

For distribution to Cooperating suppliers

Guidance manual for management of hazardous substances in product

The 5.1 edition

2009. 11



Document Introduction

This guidance manual for environmental regulation countermeasure is a means to secure environmentally friendly product competitiveness by actively responding to the environment-friendly product regulations spreading throughout the world, such as in EU nations, the US and China, etc.

The cooperating suppliers of LG Electronics must know well environmental strategy and policy based on this guidance manual and check standard for reduced materials or prohibited material to use in parts, raw materials, packaging materials and subsidiary materials, etc. traded between LG Electronics and our cooperating suppliers.

In tune with the expansion and increase of environment-friendly regulations, the contents of this manual will be revised and supplemented on a regular basis. The revised and supplemented edition will be distributed to the cooperating suppliers without delay.

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Nov.11, 2009 / 5.1 edition

CTO
Eco strategy team
Eco technology group

Document History

Edition	Issued	Written by	Contents
1st Edition	Nov. 18, 2004	Quality Management Team, LG Electronics	<p>The very first preparation of manual throughout the company/ Division/ Distribution to cooperating suppliers</p> <ol style="list-style-type: none"> 1. Standard of environment-related substance management and operation 2. Standard of environment-related substance analysis result submission
2nd Edition	Mar. 10, 2005	Quality Management Team, LG Electronics	<p>Outline of environment-friendly certification system (LG Green ship) added</p> <p>Modification in environment-related substance classification and management standard</p> <ol style="list-style-type: none"> 1. Particulars of environment-friendly certification system promotion added 2. Evaluation check list for environment-friendly certification system of cooperating suppliers added 3. Environment-related substance classification redefined and management standard reorganized 4. Permitted limit of cadmium content in zinc die-cast parts and of hexavalent chromium content in chromate plate parts redefined 5. Particulars of exemption from the recently confirmed RoHS regulation reflected
3rd Edition	Jun. 13, 2006	Quality/Supply Management Team, LG Electronics	<p>Main Change</p> <ol style="list-style-type: none"> 1. LGE Green Program renamed 2. Maximum Allowable Concentration Value revised 3. Submitted documents and effective term added for mass production items guarantee 4. RoHS Free Mark revised 5. Organization and method for analysis updated
	Jul. 11, 2006	Quality/Supply Management Team, LG Electronics	<ol style="list-style-type: none"> 1. Exceptions of environment-related substance management standard added
4th Edition	May, 2007	Production Research Institute, LG Electronics	<ol style="list-style-type: none"> 1. Main Change <p>Chapter 2. Standard for management of hazardous substances</p> <ol style="list-style-type: none"> 1) Level A-II/B substances are added and modified <p>- Level A-II added substances: PFOS, PCP,</p>

			<p>Ugilec 121, 141, DBBT, Phthalate, PVC, BFRs</p> <p>2) Related regulations, harmfulness, and Analyzing method of detailed standard for managing of environment-related substances are added</p> <p>3) Analyzing authorities and approving standard for analysis report are up-dated</p> <p>4) Redefinition of terminology and modification of form for operating Hazardous Substance Management System (HSMS) are reflected</p>
5th edition	Aug. 22, 2008	Eco strategy team, LG Electronics	<p>Manual name change and contents divided/deleted</p> <p>1. Manual for Preparation Environmental Regulations → Guidance manual for management of hazardous substances in product</p> <p>2. LGEGP operation standard / supplier assessment checklist deleted</p> <p>3. definition of terms contents arranged - plastic, ICP, XRF, IC, UV/VIS, GS-MS</p> <p>4. Analyzing Agency List and Analysis report deleted</p> <p>environment-related substance management standard added and changed</p> <p>1. REACH 52ea restriction substances 및 restricted conditions added</p> <p>2. REACH SVHC 16ea materials added</p> <p>3. Norway PoHS, new RoHS regulation expected materials added</p> <p>4. Level B application timeline/phased out time line management, substance added (Phthalates, antimony, beryllium etc)</p> <p>5. Halogen Free Mark revised</p>

5.1 edition	Nov. 11, 2009	Eco strategy team, LG Electronics	Hazardous substances and management standard changed 1. Unit (ppm → mg/kg) 2. Analysis method by the substance 3. Added and deletion exemptions in EU RoHS 4. Lead in Battery (40 → 4000 mg/kg) 5. Added in management for DMF 6. Level B management criteria change - Product and application time
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1. Purpose

This guide has been established to prohibit content level of environment-related substances contained in all parts, raw materials, packaging materials and batteries, etc. produced and supplied to LG Electronics by its cooperating suppliers from exceeding the maximum allowable level specified by LG Electronics and to serve as a common foundation of operation in environment-related substance testing, analysis, content level inspection and verification processes so that to maintain the content level of environment-related substances below the maximum allowable level.

2. Scope

This standard is to be applied to the activities of environment-related substance testing, analysis, content level testing and verification processes performed on all parts, raw materials, packaging materials and batteries, etc. produced and supplied by the registered cooperating suppliers of LG Electronics. This standard is to be used by all domestic and overseas production premises (overseas production corporations included) and cooperating suppliers of LG Electronics.

2.1 This standard is applied to the following parts supplied to LG Electronics.

- 1) Semi-finished products)
 - ex) Module parts, function-unit board assemblies and other assembly parts
- 2) Parts
 - ex) Electrical/ electronic parts, steel/ plastic parts, semiconductor elements, PWBs, recording media, packaging substances and packaging parts
- 4) Accessories
- 5) Subsidiary substances required in part and product composition
 - ex) Adhesives, adhesive tapes and soldering substances, etc
- 6) Product manual
- 7) Packaging substances
- 8) Plastic and plastic constituting substances

2.2 This standard is applied to the following products transacted with LG Electronics

- 1) All products designed, produced, sold and supplied by LG Electronics
- 2) Products designed and produced by cooperating suppliers, but supplied to market with the trademark of LG Electronics attached
- 3) Products designed by LG Electronics, produced by cooperating suppliers and supplied to market with the trademark of LG Electronics attached.

3. Definition of terms

3.1 Classification of Environmentally Environment-related Substances

1) Level A Substances (prohibited to use)

Level A substances are those considered harmful to human body and environment of the earth, thus are prohibited to use in products by law per each region and country. Intentional use of these substances is prohibited in all items supplied to LG Electronics. For Level A-I substance, suppliers must submit an analysis report issued by a certified organization or a composition table per each substance variety issued and confirmed by raw material supplier as required in part approval to check environment-related substances contained as impurities in parts.

- ① Level A-I : Level A-I substances are the 6 varieties of environment-related substances specified in RoHS Directives. Delivery or use of parts supplied is prohibited when concentration level of these substances in each part of the products supplied exceeds the maximum allowable level designated by LG Electronics.
- ② Level A-II : Level A-II substances are environmentally environment-related substances restricted of use by laws or international conventions other than RoHS Directives. These substances are prohibited of use in all parts constituting products of LG Electronics.

2) Level B Substances (to be reduced and curtailed)

Level B Substances refer to substances considered harmful to human being and environment of the earth that are not currently prohibited of use, but are scheduled for step-by-step prohibition process by NGO request in the future.

3.2 Maximum Allowable Concentration Value (MCV)

Maximum allowable concentration value refers to the maximum permitted level of hazardous substance of material in constituting parts considering impurities existing in the nature and containing unavoidably by limitation of current manufacturing and refining techniques and measurement errors of analysis test equipments, assumption intentionally. It reflects the permitted limit decided by international environment regulations, regions, or nations. It is recorded by % weight or parts per million (mg/kg).

3.3 Non-use Certificate

Non-use certificate is used by cooperating suppliers to verify that environment-related substances specified by LG Electronics are not contained in products or parts supplied with the means of submitting verification data, such as of environment-related substance test result and MSDS (material safety data sheet), to check the information of substance composition.

3.4 contained

The term 'contained' refers to all operations of both intentionally or unintentionally adding, blending, filling or adhering a third substance into the parts or constituting materials used in products prior to, after or in the course of operation processes for the purpose of administering changes in the specific qualities of them.

3.5 Impurities

The term 'impurity' refers to substances, which cannot be completely removed in the process of natural material purification due to technical difficulties or substances, which are generated in the course of substance compounding and cannot be completely removed with the currently available technologies.

3.6 Prohibition of Use

Prohibition of use means that environment-related substances specified by LG Electronics must not be intentionally contained in raw materials and parts in the courses of manufacturing. Impurities which are inevitably contained in raw materials or parts due to limitation in raw material purification technology or technical difficulty in the course of substance compounding, therefore, cannot be completely removed, are managed by setting maximum concentration value.

3.7 Exceptions of Regulation Application

Exceptions of regulation application refers to the cases in which use of a fixed level of environment-related substance is intentionally allowed because it is considered that alternative items are not possible with the currently available technologies, or social impact by the occurrence of an accident after alternation is expected too big.

3.8 Composition Table

Composition table is the basic analysis data on raw materials and substances of parts and products supplied to LG Electronics, of which checking of constituting elements and environment-related substance contents in the natural state is possible. Composition table is secured and managed by cooperating suppliers. Upon request from LG Electronics, cooperating suppliers are to submit this document (Ex.: MSDS or MILL sheet, Material Composition etc)

3.9 Homogeneous materials

Referring to the minimum constituting unit of parts made with the same material, homogenous materials cannot be separated into different substances by mechanical methods of unfastening screws, cutting, crushing, pulverizing and grinding, etc. Paints and painted parts are not homogeneous materials and are to be considered different from each other. Therefore, concentration of environment-related substances in painted and plated layers must be analyzed by measuring the weight of these payers.

3.10 Chemical substance

A chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition

3.11 HSMS (Hazardous Substances Management System)

As system managed hazardous substances information in products and parts, request for concerned substances information to suppliers in process of product development. Suppliers have to input for hazardous substances by homogeneous materials.

4. Standard for management of hazardous substances

4.1 Level A list (Substances prohibited to use)

Type	Substances	Regulation
Level A-I	Lead and its compounds	EU RoHS Directive EU Battery Directive EU Packaging Directive US California. Proposition 65 EU REACH Regulation
	Cadmium and its compounds	EU RoHS Directive EU Battery Directive EU Packaging Directive EU REACH Regulation
	Mercury and its compounds	EU RoHS Directive EU Battery Directive EU Packaging Directive EU REACH Regulation
	Hexavalent chromium and its compounds	EU RoHS Directive EU Packaging Directive EU REACH Regulation
	PBB (Polybrominated biphenyls)	EU RoHS Directive EU REACH Regulation
	PBDE (Polybrominated diphenyl ethers)	EU RoHS Directive EU REACH Regulation
Level A-II	Polychlorinated biphenyls (PCBs)	OSPAR Priority Chemicals EU REACH Regulation
	Polychlorinated naphthalenes (PCNs)	EU REACH Regulation
	Polychlorinated terphenyls (PCTs)	OSPAR Priority Chemicals EU REACH Regulation
	Pentachlorophenol (PCPs)	EU REACH Regulation
	chlorinated paraffin (SCCP/MCCP) (Short-chain chlorinated paraffin, C10-13/ Medium-chained chlorinated paraffin, C14-C17)	EU REACH Regulation
	Perfluoro compounds PFOS(Perfluoro octane sulfonate) PFOA (Perfluoro octanoic acid)	OSPAR Priority Chemicals EU REACH Regulation
	Nickel and its compounds	EU REACH Regulation
	Asbestos	EU REACH Regulation
	Specific azo compounds	EU REACH Regulation

	Ugilec 121, 141, DBBT	EU REACH Regulation
	Specified organic tin compounds	EU REACH Regulation
	Arsenic and its compounds	EU REACH Regulation
	Ozone layer depleting / global warming substances	Montreal/Kyoto Protocol EU REACH Regulation
	PAHs	EU REACH Regulation Germany GS mark
	Formaldehydes	ChemG (Germany) Formalin Act (Denmark)
	Dimethylfumarate (DMF)	2009/251/EC Directive

Note.

(1) Level A substances are prohibited of intentional use in all products, parts, raw materials, subsidiary materials and packaging materials supplied from cooperating suppliers to LG Electronics. For impurities, which cannot be completely removed due to technical problems, the maximum allowable concentration level has been suggested in “5. Detailed Standard of Environment-related Substance Management”.

① Level A-I : 6 substances regulated by RoHS Directive 2002/94/EC

② Level A-II : Substances regulated by regulations or agreements except RoHS Directive 2002/94/EC

4.2 Level B list (to be reduced and curtailed)

Type	Substances	Application	
		Product	Time
Level B	PVC, Poly vinyl chloride	Mobile phone	2010 ~
		TV, Monitor, PC	~ 2012
		others	~ 2014
	Other (Except PBB, PBDE) Bromated Flame Retardants (TBBPA)	Mobile phone	2010 ~
		TV, Monitor, PC	~ 2012
		others	~ 2014
	Phthalates	Mobile phone TV, Monitor, PC	~ 2012
		others	~ 2014
	Antimony and its compounds	Mobile phone TV, Monitor, PC	~ 2012
		others	~ 2014
	Beryllium and its compounds	All products	~ 2012
	Cobalt and its compounds, including alloy		under consideration
	Musk fragrance substances	-	under consideration
	Selenium and its compounds, including alloy	-	under consideration
	Bismuth and its compounds, including alloy	-	under consideration
	Halogen compounds	-	under consideration
	Volatile Organic Compound	-	under consideration
	Bisphenol A	-	under consideration
Triclosan	-	under consideration	
Surfactant	-	under consideration	
Chlorinated flame retardants	-	under consideration	

Note.

(1) Time for an application means launching new developed product. Some parts which can't substitute with technical problem will be applied in time it can find suitable alternatives.

4.3 Submission of environment-related substance analysis data

Cooperating suppliers are to upload the following datum in HSMS so that to check the status of prohibited substance content in all constituting parts and raw materials of a product at the time of new product approval, 4M modification in mass production items and warehousing the initial quantity of mass production lot. In case of be requested by company (or division), suppliers have to submit concerned documentation.

1) At the time of new approval and 4M modification of constituting parts in mass production items

- ① Environment-related substance analysis report *
 - submit analysis report in a term of validity**
- ② Non-use certificate
- ③ Composition table (MSDS or Mill sheet or Material Composition)
- ④ Sample submission (more than 5, raw material condition when necessary)*

* In case of be requested by company (or division), submit to directly department of examination for hazardous substances

** The term of validity for Analysis report follow a standard operating by each company(or division)

2) At the time of warehousing initial quantity of mass production lot

- ① semi analysis result (XRF etc) *
- ② Sample submission (more than 5, raw material condition when necessary) *

* In case of be requested by company (or division), submit to directly department of examination for hazardous substances

3) Periodical guarantee of parts for mass production

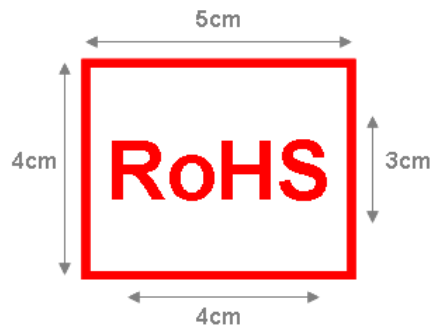
- ① Environment-related substance analysis report
 - Immediately renewal for term of validity expired**
- ② semi analysis result (XRF etc) *
- ③ Sample submission (more than 5, raw material condition when necessary)*

* In case of be requested by company (or division), submit to directly department of examination for hazardous substances

** The term of validity for Analysis report follow a standard operating by each company(or division)

4.4 Identification of RoHS free mass production parts

The parts satisfied with detailed standard of Level A-I, environment-related substance management of LG Electronics should be basically provided with identification mark like below figure on packaging materials such as packaging box for special management, at the time of warehousing materials of mass production lot and initial quantity for mass production. But, it is possible to use different identification mark by prior consultation with LG Electronics.



① Size

- self-decision well-recognizably
- the above size is recommended for large packaging
- smaller size is possible for small packaging and reel

② Color

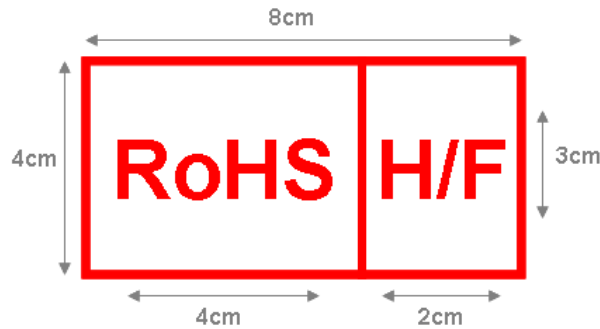
- red color is basically recommended for letter and boundary
- black color is allowed for printed marking on label

③ Marking position and attaching method

- Well-recognizable shape outside packaging (printing/stamp/label etc.)
- Attach up to small packaging and reel for small circuits like IC and Chip SIZE

4.5 Identification of Halogen free mass production parts

The parts satisfied with detailed standard of Level A-I and Halogen (Br, Cl), environment-related substance management of LG Electronics should be basically provided with identification mark like next figure on packaging materials such as packaging box(carton box, inner box, reel etc.) for special management, at the time of warehousing materials of mass production lot and initial quantity for mass production. But, it is possible to use different identification mark by prior consultation with LG Electronics.



① Size

- self-decision well-recognizably
- the above size is recommended for large packaging
- smaller size is possible for small packaging and reel

② Color

- red color is basically recommended for letter and boundary
- black color is allowed for printed marking on label

③ Marking position and attaching method

- Well-recognizable shape outside packaging (printing/stamp/label etc.)
- Attach up to small packaging and reel for small circuits like IC and Chip SIZE

But, this mark is firstly applicable for mobile phone, recommend usage of this mark to other company (or division)

4.6 Environment-related substances exceeds the maximum allowable

In case content level of environment-related substances exceeds the maximum allowable concentration level specified in “5. Detailed Standard for managing of Environment-related Substance”

- 1) Products and parts containing the 6 environment-related substances specified in RoHS Directives (Level A-1 substances) are to be rejected in importation test and parts approval process as well as to be suspended of transaction as of Apr. 1, 2005. Cooperating suppliers are to prepare and submit an improvement plan for the parts concerned, thus are to administer improvement in accordance with the presented schedule.
- 2) Substances prohibited to use (Level A-II) other than the 6 environment-related substances specified in RoHS Directives must not be used in parts and products. Upon detection of such substances used, supply of the parts and products concerned must be suspended immediately.
- 3) In case the maximum allowable concentration level is not specified and the content level is Indicated as ‘No Detection’, the cooperating suppliers are to verify that the corresponding substances are not used in parts/ products, packaging materials and batteries supplied (non-use certificate: MIL-Sheet, MSDS, or Raw material certificate etc.).

4.7 Reduced and curtailed Substances (Level B)

As these substances required continuous monitoring and management upon their current status of use, restriction measures for the used quantity at the current point in time are not administered. But suppliers have to follow up the applicable or phased out timeline announced by LG electronics. For applicable products by each substance, suppliers must meet standard defined in “5. Detailed standard for managing of environment-related substances” to trade with.

5. Detailed standard for managing of environment-related substances

[Common Particulars]

- ① An environment-related substance analysis report and composition table, etc. must be submitted with which the content of Level A-I substances (the 6 environment-related substances restricted by RoHS) specified below can be checked at the stage of part approval. Although an analysis report or composition table, etc. is not required for Level A-II substances at the stage of part approval, such document must be submitted upon separate request by LG Electronics.
- ② The data of evidence must be upload in HSMS by the CAS No., the percentage of material and purpose of usage for detailed chemical substances used for all homogeneous materials.
- ③ Prohibition of use refers to prohibiting intentional use of the substances concerned. The level of content, which is inevitably contained as impurities, must satisfy the Maximum Allowable Concentration Level.
- ④ Fundamentally, the joint standards specified below must be observed. In case separate standards are requested by Division currently supplied with parts and products, Division standard must be observed with priority.

5.1 Level A-I Substances

(1) Pb, Lead and its compounds

a. Maximum Allowable Concentration Level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
① plastic, rubber, painting, ink, coating, adhesives, tape, label, paper		100 mg/kg
② Solder (bar/wire/cream solder, Solder ball), Pb inside of lead-wire plating of parts		800 mg/kg
③ all parts except ① and ②		500 mg/kg
Main Containing Purpose	rubber hardener, pigment, paint and varnish, lubricant, plastic stabilizer, battery material, free cutting brass/carbon steel, optics materials, soldering, rubber vulcanizing agent, derivative material, resin stabilizer, plating material, alloy element, resin additives	
Harmfulness	the central nerve damage, joint weakening, high blood pressure, brain damage, sterility and miscarriage, sperm reducing by tissue damage	
Analyzing method	IEC 62321 (Ed. 1 111/116/FDIS), EPA 3051, EPA 3052, EPA 3050B, ASTM E350 * If waste matter is occurred by applying EPA 3052, EPA 3050B, analyze with complete disassembly and declare analyzing process	
Measurement	ICP-AES/OES, AAS, ICP-MS	

1) Included in conditions of The condition of REACH restriction(Annex 17)

b. Exceptions of regulation application

- Solders of high melting point to contain 85wt% or more of lead
- Lead contained in electronic ceramic parts
 - *Applicable Parts: Piezoelectric materials, dielectric materials, magnetic materials and ferrites
- Lead contained in optical glass and filter glass
- Batteries and battery packs containing 0.4wt% or less of lead
- Metallic alloys containing 0.35 wt% or less of lead
- Aluminum alloys containing 0.4 wt% or less of lead
- Copper alloys (brass and fluorescent bronze alloys included) containing 4 wt% or less of lead
- Lead contained in solders used for server, storage and storage array system
- Lead contained in solders of communication-related network devices, switching devices, signaling devices and transmission-related network infrastructures
- Lead contained in cathode-ray tubes, electrical parts and fluorescent tubes, etc.
- Lead contained in compliant-pin VHDM (Very High Density Medium) connector system
- Lead used as coating materials in thermal conduction module c-ring
- Solders consisting of more than two elements for the connection between the pins and the package of microprocessors with a lead content of more than 80 % and less than 85% by weight.
- Solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages.
- Lead in linear incandescent lamps with silicate coated tubes
- Lead halide as radiant agent in High Discharge (HID) lamps used for professional reprography applications
- Lead as activator in the fluorescent powder (1% lead by weight or less) of discharge lamps when used as sun tanning lamps containing phosphors such as BSP (BaSi₂O₅:Pb) as well as when used as special lamps for diazo-printing reprography, lithography, insect traps, photochemical and processes containing phosphors such as SMS ((Sr,Ba)₂MgSi₂O₇:Pb)
- Lead with PbBiSn-Hg and PbInSn-Hg in specific compositions as main amalgam and with PbSn-Hg as auxiliary amalgam in very compact Energy Saving Lamps (ESL)
- Lead oxide in glass used for bonding front and rear substrates of flat fluorescent lamps used for Liquid Crystal Displays (LCD)
- Lead and Cadmium of printing ink for enamel coating on borosilicate glass
- Lead as impurities of RIG Faraday rotator used for optical communication system (Until 2009.12.31)
- Lead used for connecting fine pitch and NiFePb frame connector which is less than 0.65mm
- Lead used for connecting fine pitch and CuPb frame connector which is less than 0.65mm
- Lead contained in solder used for connecting disk-shaped flat ceramic multilayer condenser with machine
- Lead oxide used for Dielectric-layer of front and back side for PDP and SED, bus electrode, the black stripe, address electrode, partition, the seal frit and frit ring, and printing paste
- Lead oxide contained in glass used for seaming Black Light Blue (BLB) lamp
- Lead alloy used for connecting converter of a large output speaker (operating some time with

more than 125 dB)

- Lead contained in crystal glass regulated by 69/493/EEC Annex 1
- Lead in solders for the soldering of thin copper wires of 100 µm diameter and less in power transformers.
- Lead in cermet-based trimmer potentiometer elements.
- Lead in the plating layer of high voltage diodes on the basis of a zinc borate glass body.

(2) Cd, Cadmium and its compounds

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
① rubber, plastic, paints, inks, and plastic surface treatment, adhesives, tape, label, paper		10 mg/kg
② all parts except ①		75 mg/kg
Main Containing Purpose	pigment, corrosion-resisting surface treatment, electric/electronic materials, optics materials, stabilizer, plating material, resin pigment, fluorescent material for optical glass, electrode, soldering materials, electrical contacts	
Harmfulness	stomach cramps, the kidney damage, high blood pressure, serum ferritin reducing, the central nerve and brain damage	
Analyzing method	IEC 62321 (Ed. 1 111/116/FDIS), EPA 3052, EPA 3050B, EN1122, ASTM E 351 * If waste matter is occurred by applying EPA 3052, EPA 3050B, analyze with complete disassembly and declare analyzing process	
Measurement	ICP-AES/OES, AAS, ICP-MS	

1) Included in conditions of REACH restriction (Annex 17).

b. Exceptions of regulation application

- In case substituting materials do not exist for electronic contact plating to require high degree of safety standard and reliability in electric/ electronic and mechanical devices
- Cadmium contained in filter glass and optical glass
- Cadmium in photoresistors for optocouplers applied in professional audio equipment until 31 December 2009.
- Cadmium and cadmium oxide in thick film pastes used on aluminium bonded beryllium oxide

(3) Hg, Mercury and its compounds

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
Interior and exterior plastic, paint and varnish, ink, coating/soldering, wattmeter, electrical contacts (relay, switch, sensor)		500 mg/kg
Main Containing Purpose	fluorescent material, electrical contacts material, pigment, anti-corrosion preparation, high efficiency illuminant, antibiosis treatment	
Harmfulness	vomiting, wheal, eye spasm, the kidney and brain damage, visually handicap, loss of eyesight, failing of memory	
Analyzing method	IEC 62321 (Ed. 1 111/116/FDIS), EPA 3052, ISO 3856-7, EN12497	
Measurement	ICP-AES/OES, AAS, ICP-MS	

1) The condition of REACH restriction : any totally or partly submerged appliances or equipment, in the preservation of wood, in the impregnation of heavy-duty industrial textiles and yarn intended for their manufacture, in the treatment of industrial waters/irrespective of their use. (Annex 17)

b. Exceptions of regulation application

- Lamps other than small-sized and straight-tube varieties (Ex.: High-pressure mercury lamp)
- Small-sized fluorescent lamps containing less than 5 mg (per lamp) of mercury
- Straight-tube fluorescent lamps containing less than 5 mg (per lamp) of mercury
 - * Halophosphate 10mg/lamp, triphosphate 5mg/lamp of average lifespan, triphosphate 8mg/lamp of long-term lifespan, straight fluorescent lamps for special purpose
- Mercury used as a cathode sputtering inhibitor in DC plasma displays with a content up to 30 mg per display until 1 July 2010.

(4) Cr⁺⁶, Hexavalent chromium and its compounds

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
① plastic, rubber, painting, ink, non-plating parts as metal/plastic coating ¹⁾		500 mg/kg
② Hexavalent chromium surface treatment parts (Screw, Bolt, Nut, plate etc.) and electroplating ²⁾		Not Detected (ban to use)
③ soluble Cr6+ of the cement ^{3,4)}		the total dry weight ≤ 0.0002%
Main Containing Purpose	paints, pigment, ink, catalyzer, plating, corrosion protection surface treatment, dyes, pigment desiccant, surface treatment, chromate treatment, adhesion improvement for pigment	
Harmfulness	sniff, sneeze, nose bleeding, tumor, convulsions, asthma, lung cancer, the kidney and liver damage, sudden death	
Analyzing method	IEC 62321 (Ed. 1 111/116/FDIS), EPA 3060, ISO 3613	
Measurement	UV-VIS, IC	

- 1) For ① parts like plastic and rubber, if total Cr(measured by ICP or AAS) could not be detected, that data can be the Cr6+ data.
- 2) Every surface treatment parts must not use Cr6+ intendedly, and Cr6+ should not be detected on electroplating. For close analysis for parts, standard for Not Detected (ban to use) is detection limit standard of each analyzing regulation.
- 3) Prohibit intentionally using Cr6+, and Cr3+ chromate limit value is 3mg/kg.(in close analysis by part)
- 4) Included in conditions of REACH restriction (Annex 17).

b. Exceptions of regulation application

- When used as corrosion preventative agent for carbon steel refrigeration system in combined refrigeration devices
- Cr6+ of electromagnetic wave shield used for equipments from 2002/96/EC classification 3, and corrosion preventative coating used for fasteners and metal sheet without corrosion preventative painting. This exception is admitted until July 1st 2007.

(5) PBB (Polybrominated biphenyls)

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
plastic		500 mg/kg
Main Containing Purpose	flame retardants	
Harmfulness	Abnormal symptom on skin, loss of hair, weight losses, the central nerve, liver, kidney, thyroid gland, and immune system damage	
Analyzing method	IEC 62321 (Ed. 1 111/116/FDIS)	
Measurement	GC/MS	

1) Included in conditions of REACH restriction (Annex 17).

(6) PBDE (Polybrominated diphenylethers)

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
plastic		500 mg/kg
Main Containing Purpose	flame retardants	
Harmfulness	Abnormal symptom on skin, loss of hair, weight losses, the central nerve, liver, kidney, thyroid gland, and immune system damage	
Analyzing method	IEC 62321 (Ed. 1 111/116/FDIS)	
Measurement	GC/MS	

1) The condition of REACH restriction : Shall be prohibited in a concentration equal to or greater than 0,1 % in substances and constituents of preparations placed on the market. (Annex 17)

5.2 Level A-II Substances

(1) Polychlorinated biphenyls (PCBs), Polychlorinated Naphthalenes (PCNs), Polychlorinated Terphenyls (PCTs)

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts ^{1), 2)}		50 mg/kg
Main Containing Purpose	<ul style="list-style-type: none"> - plasticizer for insulating oil, heat medium, specific lubricant, insulating properties, and heat-resisting insulation of transformer/condenser/paper condenser - machine oil, plasticizer, pigment, copy paper as heat medium, which need heat like 200 ~ 400 °C - flame retardant pigment, Chlorinated Rubber pigment, vinyl pigment, polyurethane pigment, pigment (weatherproofed, polish, insulation), printing ink 	
Harmfulness	Abnormal symptom on skin, loss of hair, weight losses, the central nerve, liver, kidney, thyroid gland, and immune system damage	
Analyzing method	EPA 8082 etc	
Measurement	GC/MS	

1) Polychloronaphthalence (PCN) is prohibited to use in case that the number of chlorine is more than 4

2) Included in conditions of REACH restriction (Annex 17).

(2) Pentachlorophenol (PCP)

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts ¹⁾		1000 mg/kg
Main Containing Purpose	Embalmmnt and preservative for processed goods	
Harmfulness	High epispastic, Acute Oral Toxicity, dermal toxicity, cancer-causing, and more poisonous cancer-causing material is occurred by incineration	
Analyzing method	DIN 53313	
Measurement	GC/MS	

1) Included in conditions of REACH restriction (Annex 17).

(3) SCCP/MCCP (Short-chain chlorinated paraffin, C10-13/ Medium-chained chlorinated paraffin, C14-C17)

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
All parts		1000 mg/kg
Main Containing Purpose	PVC plasticizer, flame retardant	
Harmfulness	Cancer-causing, possible to generate dioxin by incineration	
Analyzing method	EPA 3540C, 3550C etc., Extraction with organic solvent etc	
Measurement	GC/MS	

1) The condition of REACH restriction : Shall not be placed on the market for use as substances or as constituents of other substances or preparations in concentrations higher than 1 %: in metalworking / for fat liquoring of leather. (Annex 17)

(4) Perfluorooctyl compounds(Perfluorooctyl sulfonate, PFOS / Perfluorooctyl acid , PFOA)

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
Substance and Preparation		50 mg/kg
Article and parts		1000 mg/kg
Textiles, coating material		1 µg/m ²
Main Containing Purpose	PFOS (carpet, textiles, cotton, leather, clothes, paper packaging, Metal plating, Fire fighting foam) PFOA (fire fighting foam, antiseptic)	
Harmfulness	High persistent, Bioaccumulative, toxicity for mammalia	
Analyzing method	Solvent Extraction	
Measurement	LC-MS	

1) Exceptions of regulation application for PFOS

- photoresist or anti-reflection coating use for photolithography
- coating for photo used for film and paper print lithography
- mist suppressants for nondecorational chrome plating
- aircraft hydraulic fluid

(5) Nickel and its compounds

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
Exterior plating parts contact with customer body continuously (earphone, necklace, handle, mobile phone, etc.)		0.5 $\mu\text{g-Ni}/\text{cm}^2/\text{week}$
Main Containing Purpose	coating or alloy compounds, surface treatment(coating), bottom layer coating of parts, protecting coating, accessory coating	
Harmfulness	Allergy stimuli	
Analyzing method	EN 1811, EN 12471, EN 12472	
Measurement	ICP-AES/OES, AAS, ICP-MS	

1) The condition of REACH restriction : banned to use on parts, materials, and surface treatment which contact with the skin directly. (Annex 17)

(6) Asbestos

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
Fire-resistant, lagging materials, heat insulator, electric insulator, filter		Not Detected
Main Containing Purpose	Asbestos fibers, insulator, packing material, abrasive material, heat insulating material, fireproof material	
Harmfulness	Lung cancer, Asbestosis	
Analyzing method	NIOSH 9000, NIOSH 9002, NIOSH 7402 etc	
Measurement	XRD, PLM, TEM	

1) Included in conditions of REACH restriction (Annex 17).

(7) Azo compounds

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
Textiles and leather contact with customer body continuously (belt, leather strap, earphone, headphone, shoulder pad, etc.)		30 mg/kg
Main Containing Purpose	Paint, pigment, coloring agent for textiles and leather	
Harmfulness	Azo dyes is absorbed into human body through sweat, and then body enzyme decomposes azo dyes, and the decomposed azo dyes produces aromatic amine compounds which are carcinogenic substance	
Analyzing method	Leather : CEN ISO/TS 17234, Textiles : EN 14362-1,2	
Measurement	GC/MS	

1) The condition of REACH restriction : shall not be placed on the market or used for coloring textile and leather articles as a substance or constituent of preparations in concentrations higher than 0,1 % by mass, and azodyes over 30mg/kg shall not be used in textile and leather articles which may come into direct and prolonged contact with the human skin or oral cavity. (Annex 17)

(8) Ugilec 121, 141, DBBT

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts ¹⁾		Not Detected
Main Containing Purpose	electric transformer insulating oil, plasticizer, flame retardants, excavator antifricition	
Harmfulness	Non resolvability, possible to generate dioxin, all most production stop since 1990's	
Analyzing method	Solvent Extraction	
Measurement	GC/MS	

1) Included in conditions of REACH restriction (Annex 17).

(9) Organic tin compounds

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts ¹⁾		1000 mg/kg
Main Containing Purpose	PVC stabilizer, antioxidant, antifungal, antipollution, Painting, ink, sterilizer, antiseptic, Antifoulant biocides	
Harmfulness	Wild ecosystem destruction, cancer-causing, nerve disorder materials, immune system disorder materials	
Analyzing method	DIN 17353, KS K 0737 etc.	
Measurement	GC-MS	

1) The condition of REACH restriction: paint, Shall not be placed on the market for use as substances and constituents of preparations when acting as biocides in free association paint. Shall not be any totally or partly submerged appliance or equipment and preparations intended for use in the treatment of industrial waters. (Annex 17)

(10) Arsenic and its compounds

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
All parts ²⁾		100 mg/kg
Main Containing Purpose	Paint, ink, sterilizer, wood preservative	
Harmfulness	vomiting, skin browning/blackening, red blood cell reducing, loss of appetite, enlarged spleen, dry eruption	
Analyzing method	EPA 3052 (Microwave digestion) etc	
Measurement	ICP-AES/OES, AAS, ICP-MS	

1) The condition of REACH restriction: Shall not be any totally or partly submerged appliances or equipment; (b) in the preservation of wood. Furthermore, wood so treated shall not be placed on the market. (Annex 17)

2) Exemption for parts of semiconductor and glass of modules in LCD

(11) Ozone layer depleting / global warming substances

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
All parts		Not Detected
Main Containing Purpose	refrigerant, foaming agent, digestive, detergent	
Analyzing method	EPA5021A, PNNL-16813	
Measurement	GC-MS, GC-ECD	

1) Included in conditions of REACH restriction (Annex 17).

(12) PAHs (Polycyclic aromatic hydrocarbons)

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
Rubber, plastic, rubber foam used in parts possible contact in body, polymer		Not Detected
Main Containing Purpose	Cable, Plug, Plastic shaft, Plastic package, box, Strange smell plastic, Rubber product, Rubber shaft, coating agent	
Harmfulness	DNA change, harmful , mutation, cancer	
Analyzing method	EPA 8100, EPA 3540C/8270D, ISO 187287 etc	
Measurement	GC-MS	

1) The condition of REACH restriction: Shall not be used in tier (Annex 17)

(13) Formaldehydes

a. Maximum allowable concentration level

Regulated parts and materials		Maximum allowable concentration level
Wooden products like HWPW-VC / HWPW-CC / PB / MDF, (Fiberboard, plywood, speaker, shelf, etc.)		0.08 ¹⁾ / 0.08 / 0.18 / 0.21 mg/kg
Other product and parts (adhesive, vinyl, tape etc.)		0.1 mg/kg or 0.15 mg/m ³
Main Containing Purpose	Wooden product, adhesives, sterilizer, antiseptic, coating agent	
Harmfulness	Cancer-causing, promoting cancer-causing, atopic dermatitis, allergy	
Analyzing method	VDA275, DIN53315, ISO 16000 etc. Chamber	
Measurement	HPLC-UV, UV-VIS	

1) In case of HWPW-VC, apply to 0.05 mg/kg from 1. Jan. 2010

(14) Dimethylfumarate (DMF)

a. Maximum allowable concentration level

Regulated parts and materials		Maximum allowable concentration level
All parts		Not Detected
Main Containing Purpose	leather, insecticide treatment in wrapped fiber product or must protection agent	
Harmfulness	easily passing skin due to strong fat-solubility strong stimulus into eyes, eczema	
Analyzing method	Solvent Extraction	
Measurement	GC-MS	

5.2 Level B Substances

(1) PVC, Poly vinyl chloride

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts		Not Detected
Main Containing Purpose	Insulation, poly vinyl electric wire, tube, power supply code	
Harmfulness	1. plasticizer, stabilizer, filler, lubricant, and coloring agent are used on processing stage, and there are lots of hazardous substances which can cause nervous system damage, immune system abnormal condition, Peripheral Vascular abnormal condition, liver cancer 2. lots of hydrogen chloride could be occurred by pyrolyzing PVC 3. experiments on animals discover that long-term exposure causes damage on sperm and testicles	
Analyzing method	Beilstein-Test or IR (infrared rays Spectroscopy)	
Measurement	-	

(2) Other (Except PBB, PBDE) Bromated Flame Retardants (TBBPA)

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
All parts contain plastic including flame retardant		HBCDD 1000 mg/kg others : 900 mg/kg (Total Br)
Main Containing Purpose	Plastic as PCB	
Harmfulness	EU regulated as potential hazardous substance, Possible to be decomposed into Endocrine disruptor	
Analyzing method	EN 14582, EPA 3052	
Measurement	GC-MS, AOF-IC, Oxygen Bomb	

1) The condition of REACH restriction : Tris(2,3 dibromopropyl) phosphate Shall not be used in textile articles, such as garments, undergarments and linen, intended to come into contact with the skin. (Annex 17)

(3) Phthalates and its compounds, including alloy

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
All parts		1000 mg/kg
Main Containing Purpose	Plasticizer to be soften plastic	
Harmfulness	lung, kidney, heart, blood harmful, deformed birth, genital generation repression	
Analyzing method	KS M 1991, ASTM D 3421	
Measurement	GC-MS	

1) The condition of REACH restriction : Shall not be used as substances or as constituents of preparations, at concentrations higher than 0,1 % by mass of the plasticized material, in toys and childcare articles1. (Annex 17)

(4) Antimony and its compounds, including alloy

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
All parts contain plastic including flame retardant ¹⁾		1000 mg/kg
Main Containing Purpose	pigment, dye, catalyzer, flame retardant, stabilization, optical lens, solder, ink	
Harmfulness	pneumoconiosis, physiology problem, premature birth, abortion	
Analyzing method	EPA 3052	
Measurement	ICP-AES/OES, AAS, ICP-MS	

1) Exemption for antimony used except of flammability purpose.

(example) antimony used for shape capability of varistor's ceramic body, polymerization catalyzer of PET

(5) Beryllium and its compounds, including alloy

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts		BeO : Not detected others : 1000 mg/kg
Main Containing Purpose	Ceramic materials, alloy, catalyzer, electrodes, molds, electrical contacts, spring materials	
Harmfulness	carcinogenity, mutagenicity, toxicity for reproduction	
Analyzing method	EPA 3052	
Measurement	ICP-AES/OES, AAS, ICP-MS	

(6) Cobalt and its compounds, including alloy

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts		1000 mg/kg
Main Containing Purpose	alloy, magnetic material, binder, glass/ceramics blue pigment	
Harmfulness	carcinogenity, skin stimulation, aquatic ecosystem disturbance	
Analyzing method	EPA 3052	
Measurement	ICP-AES/OES, AAS, ICP-MS	

(7) Musk fragrance substances

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts		Not detected
Main Containing Purpose	perfume, detergent, fabric conditioner, air cleaner, home washing, scentless product	
Harmfulness	Endocrine disruptors	
Analyzing method	EPA 3540C etc. Solvent Extraction	
Measurement	GC-MS	

(8) Selenium and its compounds, including alloy

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts		1000 mg/kg
Main Containing Purpose	Semiconductor materials, photosensitive materials, pigment, paint, photo-receiving device	
Harmfulness	carcinogenity, mutagenicity, toxicity for reproduction	
Analyzing method	EPA 3052	
Measurement	ICP-AES/OES, AAS, ICP-MS	

(9) Bismuth and its compounds, including alloy

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts		1000 mg/kg
Main Containing Purpose	Lead free solder, semiconductor terminal plating, electrodes, lead alloys	
Harmfulness	Endocrine disruptors	
Analyzing method	EPA 3052	
Measurement	ICP-AES/OES, AAS, ICP-MS	

(10) Halogen compounds

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts contain plastic		1500 mg/kg (Total Halogen) 900 mg/kg (Total Br) ¹⁾ 900 mg/kg (Total Cl)
Main Containing Purpose	-	
Harmfulness	mucous membrane damage in inhalation, cardiovascular, respiratory damage in long time exposure	
Analyzing method	EN 14582	
Measurement	AOF-IC, Oxygen Bomb	

b. Exceptions of regulation application

- Br compounds
 - RoHS compliance Display back light foil (BEF) (non flame retardant)
 - Activator in solder
- Cl compounds
 - PA, PAA, PPS, PBT plastics and metal paint primer (including basecoats)
 - Inks and decoration foil
 - Polyphenylene sulfide plastics (under 0.5%)
 - Zinc chloride in adhesive tape
 - Colorant in Plastic

(11) Volatile Organic Compound

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
Adhesive, paint		1000 mg/kg
Main Containing Purpose	solvent (toluene, benzene)	
Harmfulness	Atopy, allergy, head ache, lethargic	
Analyzing method	EPA 5012 A	
Measurement	Headspace-GC-MS	

1) The condition of REACH restriction : Shall not be placed on the market or used as a substance or constituent of preparations in a concentration equal to or higher than 0,1 % by mass in adhesives and spray paints intended for sale to the general public (Annex 17)

(12) Bisphenol A

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts contain plastic		25 mg/kg
Main Containing Purpose	PC raw material, Epoxy Resin raw material	
Harmfulness	Endocrine disruptors, sperm decapacitation, feminization, nerve developmental disability	
Analyzing method	EPA 3540C etc. Solvent Extraction	
Measurement	HPLC/UV, GC-/MS	

(13) Triclosan

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
All parts		10 mg/kg
Main Containing Purpose	anti-microbial agent, insecticide agent, anti-bacteria agent in plastic	
Harmfulness	Skin stimulation, immunity capability weakening, carcinogenic, procreation damage in dioxin substance	
Analyzing method	EPA 3540C etc. Solvent Extraction	
Measurement	GC-MS	

(14) Surfactant

a. Maximum allowable concentration level

Regulated parts and materials		Maximum Allowable Concentration Level
cleaner		1000 mg/kg
Main Containing Purpose	Purpose of cleaner, sweeping, treatment	
Harmfulness	human, aquatic ecosystem toxic, non bio degradable	
Analyzing method	Solvent Extraction	
Measurement	LC-MS	

1) Shall not be used over 0.1w/w% in industrial clean, leather treatment

(15) Chlorinated flame retardants

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
All parts contain plastic		900 mg/kg
Main Containing Purpose	Plastic as PCB	
Harmfulness	EU regulated as potential hazardous substance, Possible to be decomposed into Endocrine disruptor	
Analyzing method	Solvent extraction	
Measurement	GC-MS	

5.3 Standard for management of hazardous substances for Packaging Materials

a. Maximum allowable concentration level

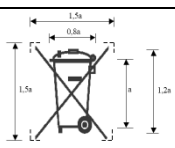
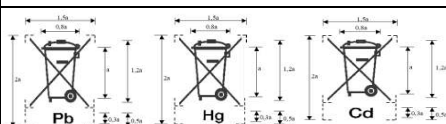
Regulated parts and materials	Maximum Allowable Concentration Level
Packaging materials for all products on market	Pb, Cd, Hg, Cr+6 total 100 mg/kg (Cd under 50mg/kg managed separately) Br 900 mg/kg, Cl 900 mg/kg

b. Exceptions of regulation application

- ① packaging materials made from Lead crystal glass

5.4 Standard for management of hazardous substances for Battery and Battery Pack

a. Maximum allowable concentration level

Regulated parts and materials ¹⁾		Maximum Allowable Concentration Level
① Pb and its compounds	Carbon zinc, Alkaline battery	2000 mg/kg
	The other all battery	4000 mg/kg
② Cd and its compounds		20 mg/kg
③ Hg and its compounds	Carbon zinc, Alkaline battery	1 mg/kg
	The other all battery	5 mg/kg exemption) button cell 2%
Marking	Not including hazardous substances	
	Including hazardous substances ²⁾	

1) Above the spec. is regulation for Battery Cell, and instrument/circuit parts used in Battery Pack have to be followed standard stated in 5.1)~2) items.

2) Above the spec. is based on the weight of battery Cell, and the name of substance have to marked on in case of that is above Pb 40, Cd 20, Hg 5mg/kg.

Appendix 1. Chemical substances list

(1) Pb, Lead and its compounds

Name	Chemical symbol	CAS No.
Lead	Pb	7439-92-1
Lead(II) carbonate	PbCO ₃	598-63-0
Lead(IV) oxide	PbO ₂	1309-60-0
Lead(II,IV) oxide	Pb ₃ O ₄	1314-41-6
Lead(II) sulfide	PbS	1314-87-0
Lead azide	Pb(N ₃) ₂	13424-46-9
Lead(II) oxide	PbO	1317-36-8
Lead(II) fluoride	PbF ₂	7783-46-2
Lead(II) chloride	PbCl ₂	7758-95-4
Lead(IV) chloride	PbCl ₄	13463-30-4
Lead(II) carbonate basic	Pb ₃ (CO ₃) ₂ (OH) ₂	1319-46-6
Lead(II) iodide	PbI ₂	10101-63-0
Lead hydroxycarbonate	(PbCO ₃) ₂ Pb(OH) ₂	1344-36-1
Lead(II) cyanide	Pb(CN) ₂	592-05-2
Lead(II) fluoroborate	Pb(BF ₄) ₂	13814-96-5
Lead(II) fluosilicate	PbSiF ₆	25808-74-6
Lead(II) sulfate	PbSO ₄	7446-14-2
Lead(II) phosphate	Pb ₃ (PO ₄) ₂	7446-27-7
Lead thiocyanate	Pb(SCN) ₂	592-87-0
Lead(II) chromate	PbCrO ₄	7758-97-6
Lead(II) titanate	PbTiO ₃	12060-00-3
Lead(II) acetate, trihydrate	Pb(CH ₃ COO) ₂ 3H ₂ O	6080-56-4
Lead(II) acetate	Pb(CH ₃ COO) ₂	301-04-2
Lead(II) metaborate	Pb(BO ₂) ₂ H ₂ O	10214-39-8
Lead metasilicate	PbSiO ₃	11120-22-2
Lead silicate	H ₂ O ₃ Si.xPb	22569-74-0
Lead antimonite	Pb(SbO ₄) ₃	13510-89-9
Lead hydrogen arsenate	PbHAsO ₄	7784-40-9
Lead(II) arsenite	Pb(AsO ₂) ₂	10031-13-7
Lead(IV) acetate / Lead tetraacetate	Pb(C ₂ H ₃ O ₂) ₄ / C ₈ H ₁₂ O ₈ Pb	546-67-8
Sulphuric acid, lead salt	PbSO ₄	15739-80-7
Lead sulfate, tribasic	Pb ₄ SO ₇ / PbSO ₄ (PbO) ₃	12202-17-4

Lead nitrate	$\text{Pb}(\text{NO}_3)_2$	10099-74-8
Lead sulfochromate yellow	-	1344-37-2
Lead oxide sulfate	$\text{Pb}_2\text{O}(\text{SO}_4)$	12036-76-9
Lead molybdate	PbMoO_4	10190-55-3
Tetramethyl lead	$\text{Pb}(\text{CH}_3)_4$	75-74-1
Tetraethyl lead	$\text{Pb}(\text{C}_2\text{H}_5)_4$	78-00-2
Lead selenide	PbSe	12069-00-0
Lead perchlorate $\text{ClHO}_4 \cdot 1/2\text{Pb}$	$\text{Pb}(\text{ClHO}_4)_2$	13637-76-8
Lead distearate	$\text{C}_{36}\text{H}_{70}\text{O}_4\text{Pb}$	1072-35-1
Lead stearate (stearic acid, lead salt)	$\text{C}_{36}\text{H}_{70}\text{O}_4\text{Pb}$	7428-48-0
Lead stearate, dibasic	$2\text{PbO} / \text{Pb}(\text{C}_{17}\text{H}_{35}\text{COO})_2$	56189-09-4
Other lead compounds	-	-

(2) Cd, Cadmium and its compounds

Name	Chemical symbol	CAS No.
Cadmium	Cd	7440-43-9
Cadmium oxide	CdO	1306-19-0
Cadmium sulfide	CdS	1306-23-6
Cadmium zinc sulfide yellow	-	8048-07-5
Cadmium carbonate	CdCO_3	513-78-0
Cadmium chloride	CdCl_2	10108-64-2
Cadmium sulfate	CdSO_4	10124-36-4
Cadmium nitrate	$\text{Cd}(\text{NO}_3)_2$	10325-94-7
Cadmium nitrate tetrahydrate	$\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$	10022-68-1
Cadmium stearate	$\text{Cd}(\text{C}_{18}\text{H}_{35}\text{O}_2)_2$	2223-93-0
Other cadmium compounds	-	-

(3) Hg, Mercury and its compounds

Name	Chemical symbol	CAS No.
Mercury	Hg	7439-97-6
Mercury(I) chloride	Hg_2Cl_2	10112-91-1
Mercury(II) chloride	HgCl_2	7487-94-7
Mercury(I) oxide	Hg_2O	15829-53-5
Mercury(II) oxide	HgO	21908-53-2
Mercury(II) nitrate	$\text{Hg}(\text{NO}_3)_2$	10045-94-0
Mercury(I) sulfate	$\text{Hg}_2(\text{SO}_4)$	7783-35-9
Mercury(II) fulminate	$\text{Hg}(\text{CNO})_2$	628-86-4

Mercury(II) acetate	$\text{Hg}(\text{CH}_3\text{COO})_2$	1600-27-7
Methylmercury salts	CH_3HgX (X: halogen)	-
Ethylmercury salts	$\text{C}_2\text{H}_5\text{HgX}$	-
Propylmercury salts	$\text{C}_3\text{H}_7\text{HgX}$	-
Methoxyethyl-mercury salts	$\text{CH}_3\text{OC}_2\text{H}_4\text{HgX}$	-
Diphenylmercury	$(\text{C}_6\text{H}_5)_2\text{Hg}$	587-85-9
Dialkylmercury	R_2Hg (R: alkyl group)	-
Phenylmercury nitrate	$\text{C}_6\text{H}_5\text{HgNO}_3$	55-68-5
Other mercury compounds	-	-

(4) Cr^{+6} , Hexavalent chromium and its compounds

Name	Chemical symbol	CAS No.
Sodium dichromate	$\text{Na}_2\text{Cr}_2\text{O}_7$	10588-01-9
Sodium dichromate, dihydrate	$\text{Na}_2\text{Cr}_2\text{H}_2\text{O}_7$	7789-12-0
Chromium(VI) oxide / Chromium trioxide	CrO_3	1333-82-0
Calcium chromate	CaCrO_4	13765-19-0
Lead(II) chromate	PbCrO_4	7758-97-6
Potassium dichromate	$\text{K}_2\text{Cr}_2\text{O}_7$	7778-50-9
Potassium chromate	K_2CrO_7	7789-00-6
Lithium chromate	Li_2CrO_4	14307-35-8
Sodium chromate	Na_2CrO_4	7775-11-03
Potassium chlorochromate	$\text{K}[\text{CrO}_3\text{Cl}]$	16037-50-6
Ammonium chromate	$(\text{NH}_4)_2\text{CrO}_4$	7788-98-9
Copper chromate	CuCrO_4	13548-42-0
Magnesium chromate	MgCrO_4	13423-61-5
Strontium chromate	SrCrO_4	7789-06-02
Barium chromate	BaCrO_4	10294-40-3
Lead chromate (orange color)	PbCrO_4	1344-38-3
Lead chromate (yellow color)	$\text{PbCrO}_4 + \text{PbSO}_4$	1344-37-2
Dichromium zinc tetraoxide	$\text{Cr}_2\text{O}_4\text{Zn}$	12018-19-8
Zinc chromate	ZnCrO_4	13530-65-9
Zinc dichromate	$\text{ZnCr}_2\text{H}_2\text{O}_7$	14018-95-2
Ammonium dichromate	$(\text{NH}_4)_2\text{Cr}_2\text{O}_7$	7789-09-05
Calcium dichromate	CaCr_2O_7	14307-33-6
Dichromic acid	$\text{H}_2\text{Cr}_2\text{O}_7$	13530-68-2
Copper chromite	CuCrO_3	12053-18-8
Other hexavalent chromium compounds	-	-

(5) Polybrominated biphenyls (PBB)

Name	Chemical symbol	CAS No.
Polybrominated biphenyl (PBB)	$C_{12}HXBr_{(10-X)}$	67774-32-7
2-bromodiphenyl	$C_{12}H_9Br$	2502-07-5
3-bromodiphenyl	$C_{12}H_9Br$	2113-57-7
4-bromodiphenyl	$C_{12}H_9Br$	92-66-0
4,4'-Dibromodiphenyl	$C_{12}H_8Br_2$	92-86-4
3,4,5-Tribromodiphenyl	$C_{12}H_7Br_3$	115245-08-4
2,4,6-Tribromodiphenyl	$C_{12}H_7Br_3$	59080-33-0
3,3',4,4',-tetrabromobiphenyl	$C_{12}H_6Br_4$	77102-82-0
2,2',4,5',-tetrabromobiphenyl	$C_{12}H_6Br_4$	60044-24-8
2,2',4,5',6-pentabromobiphenyl	$C_{12}H_5Br_5$	59080-39-6
3,3',4,4',5,5'-Hexabromodiphenyl	$C_{12}H_4Br_6$	60044-26-0
2,2',4,4',5,5'-Hexabromodiphenyl	$C_{12}H_4Br_6$	59080-40-9
2,2',3,3',4,5',6,6'-Octabromodiphenyl	$C_{12}H_2Br_8$	119264-60-7
2,2',3,3',4,4',5,5',6,6'-Decabromodiphenyl	$C_{12}Br_{10}$	13654-09-6
Other PBBs compounds	-	-

(6) Polybrominated diphenylethers (PBDE)

Name	Chemical symbol	CAS No.
Polybrominated diphenyl ether(PBDE)		
Polybrominated diphenyl oxide(PBDO)	$C_{12}H_{(10-X)}Br_XO$	-
Polybrominated byphenyl ethers(PBBE)		
4-Bromophenyldiphenyl ether	$C_{12}H_9BrO$	101-55-3
4,4'-Dibromodiphenyl ether	$C_{12}H_8Br_2O$	2050-47-7
Tribromodiphenyl ether	$C_{12}H_7Br_3O$	49690-94-0
Tetrabromodiphenyl ether	$C_{12}H_6Br_4O$	40088-47-9
Pentabromodiphenyl ether	$C_{12}H_5Br_5O$	32534-81-9
Hexabromodiphenyl ether	$C_{12}H_4Br_6O$	36483-60-0
Heptabromodiphenyl ether	$C_{12}H_3Br_7O$	68928-80-3
Octabromodiphenyl ether	$C_{12}H_2Br_8O$	32536-52-0
Nonabromodiphenyl ether	$C_{12}HBr_9O$	63936-56-1
Decabromodiphenyl ether	$C_{12}Br_{10}O$	1163-19-5
Other PBDEs compounds	-	-

**(7) Polychlorinated biphenyls (PCBs), Polychlorinated Naphthalenes (PCNs),
Polychlorinated Terphenyls (PCTs)**

Name	Chemical symbol	CAS No.
Polychlorinated biphenyls (PCBs)	$C_{12}H_{10-x}Cl_x$	1336-36-3
Polychlorinated terphenyls (PCTs)	$C_{18}H_{14-x}Cl_x$	61788-33-8
Polychlorinated naphthalenes (PCNs)	$C_{10}H_{8-x}Cl_x$	70776-03-3
Trichloronaphthalene	$C_{10}H_5Cl_3$	1321-65-9
Tetrachloronaphthalene	$C_{10}H_4Cl_4$	1335-88-2
Pentachloronaphthalene	$C_{10}H_3Cl_5$	1321-64-8
Octachloronaphthalene	$C_{10}Cl_8$	2234-13-1
Other PCBs, PCNs, PCTs compounds	-	-

(8) Pentachlorophenol (PCP)

Name	Chemical symbol	CAS No.
Pentachlorophenol	C_6HCl_5O	87-86-5

(9) SCCP/MCCP

Name	Chemical symbol	CAS No.
Short-chain chlorinated paraffine (C10~13)	-	85535-84-8
Medium-chained chlorinated paraffins, (C14-C17)	-	85535-85-9

(10) Perfluorooctyl sulfonate, PFOS / Perfluorooctyl acid , PFOA

Name	Chemical symbol	CAS No.
AMMONIUM HEPTADEC AFLUORO OCTANESULPHONATE	$C_8H_4F_{17}NO_3S$	29081-56-9
HEPTADEC AFLUORO-1-OCTANESULFONIC ACID, COMPD. WITH DIETHANOLAMINE	$C_{12}H_{12}F_{17}NO_5S$	70225-14-8
LITHIUM PERFLUORO OCTANE SULFONATE	$C_8F_{17}LiO_3S$	29457-72-5
HEPTADEC AFLUORO OCTANESULFONIC ACID	$C_8HF_{17}O_3S$	1763-23-1
POTASSIUM PERFLUORO OCTANESULFONATE	$C_8F_{17}KO_3S$	2795-39-3
PENTADEC AFLUORO OCTANOIC ACID	$C_8HF_{15}O_2$	335-67-1
PERFLUORO OCTANOIC ANHYDRIDE	$C_{16}F_{30}O_3$	33496-48-9
PERFLUORO OCTANOIC ACID AMMONIUM SALT	$C_8H_4F_{15}NO_2$	3825-26-1
Other PFOS, PFOA compounds	-	-

(11) Nickel and its compounds

Name	Chemical symbol	CAS No.
Nickel	Ni	7440-02-0
Nickel(II) oxide	NiO	1313-99-1
Nickel sulfate	NiSO ₄	7786-81-4
Nickel carbonate	NiCO ₃	3333-67-3
Nickel chloride	NiCl ₂	7718-54-9
Dinickel trioxide	Ni ₂ O ₃	1314-06-3
Nickel dihydroxide	NiH ₂ O ₂	12054-48-7
Other nickel compounds	-	-

(12) Asbestos

Name	Chemical symbol	CAS No.
Actinolite	Ca ₂ (Mg,Fe) ₅ Si ₈ O ₂₂ (OH) ₂	77536-66-4
Amosite	(Mg,Fe) ₇ Si ₈ O ₂₂ (OH) ₂	12172-73-5
Anthophyllite	(Mg,Fe) ₇ Si ₈ O ₂₂ (OH) ₂	77536-67-5
Chrysotile	Mg ₃ Si ₂ O ₅ (OH) ₄	12001-29-5
Crocidolite	Na ₂ F ₅ Si ₈ O ₂₂ (OH) ₂	12001-28-4
Tremolite	Ca ₂ (Mg,Fe) ₅ Si ₈ O ₂₂ (OH) ₂	77536-68-6

(13) Azo compounds

Name	Chemical symbol	CAS No.
2,4,5-Trimethylaniline	C ₉ H ₁₃ N	137-17-7
2,4-Diaminoanisole	C ₇ H ₁₀ N ₂ O	615-05-4
2,4-Toluenediamine	C ₇ H ₁₀ N ₂	95-80-7
2-Amino-4-nitrotoluene	C ₇ H ₈ N ₂ O ₂	99-55-8
2-Naphthylamine	C ₁₀ H ₉ N	91-59-8
3,3'-Dichlorobenzidine	C ₁₂ H ₁₀ Cl ₂ N ₂	91-94-1
3,3'-Dimethoxybenzidine	C ₁₄ H ₁₆ N ₂ O ₂	119-90-4
3,3'-Dimethyl-4,4'-diaminodiphenylmethane	C ₁₅ H ₁₈ N ₂	838-88-0
3,3'-Dimethylbenzidine	C ₁₄ H ₁₆ N ₂	119-93-7
4,4'-Diaminodiphenylmethane	C ₁₃ H ₁₄ N ₂	101-77-9
4,4'-Methylene-bis-(2-chloroaniline)	C ₁₃ H ₁₂ Cl ₂ N ₂	101-14-4
4,4'-Oxydianiline	C ₁₂ H ₁₂ N ₂ O	101-80-4
4,4'-Thiodianiline	C ₁₂ H ₁₂ N ₂ S	139-65-1
4-amino azobenzene	C ₁₂ H ₁₁ N ₃	60-09-3

4-Aminodiphenyl	C ₁₂ H ₁₁ N	92-67-1
4-Chloro-o-toluidine	C ₇ H ₈ ClN	95-69-2
Benzidine	C ₁₂ H ₁₂ N ₂	92-87-5
o-Aminoazotoluene	C ₁₄ H ₁₅ N ₃	97-56-3
o-anisidine	C ₇ H ₉ NO	90-04-0
o-Toluidine	C ₇ H ₉ N	95-53-4
p-Chloroaniline	C ₆ H ₆ ClN	106-47-8
p-Cresidine	C ₈ H ₁₁ NO	120-71-8

(14) Ugilec 121, 141, DBBT

Name	Chemical symbol	CAS No.
DBBT (Monomethyl dibromo diphenyl methane)	C ₁₄ H ₁₂ Br ₂	99688-47-8
Ugilec 121 (Monomethyl dichloro diphenyl methane)	C ₁₄ H ₁₂ Cl ₂	81161-70-8
Ugilec 141 (Monomethyl tetrachloro diphenyl methane)	C ₁₄ H ₁₀ Cl ₄	76253-60-6

(15) Organic tin compounds

Name	Chemical symbol	CAS No.
Bis(tri-n-butyltin) oxide	O(Sn(C ₄ H ₉) ₃) ₂	56-35-9
Tributyltin(TBT)	(C ₄ H ₉) ₃ Sn	56573-85-4
Triphenyltin (TPT)	(C ₆ H ₅) ₃ Sn	668-34-8
Tributyltin bromide	(C ₄ H ₉) ₃ SnBr	1461-23-0
Triphenyltin N,N'-dimethyldithiocarbamate	(C ₆ H ₅) ₃ Sn(CH ₃) ₂ NCS ₂	1803-12-9
Triphenyltin fluoride	(C ₆ H ₅) ₃ SnF	379-52-2
Triphenyltin acetate	(C ₆ H ₅) ₃ SnOCOCH ₃	900-95-8
Triphenyltin chloride	(C ₆ H ₅) ₃ SnCl	639-58-7
Triphenyltin hydroxide	(C ₆ H ₅) ₃ SnOH	76-87-9
Triphenyltin fatty acid salts (C=9~11)	-	47672-31-1
Triphenyltin chloroacetate	(C ₆ H ₅) ₃ SnOCOCH ₃ Cl	7094-94-2
Tributyltin methacrylate	(C ₄ H ₉) ₃ SnC ₄ H ₅ O ₂	2155-70-6 / 18380-71-7
Bis(tributyltin) fumarate	C ₂ H ₂ (COO) ₂ ((C ₄ H ₉) ₃ Sn) ₂	6454-35-9
Tributyltin fluoride	(C ₄ H ₉) ₃ SnF	1983-10-4
Bis(tributyltin) 2,3-dibromosuccinate	((C ₄ H ₉) ₃ Sn) ₂ C ₂ H ₂ (Br) ₂ (COO) ₂	31732-71-5
Tributyltin acetate	(C ₄ H ₉) ₃ SnOCOCH ₃	56-36-0
Tributyltin laurate	(C ₄ H ₉) ₃ SnC ₁₂ H ₂₃ O ₂	3090-36-6

Bis(tributyltin) phthalate	$C_6H_4(COO)_2((C_4H_9)_3Sn)_2$	4782-29-0
Copolymer of alkyl acrylate, methyl methacrylate and tributyltin methacrylate (alkyl; C=8)	-	-
Tributyltin sulfamate	$(C_4H_9)_3SnSO_3NH_2$	6517-25-5
Bis(tributyltin) maleate	$C_2H_2(COO)_2((C_4H_9)_3Sn)_2$	14275-57-1
Tributyltin chloride	$(C_4H_9)_3SnCl$	1461-22-9
Mixture of tributyltin cyclopentane-carboxylate and its analogs (Tributyltin rosin salts)	$(C_4H_9)_3SnSO_3C_5H_9$	26239-64-5
Tributyltin naphthennate	$(C_4H_9)_3Sn(C_{10}H_8)$	85409-17-2
Dibutyltin	$C_8H_{20}Sn$	1002-53-5
Diocyltin	$C_{16}H_{36}Sn$	15231-44-4
Dibutyltin X	$C_8H_{20}SnX$	-
Diocyltin X	$C_{16}H_{36}SnX$	-
Other organotin compounds	-	-

(16) Arsenic and its compounds

Name	Chemical symbol	CAS No.
ARSENIC	As	7440-38-2
TRIETHYL ARSENATE	$C_6H_{15}AsO_4$	15606-95-8
ARSENIC ACID DISODIUM SALT, HEPTAHYDRATE	$AsH_{15}Na_2O_{11}$	10048-95-0
ARSENIC ACID, CALCIUM SALT	$As_2Ca_3O_8$	7778-44-1
ARSENIC ACID, COPPER SALT	$As_2Cu_3O_8$	10103-61-4
ARSENIC ACID, DIAMMONIUM SALT	$AsH_9N_2O_4$	7784-44-3
ARSENIC ACID, LEAD SALT	$AsHO_4Pb$	7784-40-9
ARSENIC ACID, MAGNESIUM SALT	$As_2Mg_3O_8$	10103-50-1
ARSENIC PENTOXIDE	As_2O_5	1303-28-2
ARSENIC TRICHLORIDE	$AsCl_3$	7784-34-1
ARSENIC TRIHYDRIDE	AsH_3	7784-42-1
ARSENIC TRIOXIDE	As_2O_3	1327-53-3
ARSENIOUS ACID, COPPER (II) SALT	$AsCuHO_3$	10290-12-7
ARSENIOUS ACID, POTASSIUM SALT	$AsKO_2$	10124-50-2

(17) Ozone layer depleting / global warming substances

Name	Chemical symbol	CAS No.
Chloroform	CHCl ₃	67-66-3
1,1,2 Trichloroethane	C ₂ H ₃ Cl ₃	79-00-5
1,1,2,2 Tetrachloroethane	C ₂ H ₂ Cl ₄	79-34-5
1,1,1,2 Tetrachloroethane	C ₂ H ₂ Cl ₄	630-20-6
Pentachloroethane	C ₂ HCl ₅	76-01-7
1,1 Dichloroethylene	C ₂ H ₂ Cl ₂	75-35-4
CFC 11	CCl ₃ F	75-69-4
CFC 111	C ₂ Cl ₅ F	354-56-3
CFC 112	C ₂ Cl ₄ F ₂	76-12-0 / 28605-74-5
CFC 113	C ₂ Cl ₃ F ₃	76-13-1
CFC 114	C ₂ Cl ₂ F ₄	76-14-2 / 1320-37-2
CFC 115	C ₂ ClF ₅	76-15-3
CFC 12	CCl ₂ F ₂	75-71-8
CFC 13	CClF ₃	75-72-9
CFC 211	C ₃ Cl ₇ F	422-78-6 / 135401-87-5
CFC 212	C ₃ Cl ₆ F ₂	3182-26-1
CFC 213	C ₃ Cl ₅ F ₃	2354-06-5
CFC 214	C ₃ Cl ₄ F ₄	2268-46-4
CFC 215	C ₃ Cl ₃ F ₅	1652-81-9
CFC 216	C ₃ Cl ₂ F ₆	661-97-2
CFC 217	C ₃ ClF ₇	422-86-6
Halon 1211	CBrClF ₂	353-59-3
Halon 1301	CBrF ₃	75-63-8
Halon 2402	C ₂ Br ₂ F ₄	124-73-2
bromochloromethane	CH ₂ BrCl	74-97-5
HBFC-121B4	C ₂ HFBr ₄	306-80-9
HBFC-122B3	C ₂ HF ₂ Br ₃	-
HBFC-123B2	C ₂ HF ₃ Br ₂	354-04-1
HBFC-124B1	C ₂ HF ₄ Br	-
HBFC-131B3	C ₂ H ₂ FBr ₃	-
HBFC-132B2	C ₂ H ₂ F ₂ Br ₂	75-82-1
HBFC-141B2	C ₂ H ₃ FBr ₂	358-97-4
HBFC-133B1	C ₂ H ₂ F ₃ Br	-
HBFC-142B1	C ₂ H ₃ F ₂ Br	-
HBFC-151B1	C ₂ H ₄ FBr	762-49-2
HBFC-21B2	CHFBr ₂	-
HBFC-221B6	C ₃ HFBr ₆	-

HBFC-222B5	$C_3HF_2Br_5$	-
HBFC-223B4	$C_3HF_3Br_4$	-
HBFC-224B3	$C_3HF_4Br_3$	-
HBFC-226B1	C_3HF_6Br	-
HBFC-225B2	$C_3HF_5Br_2$	431-78-7
HBFC-22B1	CHF_2Br	-
HBFC-231B5	$C_3H_2FBr_5$	-
HBFC-232B4	$C_3H_2F_2Br_4$	-
HBFC-233B3	$C_3H_2F_3Br_3$	
HBFC-234B2	$C_3H_2F_4Br_2$	-
HBFC-235B1	$C_3H_2F_5Br$	460-88-8
HBFC-242B3	$C_3H_3F_2Br_3$	70192-80-2
HBFC-241B4	$C_3H_3FBr_4$	-
HBFC-243B2	$C_3H_3F_3Br_2$	70192-83-5
HBFC-244B1	$C_3H_3F_4Br$	679-84-5
HBFC-251B3	$C_3H_4FBr_3$	75372-14-1
HBFC-253B1	$C_3H_4F_3Br$	421-46-5
HBFC-252B2	$C_3H_4F_2Br_2$	460-25-3
HBFC-261B2	$C_3H_5FBr_2$	51584-26-0
HBFC-262B1	$C_3H_5F_2Br$	-
HBFC-31B1	CH_2FBr	-
HBFC-271B1	C_3H_6FBr	352-91-0
HCFC-31	CH_2FCl	373-52-4
HCFC-121	C_2HFCl_4	354-14-3
HCFC-122	$C_2HF_2Cl_3$	354-21-2
HCFC-123	$C_2HF_3Cl_2$	306-83-2
HCFC-124	C_2HF_4Cl	2837-89-0
HCFC-131	$C_2H_2FCl_3$	134237-34-6
HCFC-132	$C_2H_2F_2Cl_2$	25915-78-0
HCFC-133	$C_2H_2F_3Cl$	75-88-7
HCFC-141	$C_2H_3FCl_2$	25167-88-8
HCFC-141b	$C_2H_3FCl_2$	1717-00-6
HCFC-142	$C_2H_3F_2Cl$	25497-29-4
HCFC-142b	CH_3CF_2Cl	75-68-3
HCFC-151	C_2H_4FCl	1615-75-4
HCFC-21	$CHFCl_2$	75-43-4
HCFC-22	CHF_2Cl	75-45-6

HCFC-221	C ₃ HFCl ₆	134237-35-7
HCFC-222	C ₃ HF ₂ Cl ₅	134237-36-8
HCFC-223	C ₃ HF ₃ Cl ₄	34237-37-9
HCFC-224	C ₃ HF ₄ Cl ₃	134237-38-0
HCFC-225	C ₃ HF ₅ Cl ₂	128903-21-9
HCFC-225ca	CF ₃ CF ₂ CHCl ₂	422-56-0
HCFC-225cb	CF ₂ CICF ₂ CHCIF	507-55-1
HCFC-226	C ₃ HF ₆ Cl	134308-72-8
HCFC-231	C ₃ H ₂ FCl ₅	134190-48-0
HCFC-232	C ₃ H ₂ F ₂ Cl ₄	134237-39-1
HCFC-233	C ₃ H ₂ F ₃ Cl ₃	134237-40-4
HCFC-234	C ₃ H ₂ F ₄ Cl ₂	127564-83-4
HCFC-235	C ₃ H ₂ F ₅ Cl	134237-41-5
HCFC-241	C ₃ H ₃ FCl ₄	134190-49-1
HCFC-242	C ₃ H ₃ F ₂ Cl ₃	134237-42-6
HCFC-243	C ₃ H ₃ F ₃ Cl ₂	134237-43-7
HCFC-244	C ₃ H ₃ F ₄ Cl	134190-50-4
HCFC-251	C ₃ H ₄ FCl ₃	134190-51-5
HCFC-252	C ₃ H ₄ F ₂ Cl ₂	134190-52-6
HCFC-253	C ₃ H ₄ F ₃ Cl	134237-44-8
HCFC-261	C ₃ H ₅ FCl ₂	134237-45-9
HCFC-262	C ₃ H ₅ F ₂ Cl	134190-53-7
HCFC-271	C ₃ H ₆ FCl	134190-54-8
methyl bromide	CH ₃ Br	74-83-9
1,1,1-trichloroethane	C ₂ H ₃ Cl ₃	71-55-6
Carbon tetrachloride	CCl ₄	56-23-5
sulfur hexafluoride	F ₆ S	2551-62-4
HFCs	-	-
PFCs	-	-

(18) PAHs

Name	Chemical symbol	CAS No.
NAPHTHALENE	C ₁₀ H ₈	91-20-3
ACENAPHTHYLENE	C ₁₂ H ₈	208-96-8
ACENAPHTHENE	C ₁₂ H ₈	83-32-9
FLUORENE	C ₁₃ H ₁₀	86-73-7
PHENANTHRENE	C ₁₄ H ₁₀	85-01-8

ANTHRACENE	C ₁₄ H ₁₀	120-12-7
FLUORANTHENE	C ₁₆ H ₁₀	206-44-0
INDENO[c,d]PYRENE	C ₂₂ H ₁₂	193-39-5
PYRENE	C ₁₆ H ₁₀	129-00-0
BENZO[g,h,i]PERYLENE	C ₂₂ H ₁₂	129-24-2
Benzo(a)pyrene(BaP)	C ₂₀ H ₁₂	50-32-8
Benzo(e)pyrene(BeP)	C ₂₀ H ₁₂	192-97-2
Benzoanthracenepyrene(BaA)	C ₁₈ H ₁₂	56-55-3
Chrysen	C ₁₈ H ₁₂	218-01-9
Benzofluoranthene(BbFA)	C ₂₀ H ₁₂	205-99-2
Benzofluoranthene(BjFA)	C ₂₀ H ₁₂	205-82-3
Benzofluoranthene(BkFA)	C ₂₀ H ₁₂	207-08-9
Dibenzoanthracene(DBAhA)	C ₂₂ H ₁₄	53-70-3

(19) Formaldehydes

Name	Chemical symbol	CAS No.
Formaldehyde	HCHO	50-00-0

(20) Dimethylfumarate (DMF)

Name	Chemical symbol	CAS No.
Dimethylfumarate	C ₆ H ₈ O ₄	624-49-7

(21) Poly vinyl chloride

Name	Chemical symbol	CAS No.
Poly vinyl chloride	H(CH ₂ CHCl) _n H	9002-86-2 / 93050-82-9

(22) Other (Except PBB, PBDE) Bromated Flame Retardants (TBBPA)

Name	Chemical symbol	CAS No.
Tetrabromobisphenol A	C ₁₅ H ₁₂ Br ₄ O ₂	79-94-7
Tetrabromobisphenol A dimethylether	C ₁₇ H ₁₆ Br ₄ O ₂	37853-61-5
Tetrabromobisphenol A bis(dibromopropyl ether)	C ₂₁ H ₂₀ Br ₈ O ₂	21850-44-2
Tetrabromobisphenol A bisallylether	C ₂₁ H ₂₀ Br ₄ O ₂	25327-89-3
Tetrabromobisphenol A bis(2-hydroxyethyl ether)	C ₁₉ H ₂₀ Br ₄ O ₄	4162-45-2
Tri(2, 3-dibromopropyl) phosphate	C ₉ H ₁₅ Br ₆ O ₄ P	126-72-7
Bis(2, 3-dibromopropyl) phosphate	C ₆ H ₁₁ Br ₄ O ₄ P	5412-25-9

Tetradecabromo (p-diphenoxybenzene)	$C_{18}Br_{14}O_2$	58965-66-5
Bis(2, 4, 6-tribromophenyl) carbonate	$C_{13}H_4Br_6O_3$	67990-32-3
2-Propenoic acid (pentabromophenylmethyl) ester, homopolymer	$(C_{10}H_5Br_5O_2)_n$	59447-57-3
Polystyrene, brominated	$(C_8H_5Br_3)_n$	88497-56-7
1, 2-Bis (2, 4, 6-tribromophenoxy) ethane	$C_{14}H_8Br_6O_2$	37853-59-1
Disodium tetrabromophthalate	$C_8H_2Br_4O_4 \cdot 2Na$	25357-79-3
TBBPA bis (2, 3-dibromopropyl) ether	$C_{21}H_{20}Br_8O_2$	21850-44-2
1H-Isoindole-1, 3(2H)-dione-2,2'-(1,2-ethanediyl)bis[4,5,6,7-tetrabromo]	$C_{18}H_4Br_8N_2O_4$	32588-76-4
Hexabromocyclododecane	$C_{12}H_{18}Br_6$	25637-99-4
3,4,5,6-Tetrabromo-1,2-benzenedicarboxylic mixed esters acid, propylene with diethylene-glycol and glycol		77098-07-8
Polymer of TBBPA, phosgene, and phenol	$(C_7H_5O_2) \cdot (C_{16}H_{10}Br_4O_3)_n \cdot (C_6H_5O)$	94334-64-2
Tris(tribromoneopentyl) phosphate	$C_{15}H_{24}Br_9O_4P$	19186-97-1
TBBPA, 2,2-bis[4-(2,3-epoxypropyloxy) dibromo Phenyl]propane polymer	$(C_{21}H_{20}Br_4O_4)_n \cdot (C_{15}H_{12}Br_4O_2)_n$	68928-70-1
Phosphoric acid, mixed 3-bromo-2,2-dimethylpropyl and 2-bromoethyl and 2-chloroethyl esters		125997-20-8
2,4,6-Tribromophenyl terminated carbonate oligomer	$(C_7H_2Br_3O_2) \cdot (C_{16}H_{10}Br_4O_3)_n \cdot (C_6H_2Br_3O)$	71342-77-3
Tetrabromocyclooctane	$C_8H_{12}Br_4$	31454-48-5
Brominated aliphatic Compounds	-	-
Dibromoethyl dibromo cyclohexane	$C_8H_{12}Br_4$	3322-93-8
N,N-Ethylene-bis(tetrabromophthalimide)	$C_{18}H_4Br_8N_2O_4$	32588-76-4
Brominated polystyrene	$(C_8H_5Br_3)_n$	57137-10-7
Tetrabromophthalic anhydride	$C_8Br_4O_3$	632-79-1
Ethylenebis(Tetrabromophthalimide)	$C_{18}H_4Br_8N_2O_4$	32588-76-4
Other BFRs compounds	-	-

(23) Phthalates

Name	Chemical symbol	CAS No.
Dimethyl phthalate (DMP)	C ₁₀ H ₁₀ O ₄	131-11-3
Diethyl phthalate (DEP)	C ₁₂ H ₁₄ O ₄	84-66-2
Bis(2-ethyl-hexyl) phthalate(DEHP)	C ₂₄ H ₃₈ O ₄	117-81-7
Dibutyl phthalate(DBP)	C ₁₆ H ₂₂ O ₄	84-74-2
Benzyl butyl phthalate(BBP)	C ₁₉ H ₂₀ O ₄	85-68-7
Di-“isononyl” phthalate(DINP)	C ₂₆ H ₄₂ O ₄	28553-12-1 / 68515-48-0
di-“isodecyl” phthalate(DIDP)	C ₂₈ H ₄₆ O ₄	26761-40-0 / 68515-49-1
di-n-octyl phthalate(DNOP)	C ₂₄ H ₃₈ O ₄	117-84-0
Other Phthalates compounds	-	-

(24) Antimony and its compounds

Name	Chemical symbol	CAS No.
Antimony trioxide	Sb ₂ O ₃	1309-64-4
Antimony pentoxide	Sb ₂ O ₅	1314-60-9

(25) Beryllium and its compounds

Name	Chemical symbol	CAS No.
BERYLLIUM	Be	7440-41-7
BERYLLIUM CARBONATE	Be ₂ CO ₃ (OH) ₂	66104-24-3
BERYLLIUM CHLORIDE	BeCl ₂	7787-47-5
BERYLLIUM FLUORIDE	BeF ₂	7787-49-7
BERYLLIUM HYDROXIDE	BeH ₂ O ₂	13327-32-7
BERYLLIUM NITRATE	Be.2HNO ₃	13597-99-4
BERYLLIUM PHOSPHATE	BeHO ₄ P	13598-15-7
BERYLLIUM SULFATE	Be.H ₂ O ₄ S	13510-49-1
BERYLLIUM SULPHATE TETRAHYDRATE	BeH ₈ O ₈ S	7787-56-6
BERYLLIUM OXIDE	BeO	1304-56-9
BERYLLIUM-ALUMINUM ALLOY	-	12770-50-2
BERYLLIUM COPPER AND OTHER METAL ALLOYS CONTAINING GREATER AMOUNTS OF BERYLLIUM	-	-
Other BERYLLIUM compounds	-	-

(26) Cobalt and its compounds

Name	Chemical symbol	CAS No.
Cobalt	Co	7440-48-4
Cobalt Oxide	CoO	1307-96-6
Cobalt dichloride	CoCl ₂	7646-79-9
Other cobalt compounds	-	-

(27) Musk fragrance substances

Name	Chemical symbol	CAS No.
5-tert-butyl-2,4,6-trinitro-m-xylene (musk xylene)	C ₁₂ H ₁₅ N ₃ O ₆	81-15-2
4'-tert-butyl-2',6'-dimethyl-3',5'-dinitroacetophenone (musk ketone)	C ₁₄ H ₁₈ N ₂ O ₅	81-14-1

(28) Selenium and its compounds

Name	Chemical symbol	CAS No.
Selenium	Se	7782-49-2
Hydrogen selenide	SeH ₂	7783-07-5
Sodium selenide	SeNa ₂	1313-85-5
Selenium dioxide	SeO ₂	7446-08-4
Sodium selenate (Selenic acid, monosodium salt)	-	10112-94-4
Dimethyl selenide	C ₂ H ₆ Se	593-79-3
Selenium oxide	SeO	12640-89-0
Other Selenium compounds	-	-

(29) Bismuth and its compounds

Name	Chemical symbol	CAS No.
Bismuth	Bi	7440-69-9
Bismuth nitrate	Bi(HNO ₃) ₃	10361-44-1
Bismuth trioxide	Bi ₂ O ₃	1304-76-3
Other bismuth compounds	-	-

(30) Halogen compounds

Name	Chemical symbol	CAS No.
Bromine compound	-	-
Chlorine compound	-	-

(31) Volatile Organic Compound

Name	Chemical symbol	CAS No.
Toluene	C ₇ H ₈	108-88-3
Benzene	C ₆ H ₆	71-43-2
Trichlorobenzene	C ₆ H ₃ Cl ₃	120-82-1

(32) Bisphenol A

Name	Chemical symbol	CAS No.
Bisphenol A (4,4'-Isopropylidendiphenol)	C ₁₅ H ₁₆ O ₂	80-05-7

(33) Triclosan

Name	Chemical symbol	CAS No.
5-chloro-2-(2,4-dichlorophenoxy)phenol	C ₁₂ H ₇ Cl ₃ O ₂	3380-34-5

(34) Surfactant

Name	Chemical symbol	CAS No.
DTDMAC	-	-
DODMAC/DSDMAC	-	-
HTDMAC	-	-
Nonylphenol	C ₆ H ₄ (OH)C ₉ H ₁₉	25154-52-3
Nonylphenol ethoxylate	(C ₂ H ₄ O) _n C ₁₅ H ₂₄ O	9016-45-9

(35) Chlorinated flame retardants

Name	Chemical symbol	CAS No.
Tris(2-chloroethyl)phosphate	C ₁₆ H ₁₂ Cl ₃ O ₄ P	
Other CFRs compounds	-	-