

## Test Report

No. : CE/2019/A2167

Date : 2019/10/18

Page : 1 of 9

TAIYO YUDEN CO., LTD.

8-1, SAKAE-CHO, TAKASAKI-SHI, GUNMA, JAPAN

The following samples was/were submitted and identified by/on behalf of the applicant as :

Sample Submitted By : TAIYO YUDEN CO., LTD.  
Sample Description : ELECTRODE  
Style/Item No. : MLD-3  
Sample Receiving Date : 2019/10/14  
Testing Period : 2019/10/14 to 2019/10/18

### 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 Result(s) : Please refer to following pages.

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



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# Test Report

No. : CE/2019/A2167

Date : 2019/10/18

Page : 2 of 9

TAIYO YUDEN CO., LTD.

8-1, SAKAE-CHO, TAKASAKI-SHI, GUNMA, JAPAN

## Test Result(s)

PART NAME No.1 : IRON-GRAY CHIP

Test Item(s)	Unit	Method	MDL	Result
				No.1
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-OES.	2	n.d.
Lead (Pb)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-OES.	2	n.d.
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013+AMD1:2017 and performed by ICP-OES.	2	n.d.
Hexavalent Chromium Cr(VI)(#2)	µg/cm <sup>2</sup>	With reference to IEC 62321-7-1 (2015) and performed by UV-VIS.	0.10	n.d.
<b>Sum of PBBs</b>	mg/kg	With reference to IEC 62321-6 (2015) and performed by GC/MS.	-	n.d.
Monobromobiphenyl	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.
<b>Sum of PBDEs</b>	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.	

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# Test Report

No. : CE/2019/A2167

Date : 2019/10/18

Page : 3 of 9

TAIYO YUDEN CO., LTD.

8-1, SAKAE-CHO, TAKASAKI-SHI, GUNMA, JAPAN

Test Item(s)	Unit	Method	MDL	Result
				No.1
BBP (Butyl Benzyl phthalate) (CAS No.: 85-68-7)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.
DBP (Dibutyl phthalate) (CAS No.: 84-74-2)	mg/kg		50	n.d.
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 117-81-7)	mg/kg		50	n.d.
DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5)	mg/kg		50	n.d.
DIDP (Di-isodecyl phthalate) (CAS No.: 26761-40-0; 68515-49-1)	mg/kg		50	n.d.
DINP (Di-isononyl phthalate) (CAS No.: 28553-12-0; 68515-48-0)	mg/kg		50	n.d.
DNOP (Di-n-octyl phthalate) (CAS No.: 117-84-0)	mg/kg		50	n.d.
Halogen-Chlorine (Cl) (CAS No.: 22537-15-1)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.
Halogen-Bromine (Br) (CAS No.: 10097-32-2)	mg/kg		50	n.d.
Antimony (Sb)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-OES.	2	n.d.
Arsenic (As)	mg/kg		2	n.d.
Beryllium (Be)	mg/kg		2	n.d.
Phosphorus (P)	mg/kg		2	142

## Note :

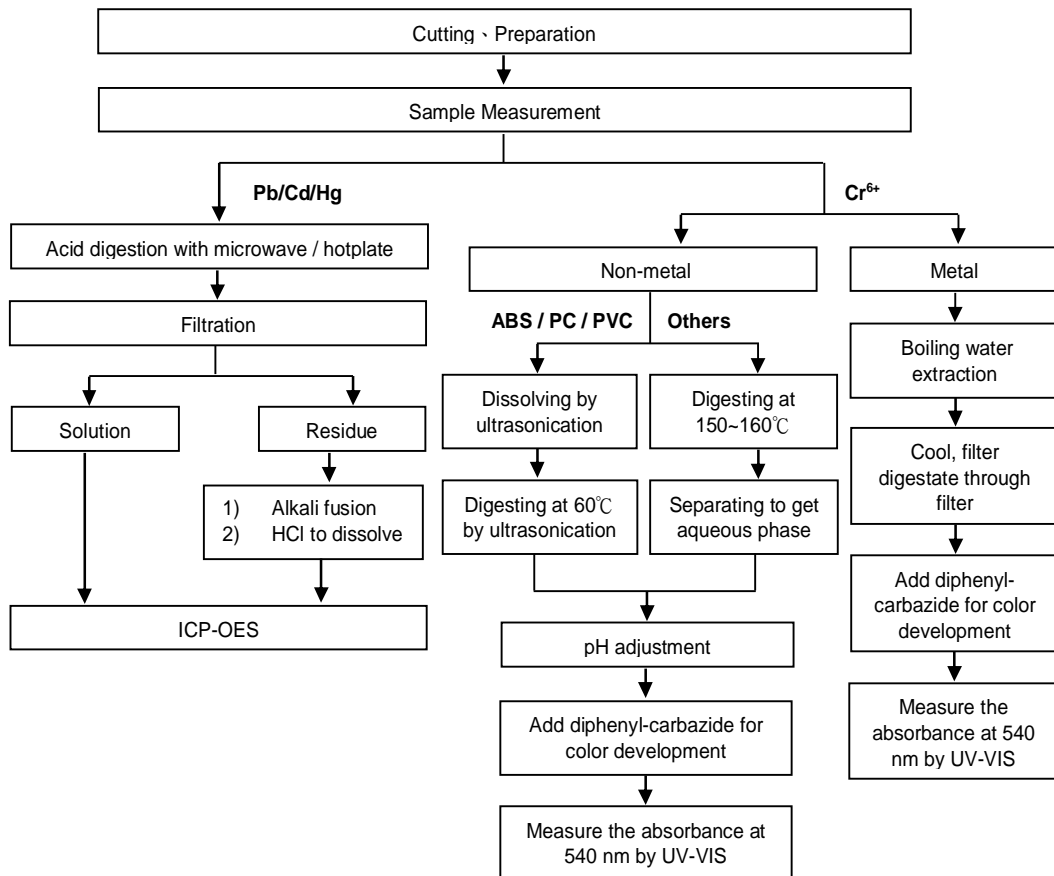
1. mg/kg = ppm ; 0.1wt% = 1000ppm
2. MDL = Method Detection Limit
3. n.d. = Not Detected = less than MDL
4. " - " = Not Regulated
5. (#2) =
  - a. The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13  $\mu\text{g}/\text{cm}^2$ .  
The sample coating is considered to contain Cr(VI)
  - b. The sample is negative for Cr(VI) if Cr(VI) is n.d. (concentration less than 0.10  $\mu\text{g}/\text{cm}^2$ ).  
The coating is considered a non-Cr(VI) based coating
  - c. The result between 0.10  $\mu\text{g}/\text{cm}^2$  and 0.13  $\mu\text{g}/\text{cm}^2$  is considered to be inconclusive - unavoidable coating variations may influence the determination.

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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<sup>6+</sup> test method excluded)

- Technician : Rita Chen
- Supervisor: Troy Chang

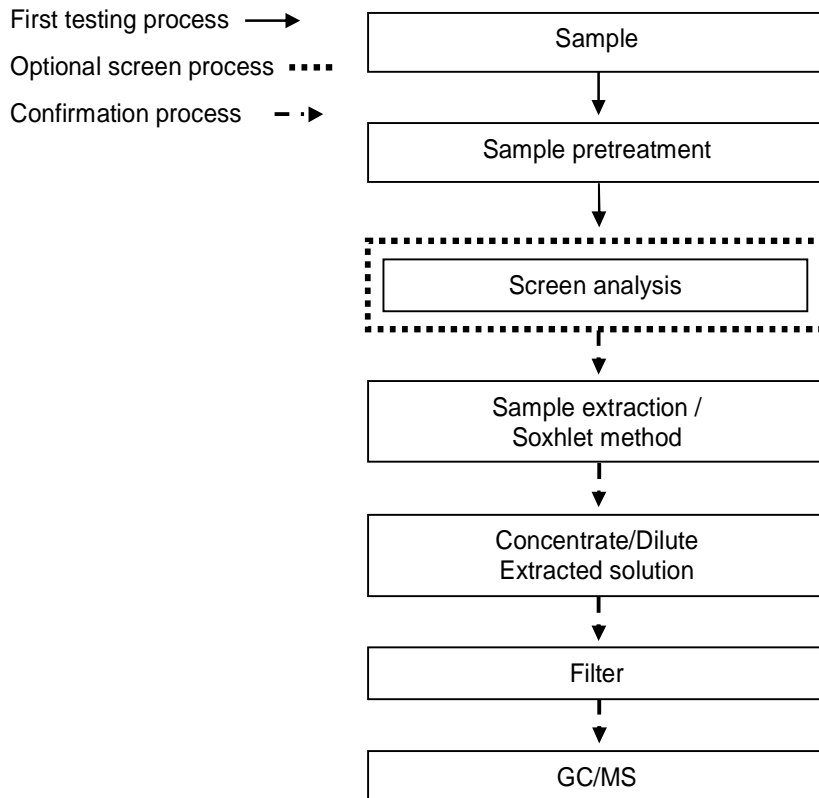


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8-1, SAKAE-CHO, TAKASAKI-SHI, GUNMA, JAPAN

### Analytical flow chart – PBB / PBDE

- Technician : Yaling Tu
- Supervisor: Troy Chang



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## Test Report

No. : CE/2019/A2167

Date : 2019/10/18

Page : 6 of 9

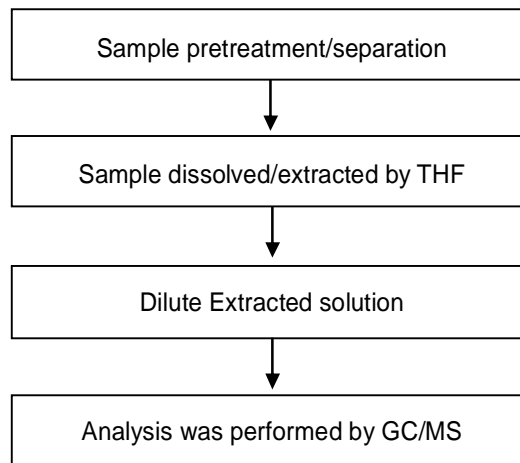
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8-1, SAKAE-CHO, TAKASAKI-SHI, GUNMA, JAPAN

### Analytical flow chart - Phthalate

- Technician: Yaling Tu
- Supervisor: Troy Chang

**【Test method: IEC 62321-8】**



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## Test Report

No. : CE/2019/A2167

Date : 2019/10/18

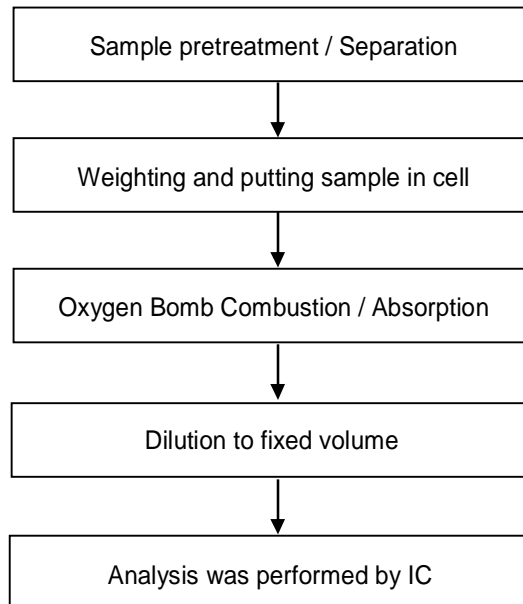
Page : 7 of 9

TAIYO YUDEN CO., LTD.

8-1, SAKAE-CHO, TAKASAKI-SHI, GUNMA, JAPAN

### Analytical flow chart - Halogen

- Technician: Rita Chen
- Supervisor: Troy Chang



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# Test Report

No. : CE/2019/A2167

Date : 2019/10/18

Page : 8 of 9

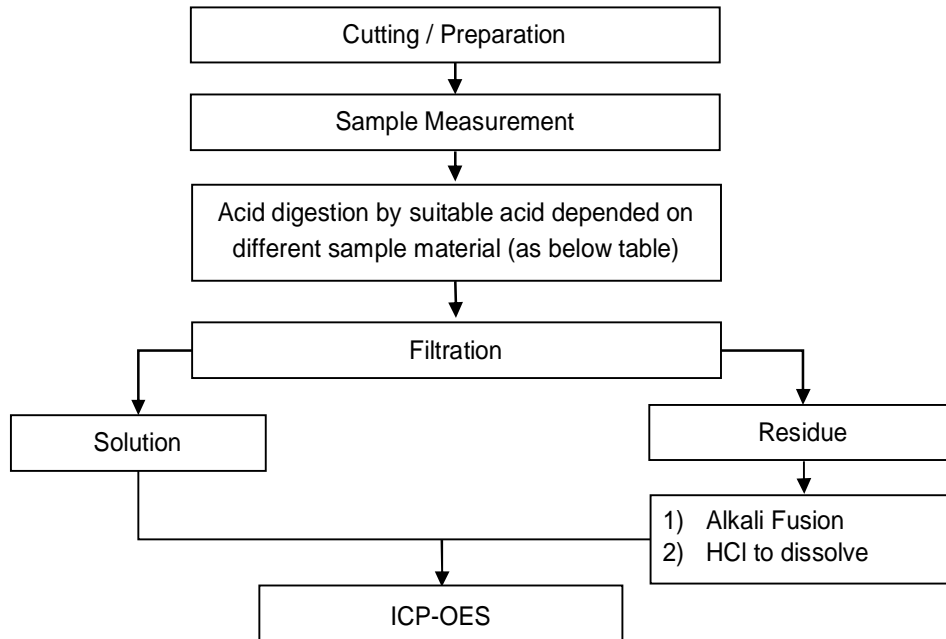
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8-1, SAKAE-CHO, TAKASAKI-SHI, GUNMA, JAPAN

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

- Technician: Rita Chen
- Supervisor: Troy Chang

### Flow Chart of digestion for the elements analysis performed by ICP-OES



Steel, copper, aluminum, solder	Aqua regia, HNO <sub>3</sub> , HCl, HF, H <sub>2</sub> O <sub>2</sub>
Glass	HNO <sub>3</sub> /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO <sub>3</sub>
Plastic	H <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O <sub>2</sub> , HNO <sub>3</sub> , HCl
Others	Added appropriate reagent to total digestion



## Test Report

No. : CE/2019/A2167

Date : 2019/10/18

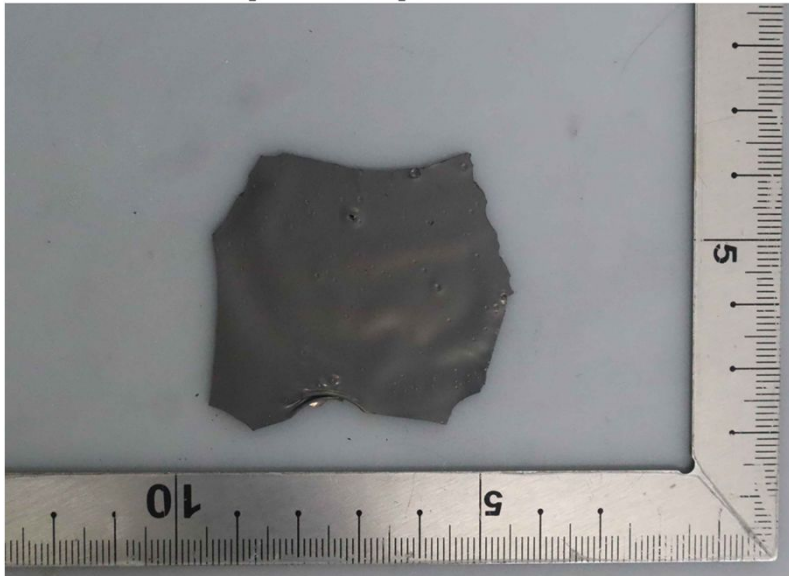
Page : 9 of 9

TAIYO YUDEN CO., LTD.

8-1, SAKAE-CHO, TAKASAKI-SHI, GUNMA, JAPAN

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

### CE/2019/A2167



\*\* End of Report \*\*