



**Manual for Survey of
Chemical Substances Contained
in Parts and Materials**

For Business Partners

Sep 2015 – Ver.2.0 –

Sakai Display Products Corporation

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1. Purpose

When purchasing parts and materials from business partners, our company conducts green procurement following the evaluation criteria in the "Green Procurement Guidelines". Green procurement, evaluation is done from two angles: "environmental management evaluation" for evaluating the environmental protection activities of the business partner's organization as a whole, and "delivered product evaluation" which looks at the environmental impact of purchased parts and materials.

This survey is conducted as a part of "delivered production evaluation". Its purpose is to clearly identify the amounts of chemical substances contained in the parts and materials of Sakai display products. To reduce their overall environmental impact, thereby ensuring user safety and protection of the environment when they are disposed of.

2. Applicable Scope

This survey applies to all parts and materials purchased by Sakai display products corporation. More specifically, it applies to the following:

- (1) Parts, materials and units incorporated into the product
- (2) Auxiliary materials used in production and contained in the product (solder, oil, grease, tape etc.)
- (3) Finished products, options, supplies and similar items purchased for sale
- (4) Printed matters and accessories enclosed with products (manuals, cables, remote controllers etc.)
- (5) Container materials for packaging products (The survey does not apply to packaging materials when parts/materials are delivered. But, it applies to packaging materials used when parts/materials to be shipped as packaging for a service part from our company.)

By-materials and indirect materials which are used in production process and do not remain with product/part are not applied.

3. Definition of Terms

- (1) Banned substances
 - Substances designated by Sakai display products, whose content in products is currently regulated, or is expected to be regulated in the future, by laws or regulations inside or outside Japan.
 - Substances designated by Sakai display products, whose content in products is currently regulated, or is expected to be regulated in the future, by voluntary standards like environmental labeling, inside or outside Japan.
 - Substances other than the above, designated independently by Sakai display products in advance of world trends, because their load on the environmental burden is known to be high, and substitute substances are available.
- (2) Substances banned in all cases
 - Among banned substances, those which cannot be used for any application.
- (3) Substances banned with conditions
 - Among banned substances, those which can be used for limited applications recognized by Sakai display products.
- (4) Managed substances
 - Substances designated by Sakai display products, whose use, applications or amounts are expected to be limited in the near future by laws, regulations or voluntary standards, such as environmental labeling

in or outside Japan.

- Substances designated by Sakai display products, the data of whose use in products must be disclosed by laws, regulations or voluntary standards, such as environmental labeling in or outside Japan.
- Substances for which customers are likely to request the disclosure of data on use in products.
- Substances, other than the above, whose usage needs to be understood because their applications or amounts are likely to be limited, or information on them disclosed in the near future.

(5) Content

- As a rule, if a substance is intentionally added, or clearly present, it shall be regarded as contained, regardless of the composition or amount contained.
- Substances not added intentionally shall be handled as impurities.
- Impurities shall be regarded as contained if their content exceeds the Sakai display products standard value (threshold value).

(6) Intentional addition

- Addition done to provide a part or material with a specific performance.
- For example, hexavalent chromium for anti-corrosion treatment of steel plate, or brominated flame retardants for improving the flame retardance of plastic cabinets.

(7) Impurities

- Substances contained in natural materials which cannot technically be completely removed in the refining process, substances which are produced in a synthesis reaction process and cannot be technically removed, and substances contained unintentionally in recycled materials

(8) Content rate

- Concentration of a specific chemical substance contained in a homogeneous material

$$\text{Content rate} = \frac{\text{Contained amount of specific chemical substance}}{\text{Mass of homogeneous material of part containing specific chemical substance}}$$

(9) Homogeneous material*1

- Material which cannot be mechanically separated into different materials
 - "Mechanical separation" refers to separation through mechanical work, such as screw removal, cutting, crushing, grinding, polishing etc.
 - Examples of homogeneous materials include: plastic, ceramics, glass, metal, alloy, paper, coatings etc.
- *1. Please see the "Attachment 1: Examples of Application Areas"

4. Survey Content

In part/material units, check the contained amount (content rate) of contained chemical substances, their use point, and their use application.

5. Chemical Substances Subject to the Survey

The chemical substances contained in parts and materials which are subject to this survey are as given in Table 1 (Chemical substances subject to the survey).

Substances subject to the survey may be changed or added to due to legal/regulatory trends or customer demand.

Surveys of other substances may be requested depending on case.

Table 1: Chemical substances subject to the survey

Substances to be managed and URL to be referred	Sakai display products
Chemical Substances Control Law (Class 1 specified chemical substances) http://www.houko.com/00/02/S49/202.HTM	required
Industrial Safety and Health Law (Substances prohibited to be produced) http://www.houko.com/00/02/S47/318.HTM	required
Poisonous and Deleterious Control Law (Specified Poisonous Substances) http://www.houko.com/00/01/S25/303.HTM	required
RoHS Directive http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02011L0065-20140609&rid=1	required
ELV Directive http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02000L0053-20130611&rid=1	required
CLP Annex VI CMR 1,2 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02006R1907-20140410&rid=1	required
REACH Annex XVII [Except: CLP Annex VI CMR 1,2] http://echa.europa.eu/addressing-chemicals-of-concern/restrictions/list-of-restrictions	required
REACH Candidate Substances to be authorized (SVHCs) http://echa.europa.eu/web/guest/candidate-list-table	required
ESIS PBT [Fulfilled] (refer to the list in the separate volume in detail)	required
POPs Regulation Annex I http://chm.pops.int/TheConvention/ThePOPs/ListingofPOPs/tabid/2509/Default.aspx	required
GADSL http://plastics.americanchemistry.com/2011-GADSL-Documents	required
IEC62474 http://std.iec.ch/iec62474/iec62474.nsf/MainFrameset	required
Our own object substances (refer to the list in the separate volume in detail)	required

For details about chemical substances subject to the survey, please see the separate volume "List of substances subject to the survey and management classification" (Download from Green Procurement HP).

6. Chemical Substance Management Categories

Chemical substances contained in parts and materials comprising "Sakai display products" products (Table 1) shall be managed by classifying them into: Substances banned in all cases, Substances banned with conditions, and Managed substances.

1) Chemical substance management categories

(1) Substances banned in all cases

The substances shown in the separate volume "List of substances subject to the survey and management classification" shall be regarded as substances banned in all cases. If they are contained, they must be eliminated immediately.

As a rule, products of "Sakai display products" products not purchase parts or materials containing substances banned in all cases.

(2) Substances banned with conditions

The substances shown in the separate volume "List of substances subject to the survey and management classification" shall be regarded as substances banned with conditions.

Use of these substances is only recognized for the excluded applications given in the Table.
In the excluded applications, they shall be treated as managed substances.

(3) Managed substances

The substances shown in the separate volume "List of substances subject to the survey and management classification" shall be regarded as managed substances.

2) Detailed explanation of chemical substance management categories

Please see the separate volume "List of substances subject to the survey and management classification".

7. Response Method

The following table (1), (2), (4) to fill out our format, please submit. The following table (3), please submit a copy of the analysis report from the analytical agents. However, in such an important change of customer requirements and standards, because there is possible to request an update of environment information, please cooperation.

Answer file table

	File name	File form
(1)	Environmentally harmful substance content condition report document(*1)	Paper, PDF
(2)	Parts Environment survey sheet (*2)	Excel
(3)	RoHS analytical report	PDF
(4)	EU eco label conformance statement(*3)	Paper, PDF

*1. "Environmentally harmful substance content condition report document" should attached to the specification.

*2. In order to confirm the entry contents of the "parts environment survey sheet", check sheet also fill in, please submit.

*3. "EU eco label conformance statement" requires a complementary material, please submit the SDS (former name MSDS).

*Target parts: plastic parts, cables, wiring, power supply units, PCB, etc..

Not target parts: Electronic parts(Example : IC, PCB mounted parts, Connectors, etc.), Part of no resin, etc..

8. Non-disclosure

Your response will be basically used only within our company, and will never be disclosed to the outside, but if disclosure of information is requested from outside of Sakai display products, we may disclose the chemical substances contained in parts and materials.

9. Contact info for inquiries

Sakai Display Products Corporation

1, Takumi-cho Sakai-ku Sakai-city, Japan (〒590-8522)

Mail : mailto:shizai_csr_green@Sakai display products.co.jp

Depending on the contents of inquiries, a response may be given from a person in charge in the product group from which the survey is requested.

10. Attachments

Attachment 1: Examples of Application Areasp.7

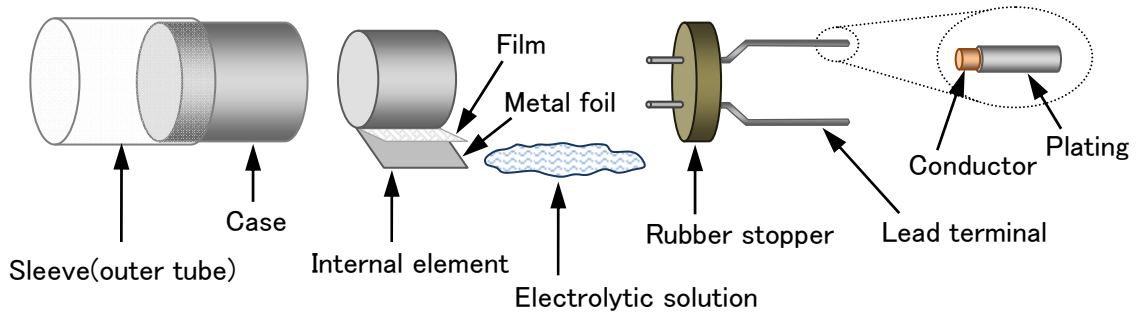
Attachment 2: RoHS analysis method guidelinep.14

Attachment 1: Examples of Application Areas

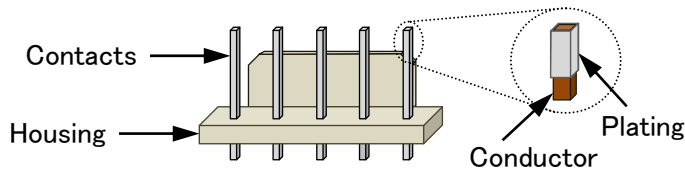
The following are example names of application areas that serve as references when completing the "application area" column of the survey.

Note: These examples do not represent all the application areas.

【Component Part Example 1】: Aluminum electrolytic capacitor

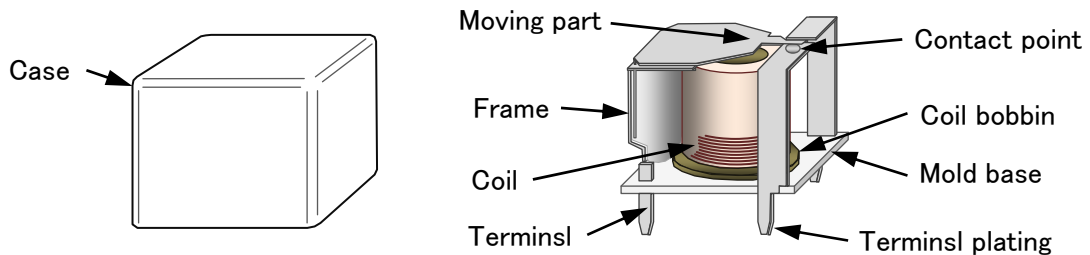


【Component Part Example 2】 Connectors



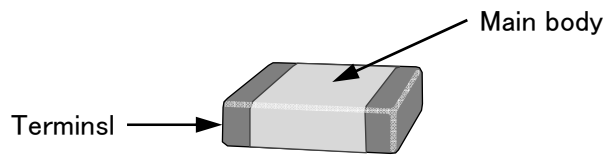
【Component Part Example 3】

Switches, relays, and other parts with mechanical components



* Please pay particular attention to special metals (alloys) used for plastic flame retardants, and electrical characteristics and lubrication of contact points.

【Component Part Example 4】 Surface-mounted chip parts



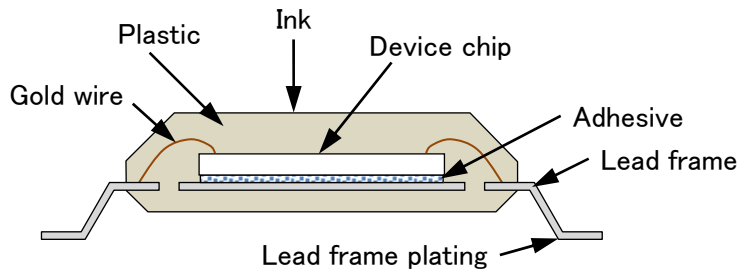
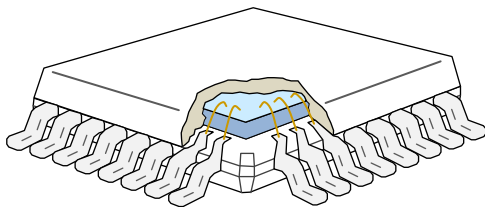
* The main body of the part is made of multiple materials and the substance concerned is present, break it down.

Example) Part (main body) → Ceramic, internal electrode

【Component Part Example 5】 Semiconductor devices

Outward appearance

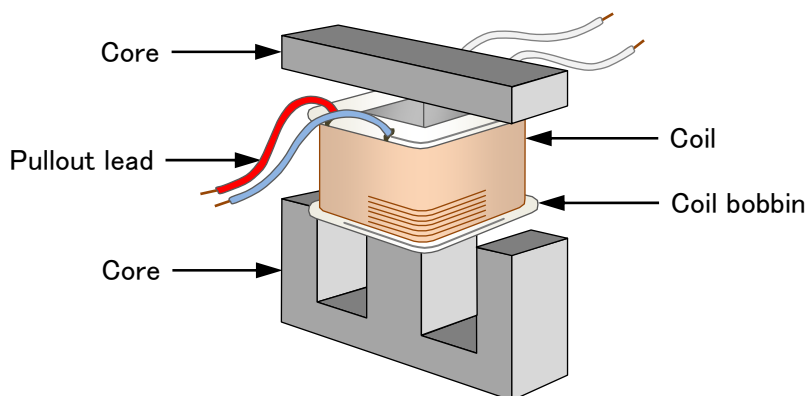
Cross section



* Please pay particular attention to any flame retardants in the package plastic, and the lead material and treatment.

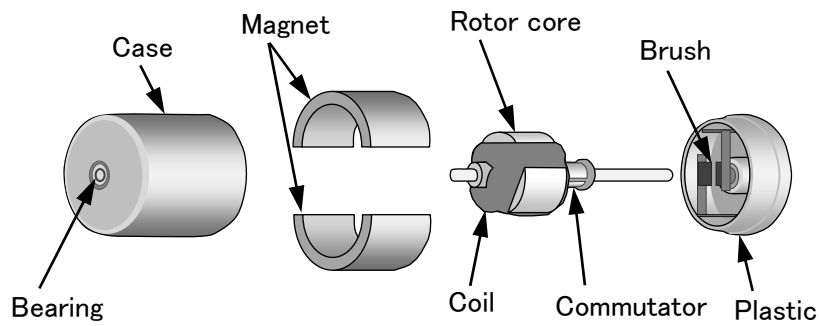
* Make the response concerning the device chip as best you can.

【Component Part Example 6】 Transformers and inductors



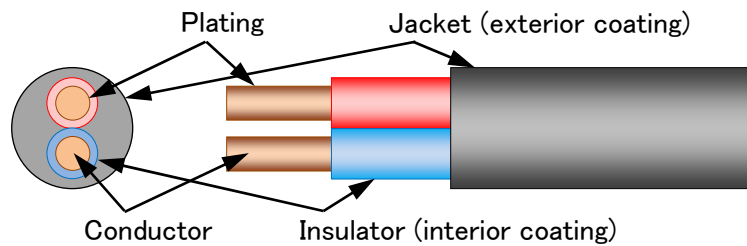
* Pay particular attention to flame retardants in plastic materials or insulating parts, impregnant in the coil, PVCs or flame retardants in the lead wire.

【Component Part Example 7】 DC motors



* Pay particular attention to special metals (alloys) used for flame retardants in plastic, and electrical characteristics and lubrication in commutators, as well as grease in bearings.

【Component Part Example 8】Electrical cable (power cord)



* Because contaminants are different when colors are different with the resin of insulator and jacket, please reply it by individual data.

Attachment 2: RoHS analysis method guideline

I. General

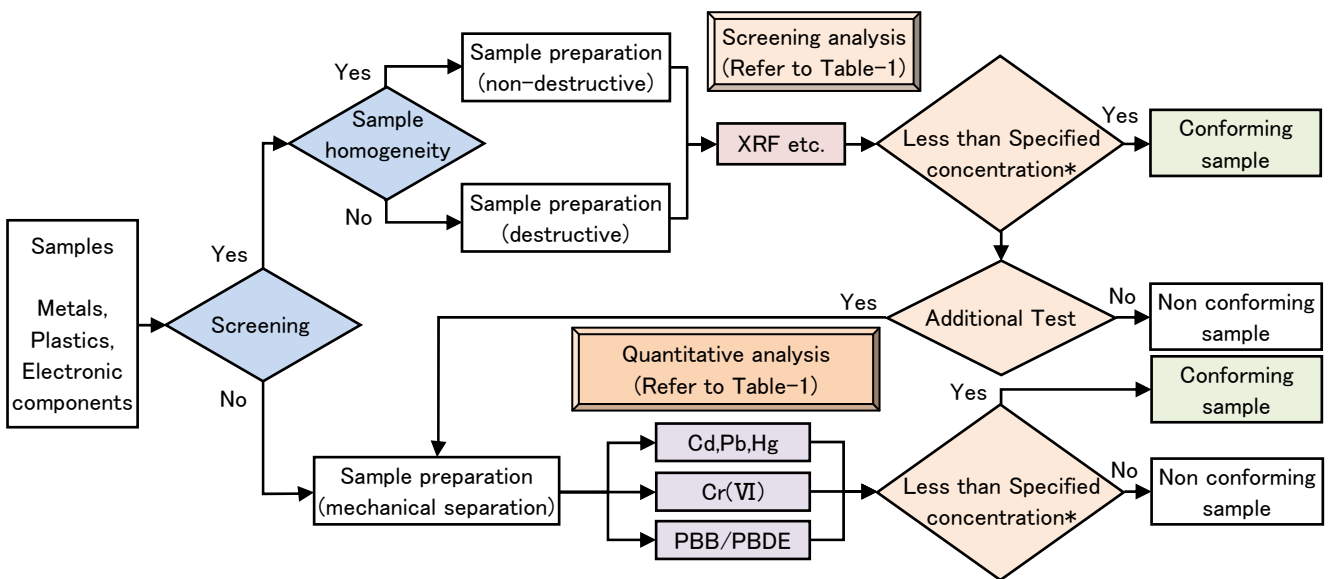
(1) How to proceed RoHS analysis

The basic way of RoHS analysis is shown in Fig.1 in the form of a flowchart. Conformance shall be determined either by screening analysis by means of an X-ray fluorescence spectrometer (XRF) etc.* shown in Table-1 or by quantitative analysis by means of ICP-OES or other methods also shown in Table-1. If the result of screening analysis turns out to be in the gray zone shown in Table-2 or Table-3, additional quantitative analysis shall be carried out for a final determination. If no additional test is carried out even though the result of analysis is in the gray zone, such a test sample shall be taken as a nonconforming item.

If any other analysis method than shown in Table-1 is to be used, submit the documentation to support the reliability of the method, and to receive a confirmation of our company.

However, if a certain analysis method is specified by the suppliers, use of such an analysis method shall not be inhibited.

*: Including 2nd screening for PBB and PBDE by Pyro/GC-MS etc., after 1st screening by XRF.



*: Specified concentration : Cd 100ppm, Pb (Resin) 300ppm, Others 1000ppm.
Heavy metal contained in packaging material 100ppm (Based on the total amount of all heavy metals)

Figure-1 Flow chart of the methods(In conformity to IEC62321 [Ed1])

(2) Applied analytical method

Table-1. Overview of the analysis method (In conformity to IEC62321 [Ed1])

Steps	Substances	Plastics	Metals, Ceramics	Electronic components
Sample preparation	Mechanical sample Preparation(homogenized) (see IEC62321 Clause 5)	Direct measurement, Cutting, milling or grinding	Direct measurement, Cutting, milling or grinding	Cutting, milling, Grinding
	Chemical sample preparation	Microwave digestion, Acid digestion, Dry-ashing, Solvent extraction	Microwave digestion, Acid digestion	Microwave digestion, Acid digestion, Solvent extraction
Screening/ Qualitative Analysis	5 elements (Hg, Pb, Cd, Br, Cr)	X-ray fluorescence (XRF) (see IEC62321 Clause 6)		
	PBBs ,PBDEs ^(*1)	IAMS, HPLC-UV, Pyro/GC-MS		IAMS, HPLC-UV, Pyro/GC-MS
Analytical technique definition (Definition of abbreviations are described last page.)	Hg	CV-AAS, CV-AFS, ICP-OES, ICP-MS(see IEC62321 Clause 7)		
	Pb/Cd	ICP-OES, ICP-MS, AAS (see IEC62321 Clause 8)	ICP-OES, ICP-MS, AAS (see IEC62321 Clause 9)	ICP-OES, ICP-MS, AAS (see IEC62321 Clause 10)
	PBB/PBDE	GC-MS (see IEC62321 Annex A)	NA	GC-MS (see IEC62321 Annex A)
	CrVI	Alkaline digestion / colorimetric method (see IEC62321 Annex C)	Boiling water extraction procedure(see IEC62321 Annex B) ^(*2)	Alkaline digestion / colorimetric method(see IEC62321 Annex C)

*1: Regarding PBB/PBDE, IAMS, HPLC-UV and Pyro/GS-MS can be used for 2nd screening, after 1st screening by XRF.

*2: Hot water (80°C) extraction/color development method is available. Determination of conformance with spot test method is not accepted.

II. Qualitative/quantitative analysis

(1) Screening/qualitative analysis by X-ray fluorescence (XRF)

When a test sample is subjected to screening measurement using X-ray fluorescence and the reading is $N \pm 3\sigma$ [unit: ppm], the value of 3σ is substituted in the judgment formula in Table-2. And if the value of N is BL, the test sample is judged as being conforming, if the value is OL, it is judged as being nonconforming, and if the value is X, it is judged as being in the gray zone.

The judgment formula in Table-2 serves as a basis for judgment, but the accurate analysis more than formula in Table-2 is possible depending on analysis organizations, analysis equipment, test samples, measurement conditions, etc. When it is appropriate to narrow the gray zone, a special exception for the judgment formula is approved. In this case, submit the documentation to support the reliability, and to receive a confirmation of our company.

When a plated test sample is subjected to screening by X-ray fluorescence, use of a thin film FP method is essential.

Table-2. Screening limits in mg/kg for regulated elements in various matrix (extract from IEC62321 Ed1 Annex D)

Element	Plastics	Metals	Electronic components
Cd	$BL \leq (70 - 3\sigma) < X < (130 + 3\sigma) \leq OL$		$LOD < X < (150 + 3\sigma) \leq OL$
Pb	$BL \leq (700 - 3\sigma) < X < (1300 + 3\sigma) \leq OL$		$BL \leq (500 - 3\sigma) < X < (1500 + 3\sigma) \leq OL$
Hg			
Br	$BL \leq (300 - 3\sigma) < X$	—	$BL \leq (250 - 3\sigma) < X$
Cr	$BL \leq (700 - 3\sigma) < X$		$BL (500 - 3\sigma) < X$

X: region where further investigation is necessary, BL: Below Limit, OL: Over Limit, LOD: Limit of detection
X-ray fluorescence cannot identify PBB, PBDE, Cr(VI), therefore you cannot judge OL(over limit) about Br and Cr.

(2) 2nd Screening/qualitative analysis for PBBs and PBDEs

The existence of PBBs and PBDEs cannot be judged by Screening by XRF. When the value of Br in a test sample by using XRF is in the gray zone, IAMS, HPLC-UV or Pyro/GC-MS can be used for 2nd screening. After measuring the value of Br by using these equipment, the measured value N[unit: ppm] is substituted in the judgment formula in Table-3. If N is in BL, it is judged as a conforming sample. If not, it is judged as a sample in the gray zone. The sample in the gray zone has to be judged whether it is confirming sample or not by using quantitative analysis.

Additionally, the judgment formula of Table-3 will basically be used in most cases. However, according to the analysis organization, analysis equipment, test samples and measurement conditions etc., the analysis that is more accurate than formula in Table-3 may be able to be used. Therefore, if it is possible to narrow the gray zone, a special exception for the judgment formula is approved. In this case, submit the documentation to support the reliability, and to receive a confirmation of our company.

Table-3. Judgment formula for 2nd Screening limits of PBBs and PBDEs

	Plastics	Metals	Electronic components
PBBs, BDEs	$BL \leq 500 < X$	—	$BL \leq 500 < X$

X: Gray zone for judgment, BL: Below Limit

Judgment value of gray zone (500ppm) for PBBs and PBDEs are in conformity to draft of IEC62321 [Ed2]

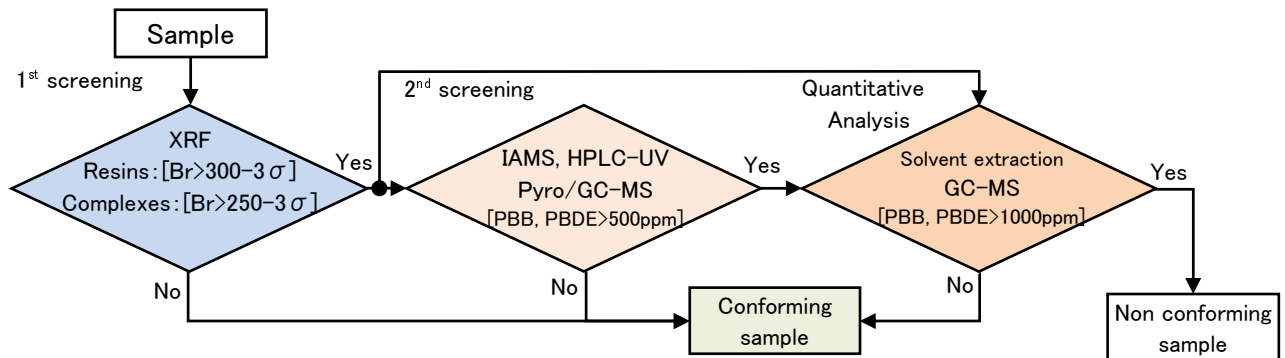


Figure-2 Flow chart on analysis method on the 2nd screening for PBBs and PBDEs.

(3) Quantitative analysis of lead and cadmium [in conformance with IEC62321 Article 8 – Article 10]

Analysis methods differ between surface-treated items such as plated ones and other homogeneous materials. Therefore, according to the purposes, analysis methods should be selected.

(3)-A. Surface-treated material such as plating

1) Surface treated material such as commonly-used plating etc.

Only the surface-treated layer of a plated test sample is selectively ground and dissolved, and is extracted as a homogeneous material, and the liquid in which it is dissolved, after being weighed, in an enclosed system (microwave decomposition) or an open system (acid decomposition) depending on the test sample is used for its analysis.

The solution of the test sample is quantitatively determined with an atomic absorption spectrometry (a flameless atomic absorption spectrometry is also available) or ICP emission spectrometry (ICP mass analysis is also available). Select acid suitable for the testing material using Table-4 as a guide

Table-4. Recommended acid by test sample material

Test sample material	Acids
Fe, Cu, Al, Solder	Aqua regia, HNO ₃ , HCl, HF, H ₂ O ₂
Au, Pt, Pd, Ceramic	Aqua regia
Polymer	H ₂ SO ₄ , H ₂ O ₂ , HNO ₃ , HCl
Glass	HNO ₃ , HF
Ag	HNO ₃
Others	Various acid

2) Surface treated material whose plated layer is 0.1 μ m or less and surface area is 10mm² or less

As a company standard, analysis method 3-(B) is applicable

EU Commission accepts alternative method on an exemption as stated in RoHS Enforcement Guidance Document (*3), in case that a analysis is economically and technically difficult when huge test material is required to dissolve selectively its plated portion to make analysis in ppm basis for such test material that plated in extremely small area and at extremely thin.

*3: RoHS Enforcement Guidance Document Ed.1, (2006/05)

3) Neither of the methods above is possible to apply, because its plated portion is too small area and thick

The analysis of object substance concentration within a plating bath is applicable.

Standard control concentration shall be 1/100 of RoHS' s allowable concentration.

(Cadmium is 1ppm or less, and lead is 10ppm or less)

(3)-B. Homogeneous material, such as solder, resin, paint, ink, and pigment

- The liquid in which the test sample is dissolved, after being weighed, in an enclosed system (microwave decomposition) or an open system (acid decomposition) depending on the test sample is used for its analysis.
- The solution sample is quantitatively determined by using an atomic absorption spectrometry (a flameless atomic absorption spectrometry is also available) or ICP emission spectral analysis. (ICP mass analysis is also available) You can select acid in response to material quality. (Reference Table-4)

(4) Quantitative analysis of mercury [in conformance with IEC62321 Article 7]

- The liquid in which the test sample is dissolved, after being weighed, in an enclosed system (microwave decomposition) or an open system (acid decomposition) depending on the test sample is used for its analysis. If a test sample residue remains failing to be completely dissolved, make sure that there is no mercury in the residue by XRF or other method.
- The solution of test material is quantitatively determined by using an atomic absorption spectrometry (a flameless atomic absorption spectrometry is also available) or ICP emission spectral analysis (ICP mass analysis is also available).

(5) Quantitative analysis of hexavalent chromium compound
[in conformance with IEC62321 Annexes B and C]

Analysis methods differ between chromate-treated components and other materials. Therefore, according to the purposes, analysis methods should be selected.

(5)-A. Components subjected to chromate treatment on the metal surface
[In conformance with IEC62321 Annex B],

“Boiling water (or hot water) extraction – diphenylcarbazide absorption photometry method”

- Take a sample having a surface area of 50cm² (20 – 30cm²), and perform extraction for 10 minutes by immersing the sample in 100 °C (80 °C) boiling water (hot water).
- After extraction, remove the sample, add water to the extraction liquid to make 50ml (30ml), and carry out analysis using this solution.
- For the sample solution, selectively quantify only the hexavalent chromium, using the diphenylcarbazide absorption photometry method or ion chromatograph analysis method.
- From the extracted amount measured in the preceding step and the surface area of the sample, calculate the extracted amount of hexavalent chromium (Cr⁶⁺) μg/cm².

Although IEC62321 prescribes the boiling water extraction method, boiling water can pose a high risk of burns. Therefore, application of the hot water extracting method that is our conventional analysis method [Ver.1.2] is also allowed only for in-house measurement (including business partners).

Table-5 shows the comparison of extraction conditions between both methods.

Table-5. Comparison of conditions between boiling water extraction method and hot water extraction method (*4)

Items	Boiling water extraction method	Hot water extraction method
Extraction water temperature (°C)	100	80
Extraction time (minute)	10±0.5	10±0.5
Surface area of the sample (cm ²) (*5)	50±5	25±5
Extraction water volume (ml)	50	30
Extraction efficiency (%)	100	50

*4 In the test method mentioned above, the measurement result is obtained by (Cr⁶⁺) μg/cm². To determine RoHS conformity, it is necessary to calculate the concentration in the chromate coating by determining the thickness of the chromate coating, the specific gravity of the chromate coating, the extraction efficiency, etc. However, it is considered that the chromate coating has a complicated multinuclear complex structure and conversion to the concentration in the chromate coating is very difficult because the thickness of the chromate coating and the specific gravity of the chromate coating vary with temperature and humidity. Therefore, even IEC62321 merely sets the criterion to determine the presence or absence of Cr⁶⁺ to 0.02 μg/cm², and does not define a criterion of judgment for conformance to RoHS standard (1,000ppm). When assuming the coating thickness to be 0.25 μm, the specific gravity of the coating to be 4, and the extraction efficiency to be 100% for convenience sake, the concentration in the chromate coating of 0.02 μg/cm² is estimated to be 200ppm. From this estimation, this guideline sets the criterion for RoHS conformance to 0.1 μg/cm² when measured using boiling water extraction method (0.05 μg/cm² for hot water extraction method assuming the extraction efficiency to be 50%).

*5: As for calculation of the surface area of a screw, please refer to the surface area calculation formula shown in IEC62321 Annex B or the surface area calculation formula by the schematic diagram and the approximation formula as follows.

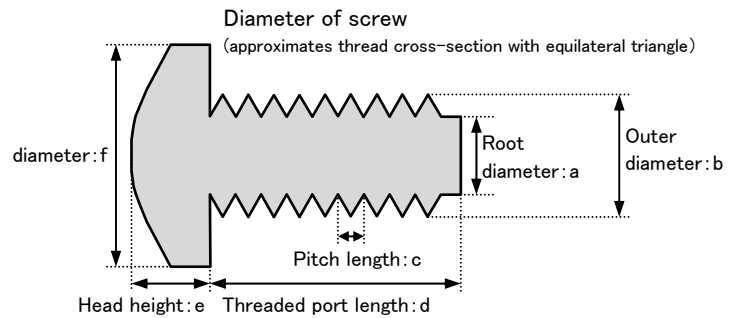
(Approximation formula)

When the cross section of threads is approximated with equilateral triangle, the surface area is given by the following formula.

Total surface area of screw = (1) Surface area of screw head and bottom + (2) Surface area of threads

$$(1) = \pi \times f \times e + 2 \times \pi \times \left(\frac{f}{2}\right)^2$$

$$(2) = \pi \times \left\{ \left(\frac{b}{2}\right) - \left(\frac{a}{2}\right) \right\} \times \frac{d}{c} \times 2 \times \frac{2}{\sqrt{3}}$$



**(5)-B. Homogeneous material, such as resin, paint, ink, and pigment and electronic parts
[in conformance with IEC62321 Annex C]**

“Alkaline extraction – diphenylcarbazine absorptiometrical method”

- Smashed test samples which pass through a screen (250 μ m) shall be used for analysis. After weighing them, perform extraction using alkaline/hot water.
- After extraction, remove the test samples from alkaline water and adjust the alkaline water to pH7.5±0.5 with diluted nitric acid, and then use it as a sample solution.
- Quantify only the hexavalent chromium in the solution sample using the diphenylcarbazine absorptiometrical method.
- Convert the quantifying result to the hexavalent chromium content in homogeneous material (Cr⁶⁺) μ g/(the total mass of test samples)g.
- A method by which the above-mentioned extraction sample is subjected to ICP measurement and the total chromium concentration is found to be lower than the criterion value is also available.

The extraction efficiency of hexavalent chromium depends heavily on the kind of resin. Therefore, Table-6 shows the extraction methods according to the kind of resin.

Table-6. Applicability for Alkaline extraction method

Resin materials	Applicability
PVC、ABS	Allowed
EVAC、PE	Not allowed
Others	Seek the extraction efficiency experimentally and correct.

(6) 2nd Screening and Quantitative Analysis of PBBs and PBDEs in Resins
[in conformity to Draft of IEC62321 Ed2 Part 6]

The sample that is judged as being in gray zone by 1st screening is better to be analyzed by quantitative analysis. It is allowed that you can implement 2nd screening before quantitative analysis, and then do the quantitative analysis after being judged as gray zone by the result of 2nd screening.

Pyro/GC-MS, IAMS or HPLC-UV can be used for 2nd screening analysis of PBBs and PBDEs

Prepare the sample for 2nd screening (different from the each equipments)

- Pyro/GC/MS, IAMS:
 - Test samples crushed under 500 μ m shall be used for analysis.
- HPLC-UV
 - Test samples crushed under 500 μ m shall be extracted by appropriate organic solvent for dissolving the sample (e.g. toluene, tetrahydrofuran).
 - Appropriate extraction procedure such as soxhlet extraction method. Test samples are either dissolution or swelling.
 - The extracted test material is cleaned up by dry silica gel and used to be analyzed.

The judgment of gray zone by 2nd screening is obeyed this formula.

$$500\text{ppm} < \text{The analyzed results of PBBs, PBDEs}$$

Prepare the sample for quantitative analysis and analyze

- Test samples crushed under 500 μ m shall be extracted by appropriate organic solvent for dissolving the sample (e.g. toluene, tetrahydrofuran).
- Appropriate extraction procedure such as soxhlet extraction method. Test samples are either dissolution or swelling.
- The extracted test material is cleaned up by dry silica gel and used to be analyzed.
- The extracted solution of test sample is quantitatively determined by using quadrupole GC-MS (Gas Chromatography Mass Spectroscopy analysis) equipment or magnetic sector-type high resolution mass spectrometer.

---End of Message---

Abbreviations

ICP-OES : Inductively coupled plasma optical emission spectrometry

ICP-MS : Inductively coupled plasma mass spectrometry

CV-AAS : Cold vapour atomic absorption spectrometry

CV-AFS : Cold vapour atomic fluorescent spectrometry

AAS : Atomic absorption spectrometry

UV-Vis : Ultraviolet and visible spectrometry

GC-MS : Gas chromatography - mass spectrometry

IA-MS : Ion attached mass spectrometry

Pyro/GC-MS : Pyrolyzer/GC-MS

HPLC-UV : High performance liquid chromatography- Ultraviolet and visible spectrometry