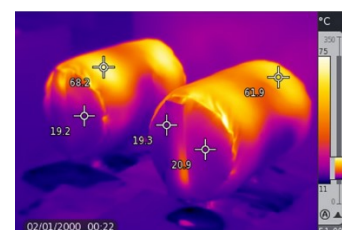
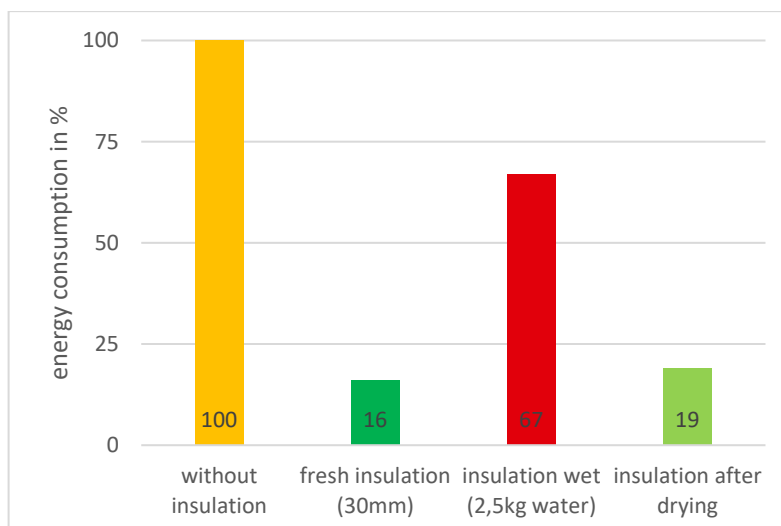
Above mentioned energy savings can be applied to a standard flanged valve of size DN25 (160 mm length) for example. For this application, calculated energy savings of about ~0,44 kWh per hour can be achieved by insulating with insulation jackets.

We assume that ~50.000 of such valves (as an average, some are smaller, larger, colder, hotter, etc.) are in use within ContiTech worldwide, there is a total energy saving of 22 MWh per hour.

The impregnation of cover material must be resistant to oil, water, and acidic media. Steam and condensate used in our facilities are acidic. Furthermore, it is required to prevent the insulation from being soaked up by leaks. Damaged or soaked insulation jackets have a reduced insulation behavior. In addition, it is a required that the main components of the insulation jackets i.e., also the cover material, must fulfill minimum fire protection class A2-s1, d0 according to DIN EN 13501-1.

Insulation jackets are alternatively offered by current suppliers with silicone or polyurethane impregnation. But they either cannot provide the required fire protection class, or they say that silicone/polyurethane will thermally degrade upon exposure to temperatures above 150°C and steam/condensate.

For example, insulation jackets with silicone impregnation have been seen in ContiTech plant Carei (Romania) where the impregnation has dissolved due to steam/condensate contact. As a result, the coating is no longer resistant and soaking up of the insulation cannot be prevented anymore.



*Figure 16: effect of insulation jackets and influence of leakages (wet insulation), results of labor investigation with "IFS plast 25" by Industriefabrik Schneider (30 mm thickness)*

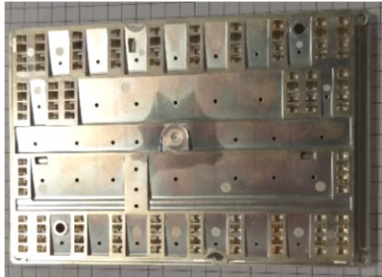
Further in some of our production areas, there is a zero-silicone policy due to the partially contained non-crosslinking volatile oils.

According to the current state of knowledge, only a PTFE coating can meet all the mentioned requirements.

As long as we have no alternative impregnation and PFAS will be prohibited, we would have no alternative to insulate special geometries with less available space or high maintenance frequency. In this case the risk of burns for employees increases. Also, the ambient temperatures in the production area will increase. Furthermore, our production process would be affected which leads to higher energy demand (compensation of losses and countermeasures due to high temperatures in production area).

All these factors have a negative impact on the environment, the working conditions and climate change.

### 4.3.3. Use case Vapor Phase Solder Process

| <i>Text proposed by Annex XV report</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <i>Amendment</i>                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No derogation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6.x. heat transfer fluids for solder process. This derogation shall apply perpetually but may be reviewed and reassessed by the Commission no later than 13.5 years after EiF; |
|  <p>Antenna for Radar (12)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  <p>Radar System (12)</p>                                                                    |
| <p><b><u>Justification:</u></b></p> <p><u>Function:</u> Describe the use case of PFAS within your application. Add a picture of application if this is required for general understanding. PFPE are used as heat transfer fluid in solder process. (9)</p> <p>Vapor phase soldering (also condensation soldering) uses the heat of condensation released during the phase change of a heat transfer medium from a gaseous to a liquid state to heat and solder electronic assemblies. Condensation occurs on the surface of the assembly until the entire assembly has reached the vapor temperature. A saturated, chemically inert vapor zone is created at a temperature identical to the boiling point of the liquid. This provides an optimal inert and oxygen-free atmosphere. The heat transfer is fast and independent of the geometry of the assembly. There are no cold zones in the shadow of large components.</p> <p>Typical application cases: prototyping, small batch production; Supply chain: antenna modules; no complete overview up to now.</p> <p><u>Alternatives:</u></p> <p>Due to the clearly defined soldering temperature and the uniform heating, overheating and the resulting damage to the components is physically impossible. As almost no oxidation takes place during the completely soldering process soldering with low activated fluxes is possible. (9)</p> <p>No alternative material is known to replace the currently used PFPE liquids.</p> |                                                                                                                                                                                |

Vapor phase soldering is increasingly replacing conventional soldering processes, as the soldering technology requirements of the new product generations can no longer be met with conventional processes. Use cases for the automotive like power electronics for electromobility and charging infrastructure are just a few examples. Without a derogation highly engineered electronics products such as electric vehicles, power converters and battery technology can no longer be manufactured. This technology is one of the essential success factors for achieving and successfully implementing the goals of the EU Green Deal as well as the initiatives for environmentally friendly mobility and digitalization.

Emissions: Release in Environment / residues on products:

Process control and technical equipment of the vapor phase soldering systems ensure that the process liquid largely remains in the system. Filters are collected and sent for waste treatment. PFPE bound on assemblies get either cleaned after soldering and detergents are sent for proper waste treatment. Assemblies without cleaning get sent for proper disposal at end of lifetime (WEEE). (9)

Socio-economic impact: Expected loss in sales; loss of workplaces.

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