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Brussels, 21 September 2023

PFAS REACH Annex XV Restriction Report

1ST Public Consultation (22 March – 25 September 2023)

Request for exclusion or derogation of certain fluorinated materials used in commercial building controllers and security devices/applications from the PFAS REACH restriction Proposal.

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1 Executive summary

Honeywell International Inc. and its affiliated companies (hereinafter - **Honeywell**)[1] are global providers of various electronic and electrical equipment (**EEE**), including devices/instruments enhancing control and security in commercial buildings (**Commercial Building Controllers and Security Devices** or **Control and Security Devices**), including flame, heat, humidity, aspiration, gas/smoke, carbon oxide (CO) and other detectors, fire alarm and air quality control/filtration systems, intrusion detection, motion and security control cameras and panels, thermostats, cables and wiring devices, automated heating/air conditioning, power distribution and lighting management, circuit protection devices, and many other. This equipment is used in numerous types of buildings including but not limited to airports, hospitals, retail premises, semiconductors and photovoltaics manufacturing facilities, water treatment and chemical plants, in energy generation and many other industries.

Devices in question contain components (for example, cables and wire, O-rings, seals, fire insulation, automated switches, films, cables and wires, monitors, heat detectors, gas/smoke and motion sensors, etc.) made of PFAS-related fluoropolymers, (per-)fluoroelastomers and perfluoropolyethers (PTFE, FEP, PFA, ETFE, PVDF, PCTFE, ECTFE, PVDF-HFP - i.e., **Fluorinated Materials**)[2]. Unique chemical, electrical, and physical properties of these materials enable critical technical characteristics (selectivity, measurement precision, response time, etc.) and reliability - particularly in emergency situations - as well as long service lives for Control and Security Devices in buildings.

[1] See the list of acronyms and abbreviations (aligned with the Proposal) in **Annex I** below.

[2] The lists of PFAS substances contained in components and materials of Control and Security Devices are provided in **Annex II** below.

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On 13 January 2023, the competent authorities of five EU/EEA states (**Dossier Submitters**) submitted to the European Chemical Agency (**ECHA**) the *PFAS REACH Annex XV Restriction Report* (**Proposal).**[3] The Proposal covers all PFAS and their uses, including in all gas detector applications.

Honeywell submits that uses of the above Fluorinated Materials in Commercial Building Controllers and Security Devices should be excluded or made subject to a derogation valid at least until 13.5 years after the entry into force (EiF) of the potential PFAS REACH restriction, due to following reasons.

Although the aforementioned Fluorinated Materials can be classified as PFAS based on their molecular structure, their mobility and long-range transport potential (LRTP), bioaccumulation, toxicological, and eco-toxicological profiles are essentially different from the majority of PFAS substances. Moreover, polymers such as PTFE, PCTFE, and all other Fluorinated Materials at stake satisfy the OECD criteria for a Polymer of Low Concern (PLC)[4], and are deemed to be environmentally and humanly benign. These substances are non-toxic, non-bioavailable, non-water soluble, and non-mobile, indicating that they do not pose any substantial risks to the environment or human health. They do not exhibit any of the intrinsic hazards assessed in section 1.1.4 of the Proposal and are not substances with similar PBT/vPvB concerns. Their grouping with "*all other PFAS*" for risk assessment purposes is not scientifically and legally justified.[5]

Respective risks from Fluorinated Materials in Control and Security Devices across their entire lifecycles are already adequately controlled by virtue of extensive industry manufacturing standards, responsible manufacturing commitments from industry, negligible leakage during the use phase (as well as during landfill), and detailed disposal requirements *inter alia* under EU *WEEE Directive*, *Waste Framework Directive* (WFD) and respective national laws and practices.[6] Incineration of these materials under standard European municipal waste incineration conditions, particularly at temperatures above 850°C, has been assessed under the various EU and national waste legislative frameworks above. Additional Risk Management Measures (RMMs) for these devices are practiced today.[7]

Due to unique physicochemical properties, these materials provide exceptional characteristics for Control and Security Devices often designed to work in emergency conditions such as extreme temperature, humidity and weather variations (e.g., in case of a fire or natural disaster), exposure to contaminants as well as aggressive flammable and/or toxic gases (e.g., in case of industrial incidents or terrorist/security threats). There are no known alternative materials that allow for this unique combination of necessary characteristics.

In particular, heat and chemical resistance, inertness, and compatibility of Fluorinated Materials are extremely important for gas/flame/smoke detection and prevention of fires, explosions and air contamination in closed buildings spaces. Unique physical (strength, durability, elasticity, repellent, etc.) and dielectric characteristics of these materials are indispensable for cables, wire, cameras, control panels, motion and other sensors, electric switches, semiconductors, capacitors and other electronic components

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3 On 22 March 2023, ECHA published the *PFAS REACH Annex XV Restriction Report* in the Registry of restriction intentions until outcome and started the 1st *Annex XV report consultation* with a final deadline for comments on 25 September 2023.

4 See detailed analysis in *A critical review of the application of polymer of low concern regulatory criteria to fluoropolymers II: Fluoroplastics and fluoroelastomers*, Stephen H. Korzeniowski *at al.*, Integrated Environmental Assessment and Management — Volume 19, Number 2—pp. 326–354, 2022.

5 *Ibid.*, page 348-349.

6 *Ibid.*, page 350.

7 See in section 4.2 below.

of Control and Security Devices. Needless to say that in emergency situations the characteristics of *inter alia* PTFE or PVDF (filters, insulation, coatings, etc.) are of crucial life and safety importance. Without fluoropolymers, gas/smoke, heat and flame detection performance, sensitivity, accuracy, response time, and recovery time of all kinds of sensors and safety/security/fire/management systems in many buildings will be significantly compromised, thereby putting in danger the safety and health of personnel as well as property/installations themselves and the surrounding environments.

In the meantime, due to the high cost and complexity of production and assembly technologies, these materials are employed only in situations where there are no viable alternatives. Currently, there are no other materials that are known or actively in development within industry that possess the necessary combination of properties, such as high thermal resistance (~200°C and higher), high humidity resistance, high flexibility, high mechanical resistance, high inertness and chemical resistance, as specifically required for applications in various Control and Security Devices.[8] Development and commercialisation of alternatives will require a much longer time than envisaged in the Proposal (if it may ever be possible), and substantial resources required to find alternatives could be prohibitive for many manufacturers.

Control and Security Devices as well as components and materials thereof are subject to stringent and comprehensive technical regulations under IEC/CENELEC (EN) standards, ATEX[9] requirements), and other international standards. Even in the long-term perspective, alternative materials will not be able to comply with all stringent technical specifications required for emergency alarms and control/management of large industrial and office sites, important security and defence facilities, nuclear and other energy plants, etc.

As a result, if Fluorinated Materials were banned in buildings Control and Security Devices across all applications, industrial production, safety and security in virtually all critical sectors (semiconductors, energy, petrochemical, steel, hospitals, etc.) would be compromised due to the lack of adequate safety and security related protection systems.

Therefore, the ban on use of Fluorinated Materials in question in Commercial Buildings Controllers and Security Devices in question is disproportionate to alleged risks for health and the environment due to PFAS persistency characteristics. Respective REACH restrictions envisaged in the Proposal would endanger lives of people and industrial safety, inevitably resulting in very high costs on the society. Although these costs are impossible to quantify, they clearly greatly overweight the questionable benefits of the Risks Management Options (RMO) envisaged in the Proposal.

In addition, negative effects of the proposed ban on the availability of efficient and reliable security and energy management (electricity, heat, ventilation, and air conditioning (HVAC)) systems in commercial premises is also difficult to overestimate. These consequences are in direct contradiction with the wider EU industrialisation and competition policies as well as objectives of the European Green Deal, REPowerEU, Net Zero Industry Act.[10]

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[8] See e.g., in section 2.4.10 of *Risk management options analysis (RMOA),* Fluoropolymer Products Group of Plastics Europe (FPG), 2021, or at page 347 of the study in footnote 4 above.

[9] *Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast).*

[10] See e.g., at pages 58, 82 and 85 of *Risk management options analysis (RMOA),* Fluoropolymer Products Group of Plastics Europe (FPG), 2021.

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2 Important features of Fluorinated Materials for Control and Security Devices in buildings

Requirements for fire/smoke/flame detectors and alarm systems as well as security and management control systems for Control and Security Devices are similar to the Petroleum and Mining use sectors (see section 1.3.2.15 and section E.2.15 of Annex E of the Proposal). Materials used in these applications require high performance and high reliability to provide accurate measurements that avoid false alarms in emergency and critical situations. The technical properties important for these devices are high and low temperature resistance (-50°C/+75°C, over +110°C in certain applications), chemical inertness and resistance, as well as high mechanical strength in harsh conditions (including fire, extreme weather, corrosion, explosions, etc.). The example of the Petroleum and Mining sector analysed in the Proposal clearly demonstrates that broad derogations of fluoropolymers for similar uses are necessary.

For example, building systems are complex, and the ability of materials in question to withstand challenging/harsh operating conditions and present negligible electrical resistance make them vital to the reliability of wires as well as optical and data transmission cables in various cameras, sensors, alarms, switches, thermostat, and actuator systems.

Only Fluorinated Materials, such as PTFE, FEP, PVDF, ECTFE, PVDF-HFP and others, provide the required complex combination of physico-chemical characteristics for materials used in buildings Control and Security Devices sector, including improved strength and fire risk of structural materials (detectors, sensors, cameras, etc.), high and low temperature/humidity resistance (cameras, sensors, etc.), low dielectric constant and high arc tracking resistance that are crucial for the safety and integrity of high speed–low signal loss systems (wire insulation, control panels, monitor etc.) and shielding from electronic interference, chemical resistance to various electrolyte liquids (e.g., in batteries, compositors, etc.). These characteristics are crucial (particularly, in emergency situations) for reliable performance of all respective systems outlined below during long service hours with minimal maintenance down times.

- Smoke Detectors
- Heat Detectors
- Flame detectors
- Aspiration detectors
- CO detectors
- Cameras
- Sensors (motion, contact & occupancy)
- Air Filtration System
- HVAC Sensors and Controllers
- Thermostats
- Automated Light Switches

Fluoropolymers (particularly PTFE) are critical to the thermal and flame resistance/retardancy of the casing/housing which needs to withstand the extreme environments of emergency situations (e.g., fire) and maintain functional durability to other environmental factors (e.g., UV light, and power surges).

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The ability to repel moisture (hydrophobic), dielectric (insulation) properties, high-end use temperature rating and resistance to corrosions are all critical to the electrical function of all the above devices/systems during use and in some cases, their manufacturing process. Fluorinated Materials are currently the only option to fulfil the multitude of critical functions which the Control and Security Devices' circuit boards and components, cabling and wiring, all need to be able to endure.

3 Mandatory technical specifications

The mandatory technical standards used for Controllers and Safety Devices in the EU and most countries outside of North America are IEC/CENELEC.[11] The IEC (International Electrotechnical Commission) has set detailed standards for equipment and classification of areas that are used by countries outside of both Europe and North America. CENELEC (European Committee for Electrotechnical Standardisation) is a rationalising group that uses EN/IEC standards as a base and harmonises them with all ATEX standards and the resulting standards legislated by member countries, which are based upon ATEX.

In particular, the EN 54 series sets requirements for the effectiveness and reliability of equipment for fire detection and alarm systems (FDAS) of buildings, including EN 54-21 relating to the transmission of alarm and/or fault warning signals relating to fire. Smoke alarms are subject to EN 14604:2005 standards. Intruder alarms and hold-up alarm should comply with EN 50131 and EN 50136 series standards.

Moreover, Safety integrity level (SIL) certification based on the EC 61508 standard ensures that the given, e.g., controller or safety device, provides for the relative level of risk-reduction intended by its safety instrumented function (SIF). In other words, that device measurements satisfy a combination of quantitative and qualitative factors relevant for output reliability/accuracy, response time, risks of failure, etc. during its entire service life cycle. For certain industries, this type of certification is mandatory.

It is noteworthy, that in case of exports Controllers and Safety Devices should comply with all applicable regulations of importing countries. Many of the latter apply rigorous technical regulations and standards (e.g., comprehensive UL standards (Underwriters Laboratories, UL LLC) in the US). It is certain, that additional recertification of devices and systems in question due to changes in technical specifications in case of the EU PFAS bans envisaged in the Proposal will be very burdensome and lengthy (see also section 4.2 below).

4 Absence of unacceptable and not adequately controlled risk

4.1 Grouping and risks assessment in the Proposal

PTFE, FEP, PFA, ETFE, PVDF, PCTFE, ECTFE, PVDF-HFP are polymer-type Fluorinated Materials. Although they are not registered under REACH, they satisfy all criteria of the internationally recognised OECD definition for a Polymer of Low Concern (PLC)[12]. They are scientifically proven to be a low-hazard, non-toxic, non-mobile, and extremely inert materials, without chemical or biological reactivity, and with

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[11] *Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast).*

[12] *Data analysis of the identification of correlations between polymer characteristics and potential for health or ecotoxicological concern*, OECD Environment, Health and Safety Publications, ENV/JM/MONO(2009).

excellent stability under a range of environmental and normal-use conditions.[13] The risks of release from sensors and control devices are negligible.

All available scientific data unequivocally demonstrates that the above fluoropolymer materials do not exhibit any of the hazards assessed in Section 1.1.4 of the Proposal in this application and that their physicochemical, toxicological, and ecotoxicological properties are very different from many other PFAS. It is apparent that these Fluorinated Materials do not exhibit PBT/vPvB equivalent concerns, contrary to the erroneous conclusions in section 1.1.6 of the Proposal.

The substances mentioned above exhibit exceptional stability, as they are solid and inert. They are resistant to deterioration caused by various factors such as acids, bases, oxidants, reductants, light-induced processes, microorganisms, and metabolic processes. As a result, they possess high resistance to thermal, chemical, oxidative, and biological changes. These materials do not typically degrade under normal environmental conditions or during regular use and processing. They are notably durable and persist over time. However, it is important to note that persistence alone does not indicate any current or future risks to human health or the environment. The persistence of these substances is not inherently hazardous, as it does not automatically imply or indicate the potential for adverse effects or toxicity. The regulation of persistence by REACH takes into consideration other properties that provide insight into potential hazards. Fluoropolymers themselves are persistent, but they are not bioaccumulative, not mobile, and not toxic (not PBT/vPvB or PMT/vPvM) and therefore not SVHCs from a regulatory perspective.[14] Durability of polymer materials is absolutely critical in Control and Safety Devices in order to ensure integrity and accurate response across a range of exposure conditions.

Therefore, grouping of Fluorinated Materials in question with "*all other PFAS*" for REACH restrictions and/or read-across purposes is not supported by available scientific data and ECHA RAAF requirements.[15] Therefore, "*segmentation based on properties should be conducted before performing any grouping-based risk assessment, placing stable, non-hazardous fluoropolymer materials that meet the criteria to be considered PLC in a separate category*".[16]

Furthermore, according to the RAC/SEAC opinions in the Restriction Proposal of microplastics (see the RAC opinion), it is only when a "*polymer*", as defined in Article 3(5) REACH, has specific intrinsic properties of "*microplastics*" (i.e., particle size, (bio)degradation, and water solubility thresholds) that these properties

13 Please find detailed assessment of PLC criteria of fluoropolymers in *A Critical Review of the Application of Polymer of Low Concern and Regulatory Criteria to Fluoropolymers*, Barbara J Henry et all, Integrated Environmental Assessment and Management — Volume 14, Number 3—pp. 316–334, 2018; and more recent and detailed in *A critical review of the application of polymer of low concern regulatory criteria to fluoropolymers II: Fluoroplastics and fluoroelastomers*, Stephen H. Korzeniowski *at al.*, Integrated Environmental Assessment and Management — Volume 19, Number 2—pp. 326–354, 2022.

14 *Persistent, mobile and toxic substances in the environment: a spotlight on current research and regulatory activities*, Heinz Rüdel et al., Environmental Sciences Europe volume 32, Article number: 5 (2020).

15 See detailed discussion at pages 348-349 and Conclusions in *A critical review of the application of polymer of low concern regulatory criteria to fluoropolymers II: Fluoroplastics and fluoroelastomers*, Stephen H. Korzeniowski *at al.*, Integrated Environmental Assessment and Management — Volume 19, Number 2—pp. 326–354, 2022.

16 *Ibid.*, at page 349.

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may affect its hazard characteristics, resulting in vPvB equivalent concerns.[17] It is evident that Fluorinated Materials in gas detection instruments do not satisfy the above definition of microplastics. Therefore, the blanket application of conclusions regarding PBT/vPvB and non-threshold properties of microplastics, as proxies to unacceptable risk to all fluoropolymer materials without adequate and comprehensive risk assessments of their respective hazards and exposure, is not justified.[18] The adequate scientific assessment of the above Fluorinated Materials, which is required to demonstrate the level of "*unacceptable risk*" under Article 68 REACH, is missing in sections 1.1.4., 1.1.5 and 1.1.6 of the Proposal.

4.2 Other effective Risk Management Measures already in place

Control and Safety Devices are subject to various stringent technical regulations during their production, use, and end-of-life (both landfill and incineration) stages.

Manufacturing processes of these devices and Fluorinated Materials in question are regulated by the EU Industrial Emissions Directive (IED)[19] and the recent *Responsible Manufacturing Commitment* of the industry.[20]

Design, use, and disposal of Control and Safety Devices, systems, and materials thereof are also subject to rigorous IEC/CENELEC and ATEX standards.[21]

During the use phase, materials in question remain stable and inert. They are also contained in closed and rigorously sealed devices/cells/chambers, excluding any PFAS emissions over the entire use stage.

The end-of-life stage of buildings and respective waste streams are subject to the EU Construction and Demolition Waste Protocol and Guidelines regulating waste identification, source separation and collection of the construction and demolition waste and respective waste management processes.

There is also considerable data demonstrating that Fluorinated Materials, e.g., PTFE or PCTFE, do not degrade in the environment or release substances of toxicological or environmental concern during the landfill disposal (i.e., negligibly leachable).[22]

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[17] In this context RAC concluded in section B.1.2.2 of the Opinion on the *Restriction Proposal of microplastics* that "*although there are uncertainties in the understanding of the hazard and risk of microplastics, there is sufficient evidence to conclude that that they constitute an intrinsic hazard because of their long-term persistence in the environment in combination with their particulate form and potential to cause adverse effects*".

[18] See e.g., on three elements of risk - hazard, exposure, and risk based on the hazard manifesting themselves in the exposure in the specific case, *Fidenato v Comune di Padova*, Case C-442/14, *Commission v Germany*, Case C-47/90. *Etimine SA v Secretary of State for Work and Pensions*, C-15/10.

[19] *Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast).*

[20] "*As such, all FPG Members have committed voluntarily to responsible manufacturing principles in term of continuously improve and/or develop best available techniques in the manufacturing process, management of environmental emissions, development of R&D programs for the advancement of technologies allowing for the replacement of PFAS-based polymerization aids, and/or the increase recyclability and reuse of its products in line with the objectives of circular economy.*" PlasticsEurope's Fluoropolymers Product Group (FPG) statement, 2021.

[21] *Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast).*

[22] Pages 350 in *A critical review of the application of polymer of low concern regulatory criteria to fluoropolymers II: Fluoroplastics and fluoroelastomers*, Stephen H. Korzeniowski *at al.*, Integrated Environmental Assessment and Management — Volume 19, Number 2—pp. 326–354, 2022.

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Incineration of Fluorinated Materials in question under normal municipal waste conditions, particularly at temperatures over 850^0 C,[23] does not result in other PFAS (including trifluoroacetic acid (TFA)) emissions either.[24]

Moreover, almost all Control and Safety Devices are considered as electrical and electronic equipment (EEE) or components thereof. Disposal and waste treatment of EEE at their end-of-life (even as hazardous waste) is subject to the EU *WEEE Directive*, *Waste Framework Directive* (WFD)[25] and national waste related legislation of the EU member states. These regulations could be amended at any time to accommodate appropriate handling of PFAS contained waste streams (collection, disposal, reuse, etc.), if warranted. These changes will be more proportionate and effective risk management options (RMO) than the universal restriction (i.e., bans) envisaged in the Proposal as far as uses of Fluorinated Materials in Commercial Buildings Controllers and Security Devices are concerned.

Therefore, risks due to uses of Fluorinated Materials in question in Commercial Buildings Controllers and Security Devices applications are already adequately controlled throughout all their lifecycle within the meaning of Articles 68 and 69 REACH, and the proposed REACH restrictions for the respective substances in these devices are not justified.

5 Why Fluorinated Materials are indispensable for Commercial Building Controllers and Safety Devices?

Commercial Building Controllers and Safety Devices are used in critical emergency situations and their components need to function at optimal levels. Therefore, all components in the device need to be safe, durable, and non-reactive across a broad range of temperatures, pressures, humidity levels, and other environmental exposures that arise. Fluorinated Materials are the only plastics that can meet all these characteristics.

Given the substantial consequences of any potential failure, it is imperative to approach substitutions of Fluorinated Materials in Controllers and Safety Devices with the utmost care. These materials have demonstrated remarkable reliability for more than sixty years. A prevailing apprehension pertains to the possibility that EN and IEC might need to be revised to accommodate alternative materials which currently fall short in delivering the necessary level of performance. Afterwards, new materials/instruments/devices for all hazard locations would need to be recertified. This will take significant time, greatly exceeding the 6.5 or 13.5 years envisaged in the Proposal.

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23 Temperatures at the pyrolysis front and the combustion front in the waste-burning bed range from 900°C to 1100°C in *A 2-D mathematical model of on-grate municipal solid waste combustion*, Asthana et al., 2006.

24 See e.g. *Waste incineration of Polytetrafluoroethylene (PTFE) to evaluate potential formation of per- and Poly-Fluorinated Alkyl Substances (PFAS) in flue gas*, K. Aleksandrov, 2019; *Investigation of waste incineration of fluorotelomer-based polymers as a potential source of PFOA in the environment*, P.H. Taylor, 2009; Per- and polyfluorinated substances in waste incinerator flue gases, Bakker, J., et al. (2021), RIVM report 2021-0143; *Using mass defect plots as a discovery tool to identify novel fluoropolymer thermal decomposition products*, Myers, A. L., et al. (2014).

25 *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.*

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Table 1 below summarises PFAS materials (i.e., Fluorinated Materials) and their uses in components of Honeywell's Commercial Building Controllers and Safety Devices as well as their respective unique characteristics and benefits.

Devices/Systems	Components	PFAS group	Unique functional criticalities of PFAS
Point Detector - Smoke (Fire alarm systems)	Printed circuit board, capacitor, Semi-conductor, PVC additive in casing	PTFE PVDF	Thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions.
Point Detector - Heat (Fire alarm systems)	Printed circuit board, capacitor, Semiconductor PVC additive in casing	PTFE PVDF	Thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions.
Flame detectors (Fire alarm systems)	Printed circuit board, capacitor, semiconductor, PVC additive in casing	PTFE PVDF	Thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions.
Aspiration detectors (Fire alarm systems)	Printed circuit board, capacitor, semiconductor, PVC additive in casing	PTFE PVDF	Thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions. General Electronic Packaging
Carbo oxide (CO) detectors (Fire alarm systems)	Printed circuit board, capacitor, semiconductor, PVC additive in casing	PTFE PVDF	Thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions.
Cameras (Security/intrusion alarm systems)	Printed circuit board, capacitor, semiconductor, PVC additive casing	PTFE PVDF	Thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions. UV protection in direct sunlight environments (>40-60°C).

Sensors (motion, contact & occupancy) (Security/intrusion alarm systems)	Printed circuit board, capacitor, semiconductor, PVC additive in casing	PTFE	High-temp resistance, water-repellent, low surface tension and high dielectric and breakdown strength. UV protection in direct sunlight environments (>40-60°C).
Air Filtration System (Building management systems)	Fluoropolymers are used as membranes and casings in various filters.	PTFE	High temp resistance. Flame retardancy. Anti-drip properties. Flexible, high stress crack resistance
HVAC Sensors (Building management systems)	Pressure Sensors. Printed circuit board, capacitor, semiconductor, PVC additive in casing	PTFE	High-temp resistance, water-repellent, low surface tension and high dielectric and breakdown strength. UV protection in direct sunlight environments (>40-60°C).
Thermostats (Building management systems)	Printed circuit board, semiconductor, capacitor, PVC additive in casing	PTFE	High-temp resistance, water-repellent, low surface tension and high dielectric and breakdown strength.
Automated Light Switches (Building management system)	Wiring and cable insulation	PTFE	High-temp resistance, water-repellent, low surface tension and high dielectric and breakdown strength.
All systems – Coatings	Coatings for all cables and wirings, other devices.	PCTFE FEP ECTFE PFA	Best available radiation curable, thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Outstanding dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions from almost all chemicals.
All systems -Printed Circuit Boards (PCB)	Rigid Circuit Board	PTFE PFA	Thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions (wide range of chemicals)
All systems -Printed Wiring Board (PWB)	Rigid Circuit Board	PTFE PFA	Thermal and flame resistance/retardancy properties. Ability to repel moisture (hydrophobic). Dielectric (insulation) properties. High-end use temperature rating and resistance to corrosions.

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All systems - Cable and wire insulations	Primary insulator in computer cables and industrial control wiring. Cross-linked heat-shrinkable tubing in connectors, sleeves, and other components.	PVDF PTFE	High temp resistance. Operation ability at high temperature. Resistance to corrosion (wide range of chemicals). Water and oil resistant. Low dielectric constant. Excellent electrical insulation. Flame retardant. Flexible, high stress crack resistance, UV resistance, long-life.
All systems - Dielectric films	Capacitors	PTFE PVDF	High temp resistance. Dielectric (insulation) properties.
All systems - Additive in plastic resins (e.g., PC/ABS)	Plastic Enclosures	PTFE	High temp resistance. Flame retardancy. Anti-drip properties. Flexible, high stress crack resistance.
All systems - Insulation/Fire prevention	Wiring and cable insulation	PVDF-HFP FEP ETFE ECTFE PCTFE PTFE	High temp resistance. Operation ability at high temperature. Resistance to corrosion (wide range of chemicals). Water and oil resistant. Low dielectric constant. Excellent electrical insulation. Flame retardant. Flexible, high stress crack resistance, UV resistance, long-life.
All systems -Insultation / heat resistant in combination with specific sensors	Wiring and cable insulation	PTFE	High temp resistance. Operation at high temperature. Resistance to corrosion (wide range of chemicals). Water and oil resistant. Low dielectric constant. Excellent electrical insulation properties. Flame retardant. Flexible, high stress crack resistance, UV resistance, long-life.
All systems -High frequency electrical insulation	Wiring and cable insulation	PTFE	High temp resistance. Operation at high temperature. Resistance to corrosion (wide range of chemicals). Water and oil resistant. Low dielectric constant. Excellent electrical insulator. Flame retardant. Flexible, high stress crack resistance, UV resistance, long-life.

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All systems - Insulation / chemical resistant	Wiring and cable insulation	PTFE	High temp resistance. Operation at high temperature. Resistance to corrosion. Water and oil resistant. Low dielectric constant. Excellent electrical insulator. Flame retardant Flexible, high stress crack resistance, UV resistance, long-life.
All systems - flame retardancy plastics	Adapters, PSUs, wiring	PTFE PVDF	High temp resistance. Flame retardancy. Anti-drip properties.
Chemical resistance, flexibility, sealing All systems -	Tubing, valves, sealing	PTFE, PVDF	High-temp resistance, water-repellent, UV protection in direct sunlight environments (>40-60°C). Flexible, high stress crack resistance
All systems - Semiconductors	Semiconductors	PTFE	High temp resistance, Structure/low dielectric constant/insulation. Antireflective Coatings. Heat transfer. Protective Coating. Wet and Dry etching agent/ facilitate and clean etch.
All systems - Lithium-ion batteries	Electrodes binders (for anode/cathode electrodes) in all commercial lithium batteries. Other uses at cell/battery (e.g., separator coatings, electrolyte additives)	PVDF FEP PTFE	Function as binder is to join the active material and conductive additives. Prevent a thermal runaway reaction and combustion of the battery. Heat absorbing layer in the inside of the case of the battery pack. Heat conductive layer at the outside of the case of the battery pack.

Unique characteristics of these Fluorinated Materials critical for Commercial Buildings Controllers and Security Devices applications vis-à-vis alternatives are further explained in section 6 below.

6 Unique characteristics of materials in question and absence of feasible alternatives

Fluorinated Materials, such as PTFE, FEP, PFA, ETFE, PVDF, PVDF-HFP, PCTFE and ECTFE, provide unique properties for critical technical features of Control and Security Devices used in buildings. These materials could not be substituted by in-kind alternative substances even within the long perspective as demonstrated below.

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As explained above, alternative materials should meet all set of unique characteristics of Fluorinated Materials, including:

- Operation at high temperatures variations (as low as near -60°C and up to 260°C).
- Corrosion resistance.
- Water (hydrophobic) and oil resistance/repellents.
- Low dielectric constant.
- Excellent electrical insulation (low dissipation factor).
- Flame retardant.
- High stress crack resistance.
- Flexibility, non-sticking and low friction.
- High Ultra Violate (UV) resistance.

However, it is of critical importance for the proper functioning of Commercial Buildings Controllers and Security Devices that most of the above characteristics are meet simultaneously to ensure adherence to applicable technical specifications (see section 2.1 above) and provide reliable services in emergency and stressful situations.

For instance, fluoropolymer insulated wire and cables can be used in harsh environments and where high-volume data transmission is required, e.g., connecting numerous sensors, cameras, control panels and switching devices.

Also, most of component parts of smoke and flame detectors either incorporate Fluorinated Materials or use them at some stage during the manufacturing process. E.g., circuit boards may use PFAS chemicals during manufacture and then also rely on them to provide effective protective coatings for difficult environments. The same is true for semiconductors, capacitors, and optics. Even the plastic moulding for detectors incorporates fluoropolymers that are required to ensure flame retardant properties of these important devices.

Although other materials can demonstrate comparable or even superior performance in single properties, only Fluorinated Materials can reach above characteristics simultaneously (e.g., high temperature performance, chemical and mechanical resistance on PTFE vs. PEEK).[26]

Importantly, in case of substitution by other materials, new Control and Security Devices would need to be recertified by all applicable national and international standards (e.g., UL, EN and IEC), meaning that hundreds of new characterization tests, parameters table updates, performance tests and certification updates will be required.

For details on comparisons of Fluorinated Materials in question and potential non-PFAS substitutes please refer to Honeywell submission on E-Chem gas sensors No: 953afdb9-29e0-47d9-bbf1-49d887020fee and Gas Detection Instruments No: 0b139110-42c4-4ca2-8aa7-f09ec1766630

[26] On unique properties of fluoropolymers please see at *Introduction to Fluoropolymers Materials, Technology and Applications*, Sina Ebnesajjad, 2013

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Moreover, the so-called POPFREE (i.e. Promotion of PFAS-free alternatives) collaboration project started in November 2017 and ended in March 2020 specifically aimed to *inter alia* identify available and competitive alternatives to various PFAS substances in a range of applications, including relevant uses in Control and Security Devices.[27]

In this regard, PTFE is a unique inert, gas permeable, hydrophobic, strong and low flammability material, which is essential for cables & wires, cases and other key components of fire/smoke/flame/CO and other gas detection and motion sensors/systems.

None of other non-PFAS substances (e.g., polymethyl urea (PMU)) can provide the required technical characteristics, specifically regarding the hydrophobic, inert, dielectric and mechanical properties of PTFE.

Specifically, PVA materials are not as robust, nor as stable, nor efficient or powerful as PTFE based devices. They are also hydrophilic and soluble in water as well as toxic (solutions containing more than 5% PVA are toxic to fish)[28] and they biodegrade slowly.[29]

In the meantime, PE, LDPE and HDPE plastics are highly flammable, sensitive to stress or oxidative cracking, and lack corrosion resistance to oxidizing agents and therefore objectively are not able to serve as a substitute for PTFE in critical emergency systems.

Fluoropolymers, such as PTFE, FEP, PFA, ETFE etc. are also indispensable for the insulation of wires and cables as well as film capacitors used in Control and Security Devices and systems. It is necessary to protect these systems against environmental threats, harsh operating conditions and to prevent electrical leakage. The use of fluoropolymers in such electric equipment is driven by its outstanding electrical properties, such as low dielectric constant, flame, crack, and chemical resistance, thereby contributing to the longevity of the overall system. For example, low dielectric loss tangent and high dielectric strength are very important for insulation of cables and wire used in buildings Control and Security Devices. Combined with high chemical and temperature resistance, and low surface friction characteristics of fluoroplastics such cables/wire are easier for passing through tight conduits.

Alternatives such as PEEK do not satisfy all application requirements (re: coefficient of friction, temperature resistance, hydrophobic properties, etc.).

For new material development, producers of Control and Security Devices (and components thereof, e.g., gas sensors) rely upon their material suppliers. However, in the case of PFAS, to the best of our knowledge, respective suppliers have indicated that replacements could be cost-prohibitive, and time periods longer than the maximal derogation period of 13.5-years envisaged in the Proposal would be required. It is also not certain that those alternatives can enable equivalent technical performance while meeting all relevant regulatory standards, particularly under ATEX and semiconductors performance. Respective re-certification will also take longer time.

[27] *PROPFREE Final Report* is available at https://www.ri.se/en/popfree .

[28] *Polyvinyl Compounds, Others*, Manfred L. Hallensleben, Ullmann's Encyclopedia of Industrial Chemistry, 2000.

[29] *Biochemistry of microbial polyvinyl alcohol degradation*, Applied Microbiology and Biotechnology, Kawai F, Hu X, 2009.

All potential alternatives, metals, non-PFAS polymers (PEEK, PPS, etc.), and non-PFAS elastomers (e.g., Ethylene Propylene Diene Monomer (EPDM), Hydrogenated Nitrile Butadiene (H-NBR), and Silicone) are not suitable for many critical applications due to either weaker flame resistance, temperature limitations, higher resource intensity, and/or mechanical properties. Moreover, these are high performance materials that are likely persistent or very persistent substances similar to fluoropolymers, resulting in substitution of one persistent material with an inferior performing one, leading to increased failure risks, maintenance cycles and generation of higher amounts of environmental waste. These materials could be considered as "*regrettable substitutions*" as far as Commercial Buildings Controllers and Security Devices are concerned.

7 Socio-economic impact of the proposed REACH restriction

Considering that an average building protection system employs tens or sometimes hundreds of different devices and components potentially subject to the PFAS REACH restriction envisaged in the Proposal. Alternative in-kind and functional solutions can almost certainly be sourced for many of them, although most probably it will be challenging to comply with all product manufacturing and application requirements established in all applicable technical regulations and standards. However, to do so the industry and actors along the overall supply, certainly need sufficient time to transition.

Fluoropolymers, such as PTFE, (per-)fluoroelastomers and perfluoropolyethers, provide crucial characteristics for key components of Commercial Building Controllers and Safety Devices (including smoke detectors, flame detectors, heat detectors, aspiration detectors, motion sensors, security cameras, automated light switches, thermostats, cable and wire insulation, fire Insulation, air filtration systems, plastic additives, capacitors, and others. These chemicals possess high temperature, pressure, chemical, and mechanical resistance, making them ideal for Commercial Building Controllers and Safety Devices. Respective characteristics directly influence selectivity, precision, reliability, and longevity of these instruments throughout various (harsh) conditions (temperature, humidity, pressures, etc) experienced in emergency situations, (e.g., a building fire, earthquake, severe weather). In this sense, Controllers and Safety Devices are critical safety applications.

Without the above Fluorinated Materials, these instruments would likely experience much higher rates of failure, component replacement, errors in measurements, and false or absent alarms, leading to premature obsolescence of other devices/machinery and substantial industrial safety and health incidents. Currently, there are no known technically, or economically, feasible alternatives to most of these substances in Commercial Building Controllers and Safety Devices. Moreover, and there is great uncertainty about successful development of alternatives within the time frames envisaged in the Proposal for most applications in this space.

In case the proposed PFAS restriction would be adopted, the worldwide Commercial Building Controllers and Safety Devices industry would experience tremendous economic and social shock. This could consequently cause a huge socio-economic impact to many industries and societies because security and controlling systems are widely used in essential utilities (power generation, water treatment, security and defence, etc.), all major production (semiconductors, chemicals, oils and gas, etc.), commercial (shopping mols, business/office spaces, storages, etc.), public (hospitals, theatres, schools, civil administration, etc.) and defence/military facilities. As noted above, if Fluorinated Materials were banned in Building Controllers and Safety Devices, industrial production in semiconductors, automotive, petrochemical, and crude oil sectors worth over 2 trillion EUR would be compromised due to the lack of adequate safety and control/management systems.

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These consequences are certainly in conflict with the wider EU industrialisation and competition policies as well as objectives of the European Green Deal, REPowerEU, European Chips Act, Net Zero Industry Act, and other emerging sustainability laws, and well as EU and UN standards for safe and reliable cities and infrastructure.

Many products contain PFAS to make them more durable because fire detection and alarm systems are often installed for over 15+ years of reliable service and often in challenging environments and remote locations. By changing to non-PFAS materials that are less durable, devices and/or their components would require repair or replacement more often and thus resulting in increased amounts of various waste. These consequences are against the aims of the European Green Deal. In addition, most probably, plastic, rubber, metallic or ceramic substitutes will be also very persistent substances leading to questionable health and environmental effects. Many of these materials also have significantly higher lifecycle GHG emissions.

Therefore, the proposed PFAS ban on all Fluorinated Materials in in Commercial Building Controllers and Safety Devices applications would result in too high costs on the society and is disproportionate to the alleged risks for health and the environment due to the lack of persistency of the PFAS materials in question.

8 Conclusion

Considering the above, PFAS materials are critical to the quality and fundamental functionality of Commercial Building Controllers and Safety Devices. Submitted information provides the necessary evidence to support either the complete exclusion of the Fluorinated Materials in question from the Proposal or justifies respective time-unlimited derogations because there are no suitable alternatives available, and their development and certification is a long-term task with unpredictable results and timelines.

In this respect, the complete ban envisaged in the Proposal on all uses in the EU of Commercial Building Controllers and Safety Devices with Fluorinated Materials, as well as components for spare parts in existing equipment and installed systems, would have tremendous consequences and costs for society.

<u>Honeywell requests that PTFE, ETFE, FEP, PFA, PVDF, PVDF-HFP, PCTFE and ECTFE based fluorinated materials used in all Commercial Building Controllers and Safety Devices should be either excluded from the scope of the Proposal or made subject to a derogation at least until 13.5 years after the entry into force (EiF) of the PFAS REACH restriction.</u>

Annex I – List of acronyms and abbreviations

Annex II – Lists of fluorinated substances and components of Commercial Building Controllers and Safety Devices