

Annex1 List of the functions and properties necessary to electrical and electronic equipment (EEE), which need PFAS materials to attain required performances.

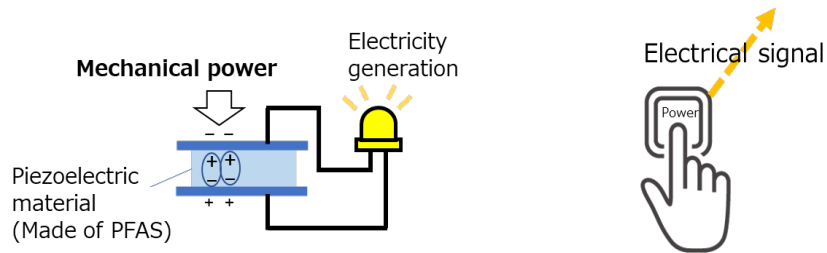
◆Function of electrical and electronic equipment (EEE) and performance requirement to PFAS material

Many electrical and electronic equipments consist of a combination of the following functions.
Therefore, if even one function is missing, the set equipments will not be able to perform its original function in any application.

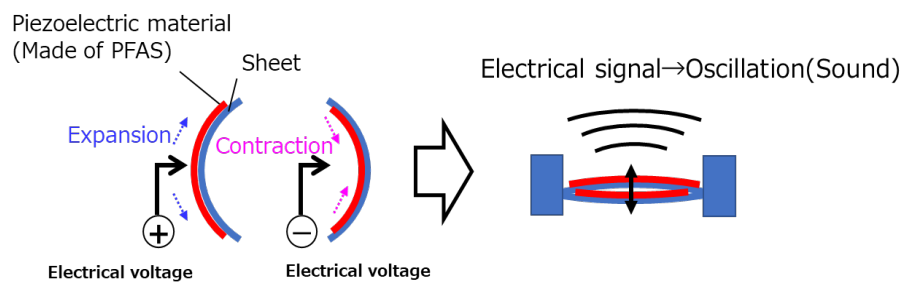
	Functions and properties required for EEE	Characteristic of parts and materials to achieve their functions and properties of EEE	Performance requirements for materials (PFAS)	(e.g.) Specific parts or components that accomplish the functions or characteristic of EEE	(e.g.) Typical EEE
1	Optical function	No interference of light transmission (Transparency)	Low refractive index, High transmissivity + Water and oil repellency, Flexibility, Flame retardancy	Optical fiber, Optical Lens, LED, Monitor/Panel, Fiberglass, Optical adhesive, Protective coating material, Anti-reflective material, etc.	Camera, Lighting, Monitor/Panel, Optical cable, Smartphone, etc. Other products in RoHS categories 1- 11, automotive, aircraft, and industrial equipments would need this function if they use optical function in control panels for example.
2	High speed communication and transmission function	Low transmission loss at high frequencies and wide frequency range	Low dielectric constant and Low transmission loss + Water and oil repellency, Flame retardancy	Printed circuit boards (Smartphone, PC, Base stations, etc.), Antenna, Cable for High-frequency, Protective coating material, etc.	Smartphone, PC, Antenna, Base stations, ADAS, Various sensor equipment, etc. Other products in RoHS categories 1- 11, automotive, aircraft, and industrial equipments would need this function if they use communication function to operate or update it for example.
3	Piezoelectric function (Conversion/Inversion between the mechanical power and electrical voltage) * Refer to separate sheet "3. Piezoelectric function" for functional explanation.	Piezoelectricity (pressure-sensitive detection) and good workability and durability	High Piezoelectricity (High piezoelectric coefficient) + Heat resistance, Flexibility	Speaker, Touch panel, Sensor, Actuator, etc.	Touch panel, Speaker, Various sensor, etc. Other products in RoHS categories 1- 11, automotive, aircraft, and industrial equipments would need this function if they use touch panels or sounds for example.
4	Sliding function in mechanical section * Refer to separate sheet "4. Sliding function" for functional explanation.	Lubricity and abrasion resistance, elasticity, Low water absorption, low moisture permeability	Lubricity, Abrasion resistance, Machineability + Flame retardancy, Durability, Low water absorption, Low moisture permeability	Sliding parts in mechanical section (Bearing, Gear, Roll), Seal material(Packing, O-ring, etc.), Grease, Lubricant, Protective coating material, Epilame, Sealing material, Painting, relays, switches, instrument panels, valves, etc.	Motor, Printer, Industrial equipment, Camera, Display, Projectors, Audio equipment, Air conditioning and heat pump equipment, Home appliances, In-vehicle equipment, compressors, etc. All the EEE in RoHS categories 1- 11, automotive, aircraft, and industrial equipments would need this function.
5	Display function(Liquid crystal display / LCD)	Low voltage drive and fast response (Low anisotropic refractive index and low viscosity)	Low anisotropic refractive index, Low viscosity, Low voltage drive + Heat resistance, Durability	Liquid crystal panel (TV, Car navigation, various monitor), etc.	Liquid crystal display panel (TV, Car navigation, Monitor for various equipments, Display), etc. Other products in RoHS categories 1- 11, automotive, aircraft, and industrial equipments would need this function if they use control panels or monitors for example.
6	Safety and safety functions	Electrical insulation and flame retardancy, Chemical resistance, Heat resistance, Durability, Dripping prevention	Low dielectric constant, Flame retardancy, Machineability, Chemical resistance + Heat resistance, Durability	Cable, Pipe/Tube, Package, Seal material, Enclosure, Encapsulation, Protective coating material, Sealing material, Protection tube, Relays, Switches, Sensors, Membranes, Films, Valves, etc.	Cable, Monitor, Medical equipment, Home appliance, Industrial equipment, Air conditioning and heat pump equipment, In-vehicle equipment, etc. All the EEE in categories RoHS 1- 11,automotive, aircraft, and industrial equipments would need this function.
7	Functional surface	Releasability and Heat resistance, UV protection, Antifouling, Waterproof	Water and oil repellency, Heat resistance, Weather resistance	Releasing and Protective coating material, Film, Paint, Ink, Membranes, etc.	Cooking appliance, Touch panel, Smartphone , Microwave ovens, Displays, Automotive equipment, Audio equipmentetc. All the EEE in RoHS categories 1- 11,automotive, aircraft, and industrial equipments would this function.
8	Semiconductor	Photoacid Generators (PAG) , Surfactants, anisotropic/isotropic etching and protective layer formation, low dielectric constants, high thermostability, chemical inertness (to acids, bases, and solvents), and low moisture absorption, low electric permittivity /dielectric loss, low water absorption, and low coefficient of thermal expansion(CTE), In heat transfer fluid uses, electrically non-conductive, and usability in very broad temperature range, and non-corrosive in closed-loop systems	Photoacid Generators (PAG) , Surfactants, anisotropic/isotropic etching and protective layer formation, low dielectric constants, high thermostability, chemical inertness (to acids, bases, and solvents), and low moisture absorption, low electric permittivity /dielectric loss, low water absorption, and low coefficient of thermal expansion(CTE), In heat transfer fluid uses, electrically non-conductive, and usability in very broad temperature range, and non-corrosive in closed-loop systems	Photolithography and thin films formed thereby, dry etching, cleaning, heat transfer fluids, resins, manufacturing equipment materials	All the EEE in RoHS categories 1- 11,automotive, aircraft, and industrial equipments would use semiconductors.
9	Thin-film device manufacturing process	Semiconductor manufacturing process and similar microfabrication process Refer to item 8. Semiconductor	Refer to item 8. Semiconductor	Thin-film device such as MEMS(Sensor, Gyroscope, Inkjet head), SAW filter, Angular velocity sensor, Moisture sensitive membrane, Capacitor, Resistor, etc.	Car navigation system, Sphygmomanometer (blood pressure meters), Inkjet printer, Smartphone, PC, etc. Other products in RoHS categories 1- 11, automotive, aircraft, and industrial equipments may use thin-film device.
10	Passive electronic components and manufacturing process	Safety, high reliability and high durability (Passive electronic components are essential components in the electrical circuits of electrical and electronic equipments that protect semiconductors, filter electrical signals, and attenuate, store, and release electrical energy.)	・ Water and oil repellency, Electrical insulation, Heat resistance ・ Binding properties, chemical and electrical stability + Reliability (heat resistance, moisture resistance, durability)	Passive electronic components (Capacitors, transformers, etc.)	Essential Device for circuit configuration of electrical and electronic equipments All electrical and electronic equipment such as Automobiles, Medical equipment, Industrial/Infrastructure equipment, Information/Communication equipment, Home appliances, Solar power generation, etc. Other products in RoHS categories 1- 11, automotive, aircraft, and industrial equipments may use passive electronic components.
11	Energy supply (Battery,Fuel cells, Solar cells)	Refer to Energy section		Battery、 Fuel cells, Solar cells	All the EEE in RoHS categories 1- 11, automotive, aircraft, and industrial equipments would use batteries, Fuel cells, and Solar cells
12	Refrigeration, Air-conditioning and heat pump sector RACHP (Refrigerant)	Refer to Fluorinated gases section and separate Panasonic HVAC submission		Refrigerant	All the EEE in RoHS categories 1- 11, automotive, aircraft, and industrial equipments would use refrigerant

3. Piezoelectric function

1) Piezoelectric effect: Convert mechanical power into electrical voltage

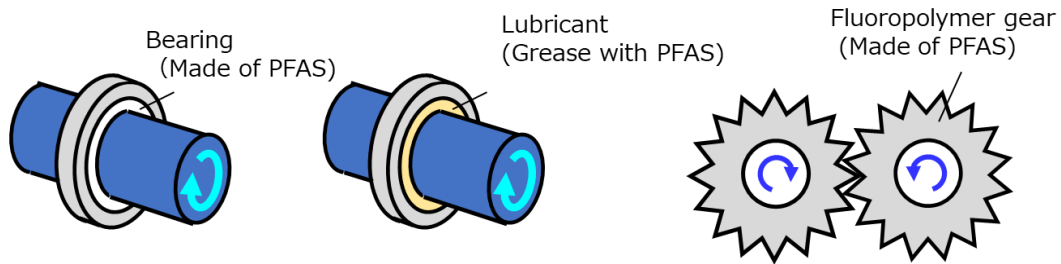


2) Inverse piezoelectric effect: Convert electrical voltage into mechanical power (Expansion and Contraction)

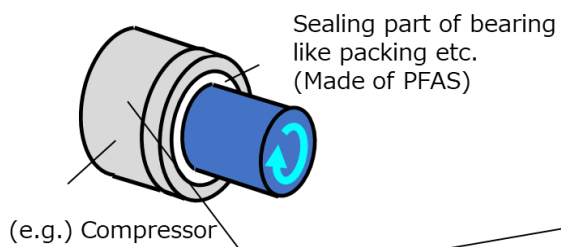


4. Sliding function

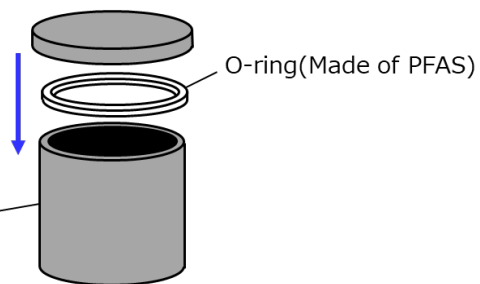
1) Lubrication improvement (Sliding part)



2) Seal improvement (Sliding part)



3) Seal improvement (Fixed part)



Fluoropolymers, which have excellent sealing properties, are sometimes used for containers.