



Test Report

No.: ETR23B02042

Date: 20-Nov-2023

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HAESUNGDS CO., LTD.

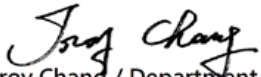
(SEONGJU-DONG) 726, UNGNAM-RO, SEONGSAN-GU, CHANG-WON-SI, GYEONGSANGNAM-DO, KOREA

The following sample(s) was/were submitted and identified by the applicant as:

Sample Submitted By : HAESUNGDS CO., LTD.
Sample Name : LEAD FRAME
Style/Item No. : C194-UPPF
Sample Material : METAL ALLOY
SGS File No. : AYGU23-08895

Sample Receiving Date : 13-Nov-2023
Testing Period : 13-Nov-2023 to 20-Nov-2023

Test Requested : (1) As specified by client, with reference to RoHS 2011/65/EU Annex II and amending Directive (EU) 2015/863 to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP contents in the submitted sample(s).
(2) Please refer to next pages for the other item(s).
Test Results : Please refer to following pages.


Troy Chang / Department Manager
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory - Taipei



PIN CODE: 7A431993

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Test Part Description

No.1 : SILVER COLORED METAL

Test Result(s)

Test Item(s)	Method	Unit	MDL	Result
				No.1
Cadmium (Cd)	With reference to IEC 62321-5: 2013, analysis was performed by ICP-OES.	mg/kg	2	n.d.
Lead (Pb)	With reference to IEC 62321-5: 2013, analysis was performed by ICP-OES.	mg/kg	2	11.2
Mercury (Hg)	With reference to IEC 62321-4: 2013+ AMD1: 2017, analysis was performed by ICP-OES.	mg/kg	2	n.d.
Hexavalent Chromium Cr(VI) (#2)	With reference to IEC 62321-7-1: 2015, analysis was performed by UV-VIS.	µg/cm ²	0.1	n.d.
Monobromobiphenyl	With reference to IEC 62321-6: 2015, analysis was performed by GC/MS.	mg/kg	5	n.d.
Dibromobiphenyl		mg/kg	5	n.d.
Tribromobiphenyl		mg/kg	5	n.d.
Tetrabromobiphenyl		mg/kg	5	n.d.
Pentabromobiphenyl		mg/kg	5	n.d.
Hexabromobiphenyl		mg/kg	5	n.d.
Heptabromobiphenyl		mg/kg	5	n.d.
Octabromobiphenyl		mg/kg	5	n.d.
Nonabromobiphenyl		mg/kg	5	n.d.
Decabromobiphenyl		mg/kg	5	n.d.
Sum of PBBs		mg/kg	-	n.d.
Monobromodiphenyl ether		mg/kg	5	n.d.
Dibromodiphenyl ether		mg/kg	5	n.d.
Tribromodiphenyl ether		mg/kg	5	n.d.
Tetrabromodiphenyl ether		mg/kg	5	n.d.
Pentabromodiphenyl ether		mg/kg	5	n.d.
Hexabromodiphenyl ether		mg/kg	5	n.d.
Heptabromodiphenyl ether		mg/kg	5	n.d.
Octabromodiphenyl ether		mg/kg	5	n.d.
Nonabromodiphenyl ether		mg/kg	5	n.d.
Decabromodiphenyl ether		mg/kg	5	n.d.
Sum of PBDEs		mg/kg	-	n.d.

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Test Item(s)	Method	Unit	MDL	Result No.1
Dibutyl phthalate (DBP)	With reference to IEC 62321-8: 2017, analysis was performed by GC/MS.	mg/kg	50	n.d.
Butyl benzyl phthalate (BBP)		mg/kg	50	n.d.
Di-(2-ethylhexyl) phthalate (DEHP)		mg/kg	50	n.d.
Diisobutyl phthalate (DIBP)		mg/kg	50	n.d.
Diisodecyl phthalate (DIDP) (CAS No.: 26761-40-0, 68515-49-1)		mg/kg	50	n.d.
Diisononyl phthalate (DINP) (CAS No.: 28553-12-0, 68515-48-0)		mg/kg	50	n.d.
Di-n-octyl phthalate (DNOP) (CAS No.: 117-84-0)		mg/kg	50	n.d.
Di-n-pentyl phthalate (DNPP) (CAS No.: 131-18-0)		mg/kg	50	n.d.
Di-n-hexyl phthalate (DNHP) (CAS No.: 84-75-3)		mg/kg	50	n.d.
Bis(2-methoxyethyl) phthalate (DMEP) (CAS No.: 117-82-8)		mg/kg	50	n.d.
N-pentyl iso-pentyl phthalate (NPIPP) (CAS No.: 776297-69-9)		mg/kg	50	n.d.
Diisopentyl phthalate (DIPP) (CAS No.: 605-50-5)		mg/kg	50	n.d.
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP) (CAS No.: 68515-42-4)		mg/kg	50	n.d.
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP) (CAS No.: 71888-89-6)		mg/kg	50	n.d.
Polychlorinated biphenyls (PCBs)	With reference to US EPA 3550C: 2007, analysis was performed by GC/MS.	mg/kg	0.5	n.d.
Polychlorinated naphthalene (PCNs)	With reference to US EPA 3550C: 2007, analysis was performed by GC/MS.	mg/kg	5	n.d.
Polychlorinated terphenyls (PCTs)	With reference to US EPA 3550C: 2007, analysis was performed by GC/MS.	mg/kg	0.5	n.d.
Short Chain Chlorinated Paraffins(C10-C13) (SCCP) (CAS No.: 85535-84-8)	With reference to ISO 18219-1: 2021, analysis was performed by GC/MS.	mg/kg	50	n.d.

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Test Item(s)	Method	Unit	MDL	Result
				No.1
Medium Chain Chlorinated Paraffins(C14-C17) (MCCP) (CAS No.: 85535-85-9)	With reference to ISO 18219-2: 2021, analysis was performed by GC/MS.	mg/kg	50	n.d.
Triphenyl tin (TPT)	With reference to ISO 17353: 2004, analysis was performed by GC/FPD.	mg/kg	0.03	n.d.
Tributyl tin (TBT)	With reference to ISO 17353: 2004, analysis was performed by GC/FPD.	mg/kg	0.03	n.d.
Dioctyl tin (DOT)	With reference to ISO 17353: 2004, analysis was performed by GC/FPD.	mg/kg	0.03	n.d.
Dibutyl tin (DBT)	With reference to ISO 17353: 2004, analysis was performed by GC/FPD.	mg/kg	0.03	n.d.
Bis(tributyltin) oxide (TBTO) (CAS No.: 56-35-9)	Calculated from the result of Tributyl Tin (TBT).	mg/kg	0.03▲	n.d.
Fluorine (F) (CAS No.: 14762-94-8)	With reference to BS EN 14582: 2016, analysis was performed by IC.	mg/kg	50	n.d.
Chlorine (Cl) (CAS No.: 22537-15-1)		mg/kg	50	n.d.
Bromine (Br) (CAS No.: 10097-32-2)		mg/kg	50	n.d.
Iodine (I) (CAS No.: 14362-44-8)		mg/kg	50	n.d.
Arsenic (As) (CAS No.: 7440-38-2)	With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.	mg/kg	2	n.d.
Beryllium (Be) (CAS No.: 7440-41-7)	With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.	mg/kg	2	n.d.
Antimony (Sb) (CAS No.: 7440-36-0)	With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.	mg/kg	2	n.d.
PFOS and its salts (CAS No.: 1763-23-1 and its salts)	With reference to CEN/TS 15968: 2010, analysis was performed by LC/MS/MS.	mg/kg	0.01	n.d.
PFOA and its salts (CAS No.: 335-67-1 and its salts)		mg/kg	0.01	n.d.
Polyvinyl chloride (PVC)	With reference to ASTM E1252: 2021, analysis was performed by FT-IR and Flame Test.	**	-	Negative
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (α - HBCDD, β - HBCDD, γ - HBCDD) (CAS No.: 25637-99-4, 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8))	With reference to IEC 62321: 2008, analysis was performed by GC/MS.	mg/kg	5	n.d.

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Note :

1. mg/kg = ppm ; 0.1wt% = 0.1% = 1000ppm
2. MDL = Method Detection Limit
3. n.d. = Not Detected (Less than MDL)
4. "-" = Not Regulated
5. ** = Qualitative analysis (No Unit)
6. Negative = Undetectable ; Positive = Detectable
7. (#2) =
 - a. The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13 µg/cm². The sample coating is considered to contain Cr(VI).
 - b. The sample is negative for Cr(VI) if Cr(VI) is n.d. (concentration less than 0.10 µg/cm²). The coating is considered a non-Cr(VI) based coating
 - c. The result between 0.10 µg/cm² and 0.13 µg/cm² is considered to be inconclusive - unavoidable coating variations may influence the determination.
8. ▲ : The MDL was evaluated for element / tested substance.

Conversion Formula : $AX = A \times F$

AX	A	F
Bis(tributyltin)oxide (TBTO)	Tributyl Tin (TBT)	1.0276

Parameter Conversion Table : https://eecloud.sgs.com/Region_TW/DocDownload.aspx?name=Others

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PFAS Remark :

The quantitative technology of PFAS is to analyze the specific structure of PFAS substances. However, PFAS acid and its salts with the same carbon number group have the same specific structure that can be identified. The tested results of the analyzed specific structure cannot be distinguished to identify the contribution from PFAS acid or its salts. Therefore, the tested results display the sum of concentrations of PFAS acids and its salts with the same carbon number group. The concentration of PFAS substances in the below table have been included in the tested results, please refer to the table for relevant information: (The listed PFAS substances are examples only, it do not include all PFAS salts with the same carbon number group.)

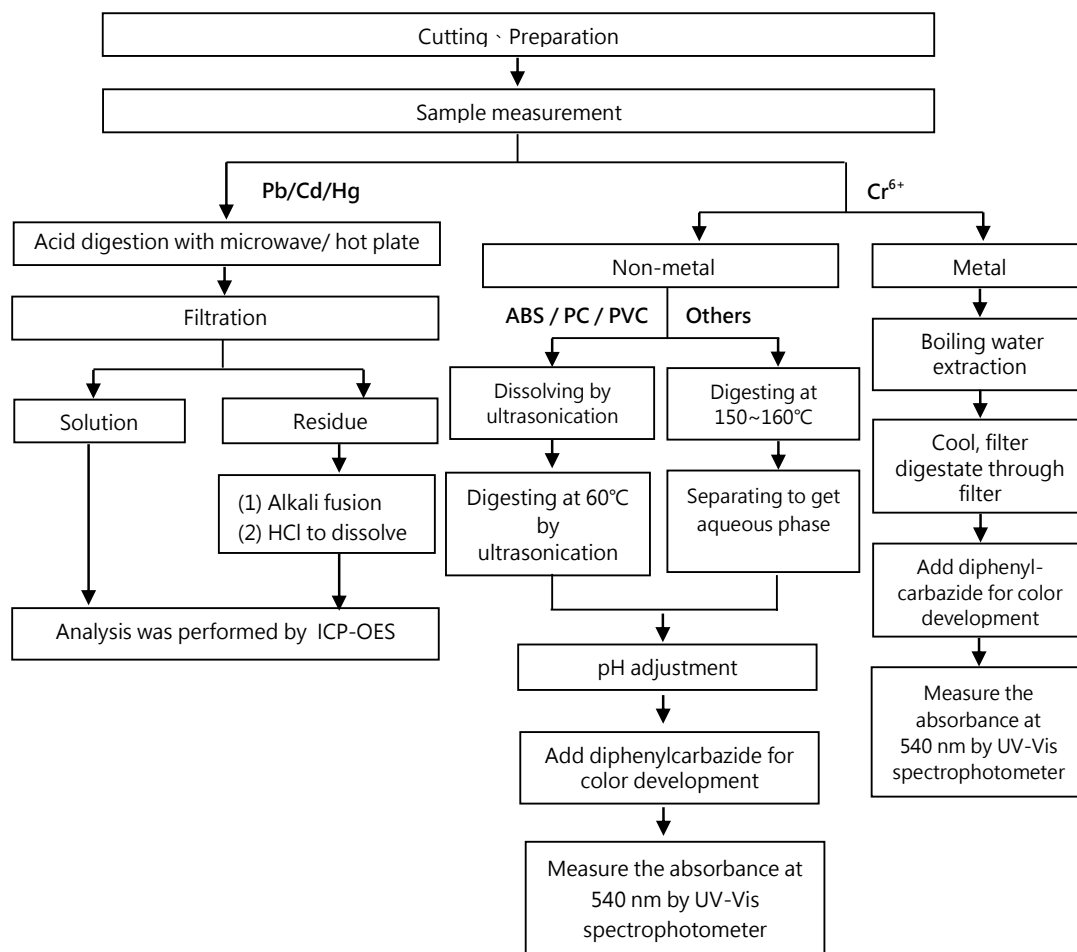
Classification of Substance Concentration	Substance Name	CAS No.
Perfluorooctane sulfonates and its salts (PFOS and its salts) (CAS No.: 1763-23-1 and its salts)	Potassium perfluorooctanesulfonate (PFOS-K)	2795-39-3
	Perfluorooctanesulfonic acid, lithium salt (PFOS-Li)	29457-72-5
	Perfluorooctanesulfonic acid, ammonium salt (PFOS-NH ₄)	29081-56-9
	Perfluorooctane sulfonate diethanolamine salt (PFOS-NH(OH) ₂)	70225-14-8
	Perfluorooctanesulfonic acid, tetraethylammonium salt (PFOS-N(C ₂ H ₅) ₄)	56773-42-3
	N-decyl-N,N-dimethyldecyl-1-aminium 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptafluorooctane-1-sulfonate (PFOS-DDA)	251099-16-8
	Perfluorooctane sulfonyl fluoride (POSF)	307-35-7
	Perfluorooctanesulfonic acid, magnesium salt (PFOS-Mg)	91036-71-4
	Perfluorooctanesulfonic acid, sodium salt (PFOS-Na)	4021-47-0
Perfluorooctanoic acid and its salts (PFOA and its salts) (CAS No.: 335-67-1 and its salts)	Sodium perfluorooctanoate (PFOA-Na)	335-95-5
	Potassium perfluorooctanoate (PFOA-K)	2395-00-8
	Silver perfluorooctanoate (PFOA-Ag)	335-93-3
	Perfluorooctanoyl fluoride (PFOA-F)	335-66-0
	Ammonium pentadecafluorooctanoate (APFO)	3825-26-1
	Lithium perfluorooctanoate (PFOA-Li)	17125-58-5

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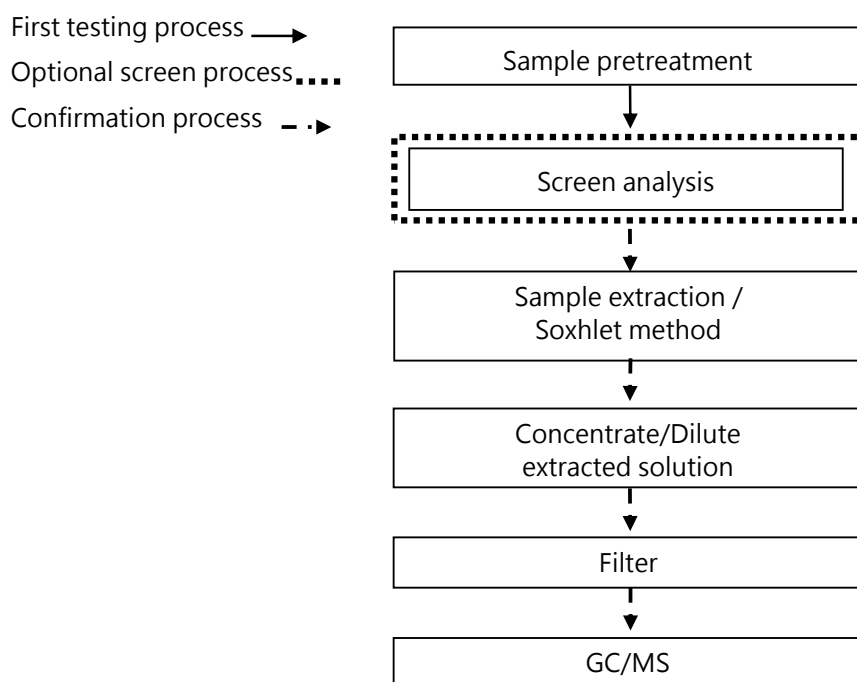
Analytical flow chart of heavy metal

These samples were dissolved totally by pre-conditioning method according to below flow chart.

(Cr^{6+} test method excluded)



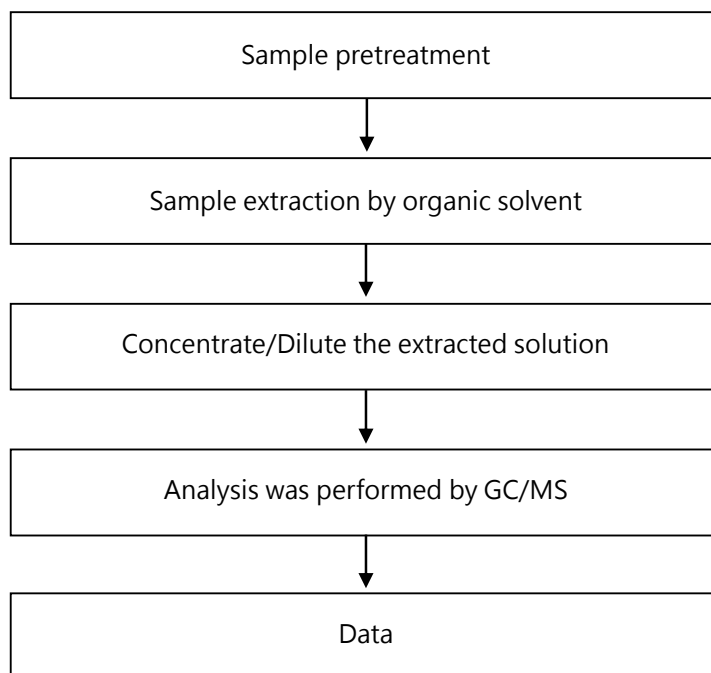
Analytical flow chart – PBBs / PBDEs



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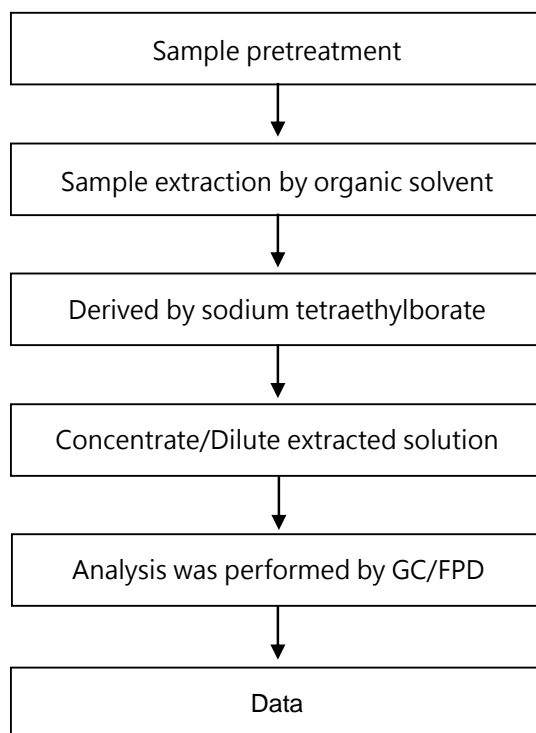
Analytical flow chart

* Apply to: PCBs, PCNs, PCTs, Mirex, Chlorinated Paraffins, DBBT



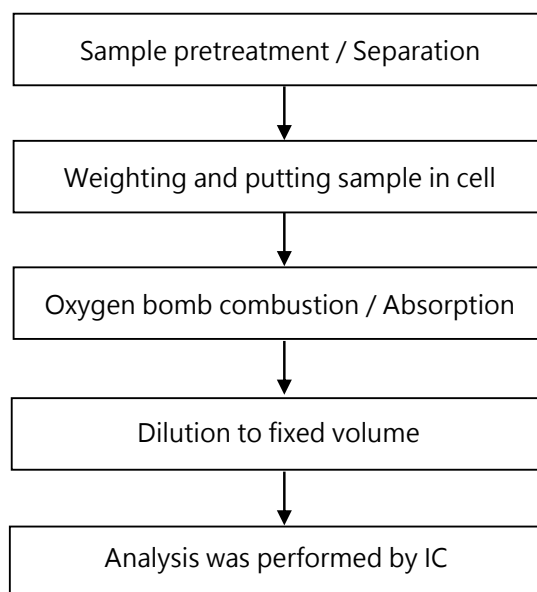
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Analytical flow chart - Organic-Tin



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Analytical flow chart - Halogen

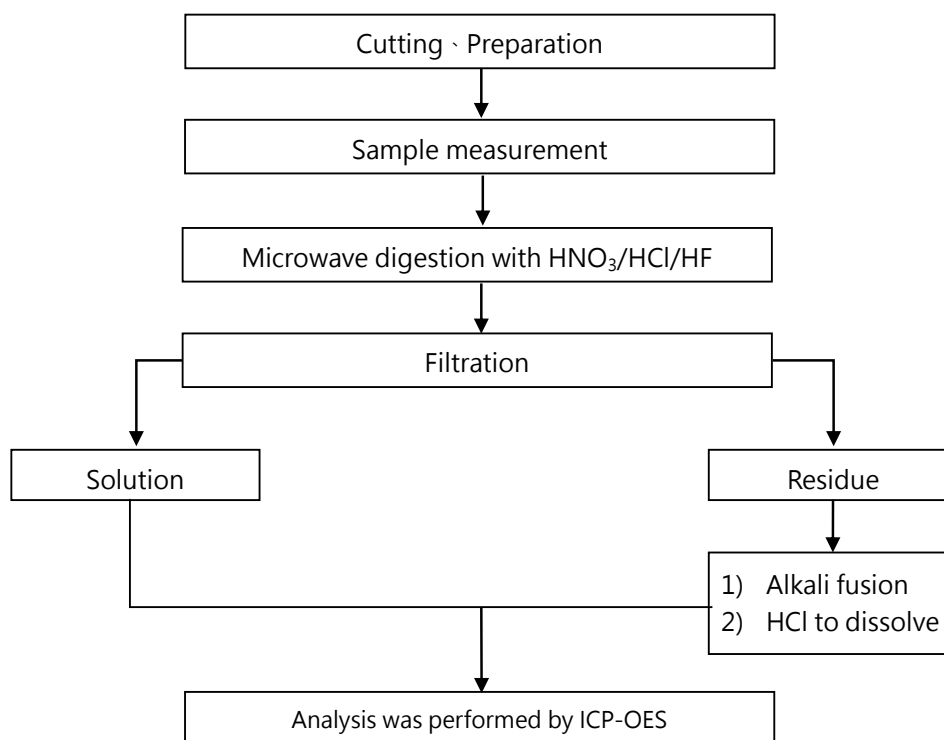


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Analytical flow chart of elements (Heavy metal included)

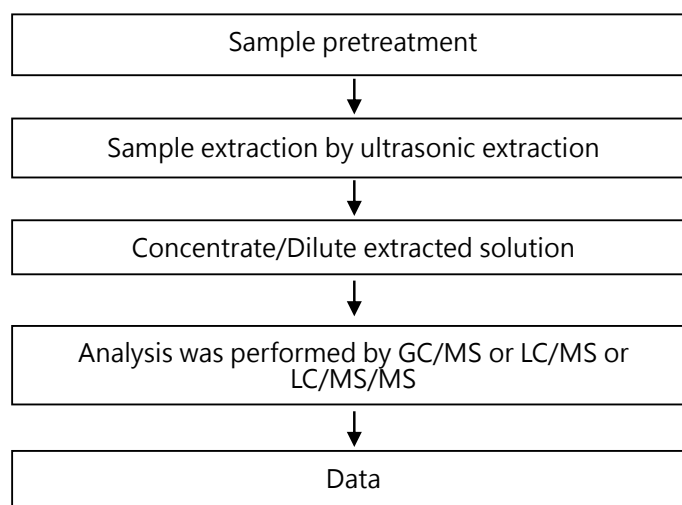
These samples were dissolved totally by pre-conditioning method according to below flow chart.

【Reference method : US EPA 3051A 、US EPA 3052】



* US EPA 3051A method does not add HF.

Analytical flow chart – PFAS (including PFOA/PFOS/its related compound, etc.)



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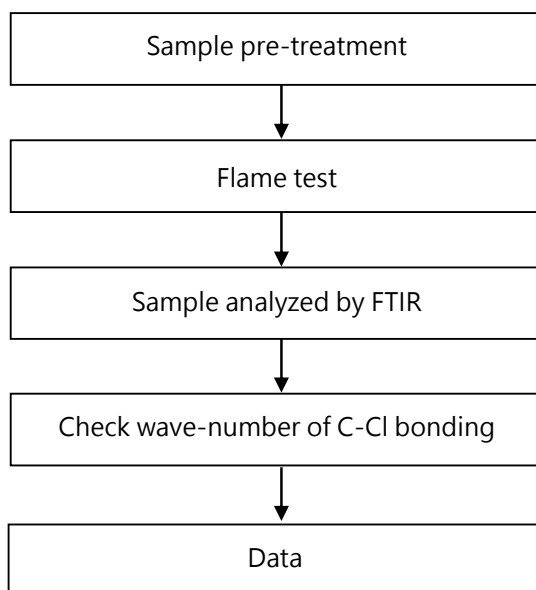
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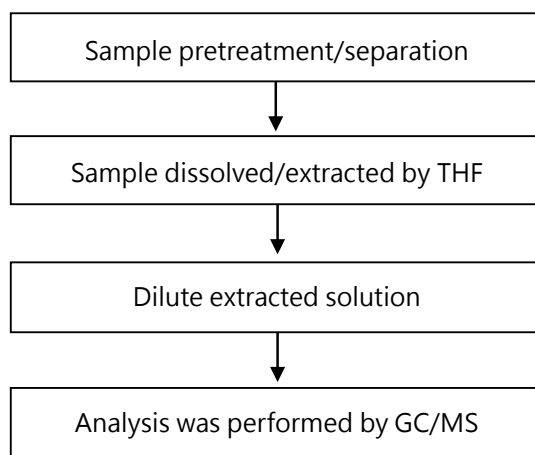
Analysis flow chart - PVC



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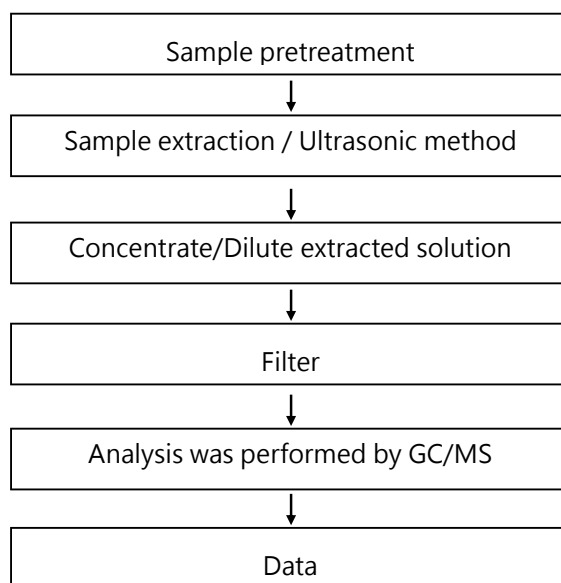
Analytical flow chart - Phthalate

【Test method: IEC 62321-8】



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Analytical flow chart - HBCDD



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Test Report

No.: ETR23B02042

Date: 20-Nov-2023

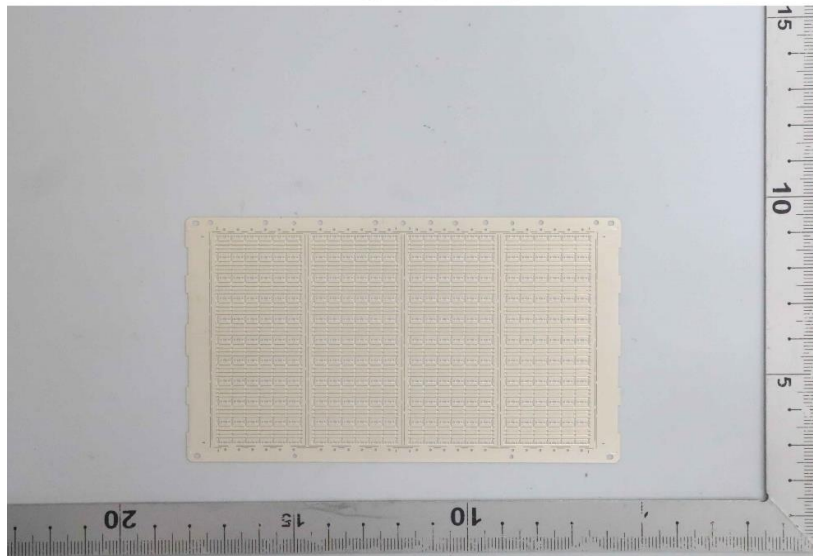
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HAESUNGDS CO., LTD.

(SEONGJU-DONG) 726, UNGNAM-RO, SEONGSAN-GU, CHANG-WON-SI, GYEONGSANGNAM-DO, KOREA

* The tested sample / part is marked by an arrow if it's shown on the photo. *

ETR23B02042



** End of Report **

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