



ICP Test Report Certification Packet

Company name: Littelfuse, Inc.

Product Series: PulseGuard ESD Protector

Product #: PGB1010402KR Series

Issue Date: July 26, 2013

It is hereby certified by Littelfuse, Inc. that there is neither RoHS (EU Directive 2002/95/EC)-restricted substance nor such use, for materials to be used for unit parts, for packing/packaging materials, and for additives and the like in the manufacturing processes. In addition, it is hereby reported to you that the parts and sub-materials, the materials to be used for unit parts, the packing/packaging materials, and the additives and the like in the manufacturing processes, are all composed of the following components.

Issued by:

A handwritten signature in black ink, appearing to read "Jenny Dinglasan", written over a horizontal line.

JENNY DINGLASAN

<EHS Specialist>

(1) Parts, sub-materials and unit parts

This document covers the PulseGuard ESD Protector RoHS-Compliant series products manufactured by Littelfuse, Inc.

< Raw Materials Used

Please see Table 1

(2) The ICP data on all measurable substances

Please see appropriate pages as identified in Table 1

Remarks :

Table 1: List of Raw Materials covered by this report

| Total Parts | Raw Material Part Number | Raw Material Description | Page(s) |
|--------------------|---------------------------------|---------------------------------|----------------|
| 1 | 010113 | Tin Anode | 3-8 |
| 2 | 010104 | Nickel Anode | 9-14 |
| 3 | 010114 | Copper Anode | 15-20 |
| 4 | 090410 | Green LPI | 21-30 |
| 5 | 4501-006 | VVM | 31-40 |
| 6 | 039610 | Cladded FR4 Panel, Natural | 41-50 |
| 7 | 090417 | Photoimageable white ink | 51-60 |



Test Report

Number : TWNC00285780

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Date : Nov 19, 2012

Sample Description:

One (1) group of submitted samples said to be :

Part Description : Tin Anode

Part Number : 010113

Date Sample Received : Nov 13, 2012

Date Test Started : Nov 13, 2012

Test Conducted :

As requested by the applicant, for details please refer to attached pages.

Authorized By:

On Behalf Of Intertek Testing Services
Taiwan Limited



K. Y. Liang
Director



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Intertek Testing Services Taiwan Ltd.

8F., No. 423, Ruiguang Rd., Neihu District, Taipei 114, Taiwan, R.O.C.

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Tel: (+886-2) 6602-2888 · 2797-8885 Fax: (+886-2) 6602-2410

Number : TWNC00285780

Test Conducted

(I) Test Result Summary :

| <u>Test Item</u> | <u>Result (ppm)</u> |
|---|------------------------------|
| | <u>Silvery plating layer</u> |
| Heavy Metal | |
| Cadmium (Cd) content | ND |
| Lead (Pb) content | ND |
| Mercury (Hg) content | ND |
| Chromium VI (Cr ⁶⁺) content (mg/kg with 50cm ²) | Negative (< 0.02) |

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg
 ND = Not detected
 < = Less than
 mg/kg with 50cm² = milligram per kilogram with 50 square centimetre
 Negative = A negative test result indicated positive observation was not found at the time of Test.

Responsibility of Chemist : Irene Chiou / Kevin Liu

Date Sample Received : Nov 13, 2012

Test Period : Nov 13, 2012 to Nov 16, 2012

(II) RoHS Limits:

| <u>Restricted Substances</u> | <u>Limits</u> |
|---|----------------|
| Cadmium (Cd) Content | 0.01% (100ppm) |
| Lead (Pb) Content | 0.1% (1000ppm) |
| Mercury (Hg) Content | 0.1% (1000ppm) |
| Chromium VI (Cr ⁶⁺) Content | 0.1% (1000ppm) |

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.



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Number : TWNC00285780

Test Conducted

(III) Test Method:

| Test Item | Test Method | Reporting Limit |
|---|---|-----------------------------------|
| Cadmium (Cd) content | With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Lead (Pb) content | With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Mercury (Hg) content | With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Chromium VI (Cr ⁶⁺) content | With reference to IEC 62321 edition 1.0:2008 in annex B, by boiling water extraction and determined by UV-Vis Spectrophotometer. | 0.02 mg/kg with 50cm ² |

Remark: Reporting limit = Quantitation limit of analyte in sample



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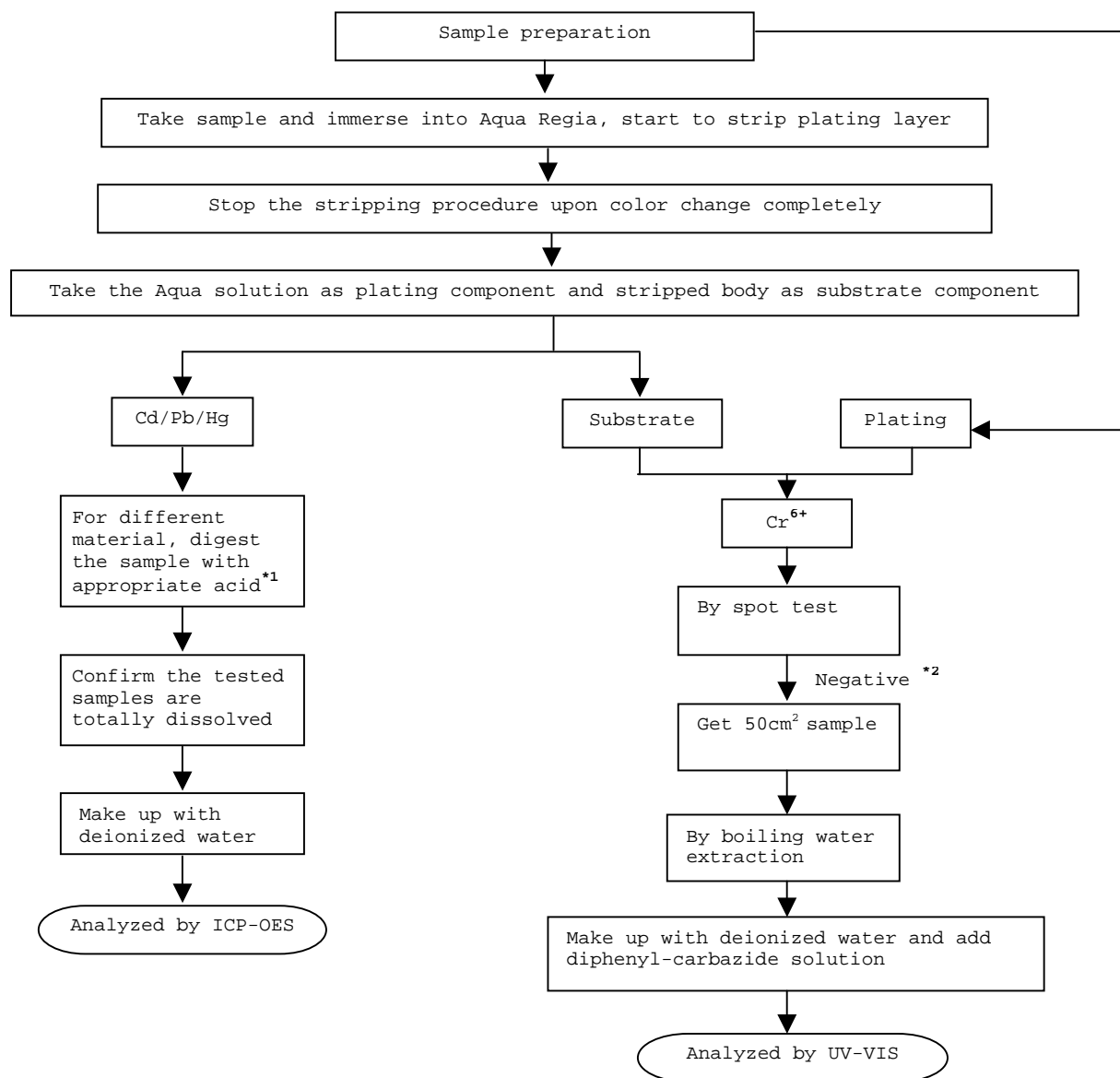
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Test Conducted

(IV) Measurement Flowchart:

Test For Cd/Pb/Hg/Chromium (VI)

Reference Standard : IEC 62321 edition 1.0:2008





Number : TWNC00285780

Test Conducted

Remarks:

*1: List Of Appropriate Acid:

| <u>Material</u> | <u>Acid Added For Digestion</u> |
|-----------------|--|
| Polymers | HNO ₃ ,HCl, HF, H ₂ O ₂ ,H ₃ BO ₃ |
| Metals | HNO ₃ ,HCl, HF |
| Electronics | HNO ₃ ,HCl, H ₂ O ₂ ,HBF ₄ |

*2: If the result of spot test is positive, Chromium VI would be determined as detected.

End of Report

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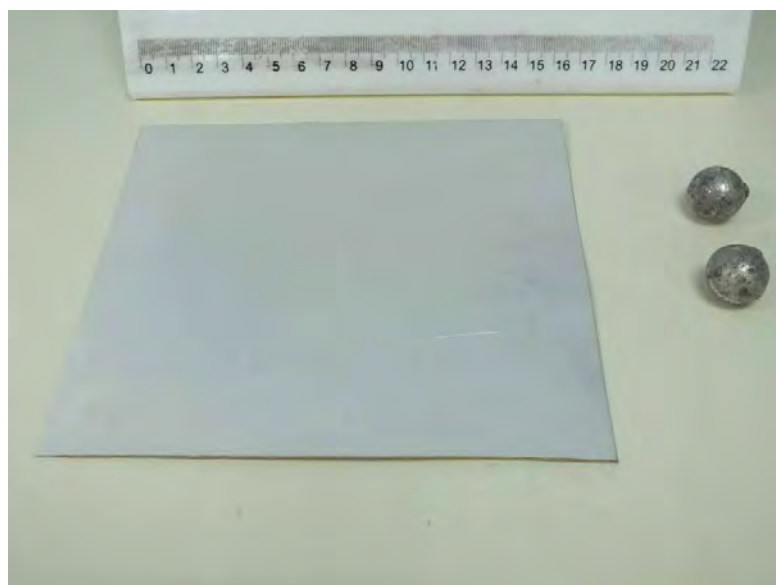
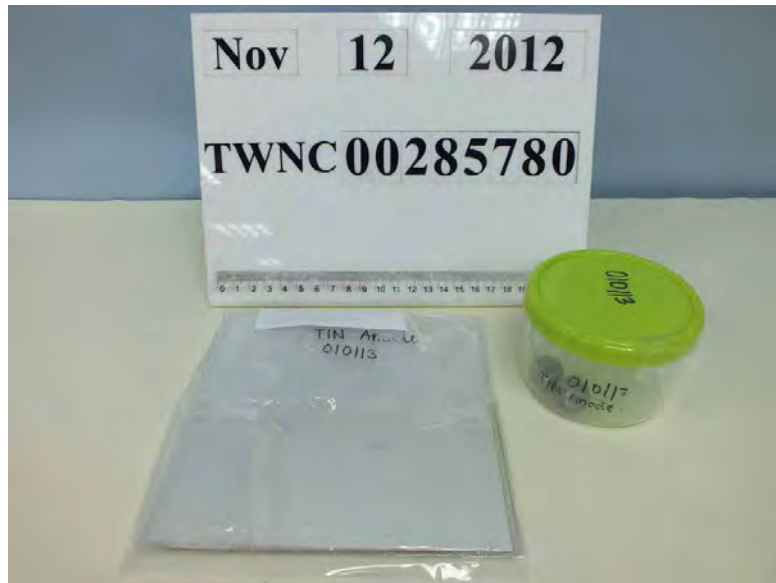
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Number : TWNC00285780

Test Conducted

Photo



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Test Report

Number : TWNC00285778

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Date : Nov 19, 2012

Sample Description:

One (1) group of submitted samples said to be :

Part Description : Copper Anode

Part Number : 010114

Date Sample Received : Nov 13, 2012

Date Test Started : Nov 13, 2012

Test Conducted :

As requested by the applicant, for details please refer to attached pages.

Authorized By:

On Behalf Of Intertek Testing Services
Taiwan Limited



K. Y. Liang
Director



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Number : TWNC00285778

Test Conducted

(I) Test Result Summary :

| <u>Test Item</u> | <u>Result (ppm)</u> |
|---|----------------------|
| | <u>Coppery Metal</u> |
| Heavy Metal | |
| Cadmium (Cd) content | ND |
| Lead (Pb) content | ND |
| Mercury (Hg) content | ND |
| Chromium VI (Cr ⁶⁺) content (mg/kg with 50cm ²) | Negative (< 0.02) |

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg
 ND = Not detected
 < = Less than
 mg/kg with 50cm² = milligram per kilogram with 50 square centimetre
 Negative = A negative test result indicated positive observation was not found at the time of Test.

Responsibility of Chemist : Irene Chiou / Kevin Liu

Date Sample Received : Nov 13, 2012

Test Period : Nov 13, 2012 To Nov 16, 2012

(II) RoHS Limits:

| <u>Restricted Substances</u> | <u>Limits</u> |
|---|----------------|
| Cadmium (Cd) Content | 0.01% (100ppm) |
| Lead (Pb) Content | 0.1% (1000ppm) |
| Mercury (Hg) Content | 0.1% (1000ppm) |
| Chromium VI (Cr ⁶⁺) Content | 0.1% (1000ppm) |

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.



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Number : TWNC00285778

Test Conducted

(III) Test Method:

| Test Item | Test Method | Reporting Limit |
|--|---|-----------------------------------|
| Cadmium (Cd) content | With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Lead (Pb) content | With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Mercury (Hg) content | With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Chromium VI (Cr^{6+}) content | With reference to IEC 62321 edition 1.0:2008 in annex B, by boiling water extraction and determined by UV-Vis Spectrophotometer. | 0.02 mg/kg with 50cm ² |

Remark: Reporting limit = Quantitation limit of analyte in sample



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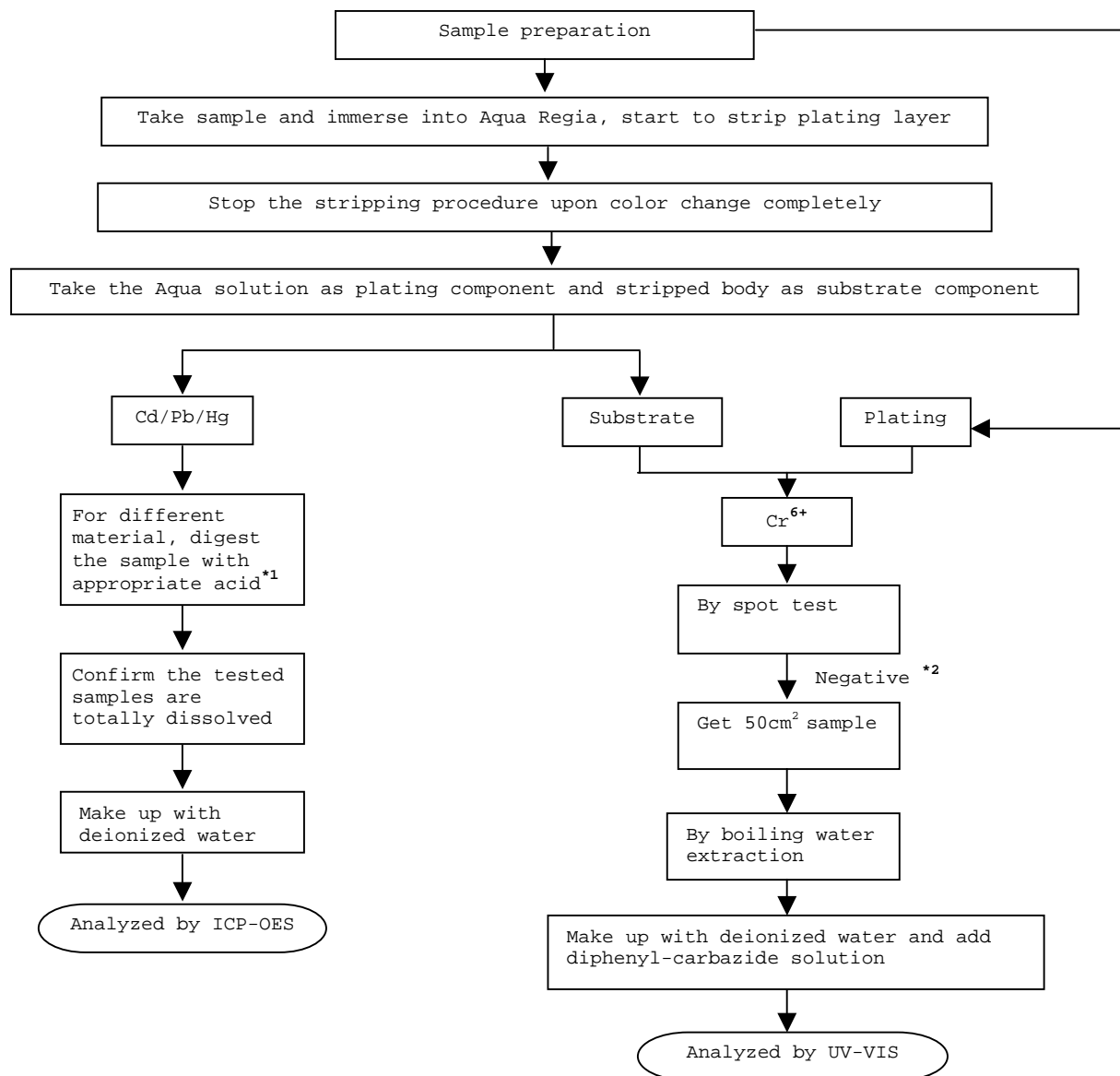
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Test Conducted

(IV) Measurement Flowchart:

Test For Cd/Pb/Hg/Chromium (VI)

Reference Standard : IEC 62321 edition 1.0:2008





Number : TWNC00285778

Test Conducted

(IV) Measurement Flowchart:

Remarks:

*1: List Of Appropriate Acid:

| Material | Acid Added For Digestion |
|-------------|--|
| Polymers | HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃ |
| Metals | HNO ₃ , HCl, HF |
| Electronics | HNO ₃ , HCl, H ₂ O ₂ , HBF ₄ |

*2: If the result of spot test is positive, Chromium VI would be determined as detected.

End of Report

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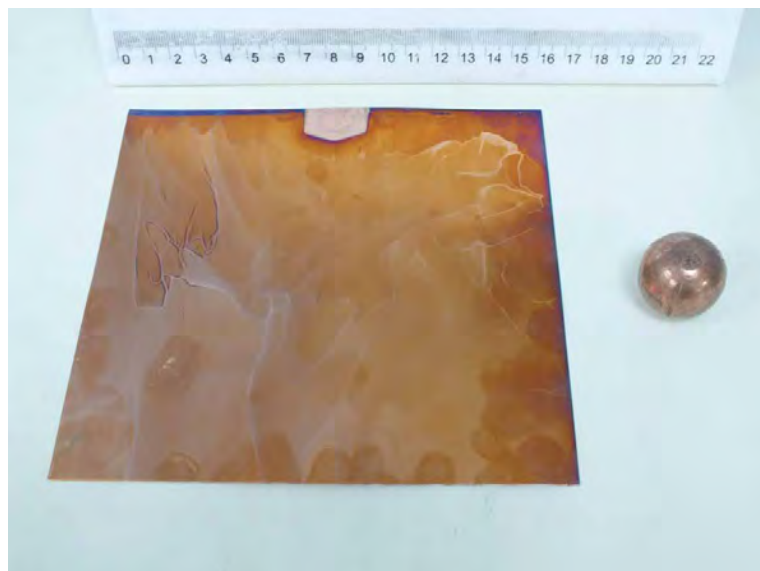
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Number : TWNC00285778

Test Conducted

Photo





Test Report

Number : TWNC00285779

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Date : Nov 19, 2012

Sample Description:

One (1) group of submitted samples said to be :

Part Description : Nickel Anode

Part Number : 010104

Date Sample Received : Nov 13, 2012

Date Test Started : Nov 13, 2012

Test Conducted :

As requested by the applicant, for details please refer to attached pages.

Authorized By:

On Behalf Of Intertek Testing Services
Taiwan Limited



K. Y. Liang
Director



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Number : TWNC00285779

Test Conducted

(I) Test Result Summary :

| <u>Test Item</u> | <u>Result (ppm)</u> |
|---|------------------------------|
| | <u>Silvery plating layer</u> |
| Heavy Metal | |
| Cadmium (Cd) content | ND |
| Lead (Pb) content | ND |
| Mercury (Hg) content | ND |
| Chromium VI (Cr ⁶⁺) content (mg/kg with 50cm ²) | Negative (< 0.02) |

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg
 ND = Not detected
 < = Less than
 mg/kg with 50cm² = milligram per kilogram with 50 square centimetre
 Negative = A negative test result indicated positive observation was not found at the time of Test.

Responsibility of Chemist : Irene Chiou / Kevin Liu

Date Sample Received : Nov 13, 2012

Test Period : Nov 13, 2012 to Nov 16, 2012

(II) RoHS Limits:

| <u>Restricted Substances</u> | <u>Limits</u> |
|---|----------------|
| Cadmium (Cd) Content | 0.01% (100ppm) |
| Lead (Pb) Content | 0.1% (1000ppm) |
| Mercury (Hg) Content | 0.1% (1000ppm) |
| Chromium VI (Cr ⁶⁺) Content | 0.1% (1000ppm) |

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.



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Test Conducted

(III) Test Method:

| Test Item | Test Method | Reporting Limit |
|--|---|-----------------------------------|
| Cadmium (Cd) content | With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Lead (Pb) content | With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Mercury (Hg) content | With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Chromium VI (Cr^{6+}) content | With reference to IEC 62321 edition 1.0:2008 in annex B, by boiling water extraction and determined by UV-Vis Spectrophotometer. | 0.02 mg/kg with 50cm ² |

Remark: Reporting limit = Quantitation limit of analyte in sample

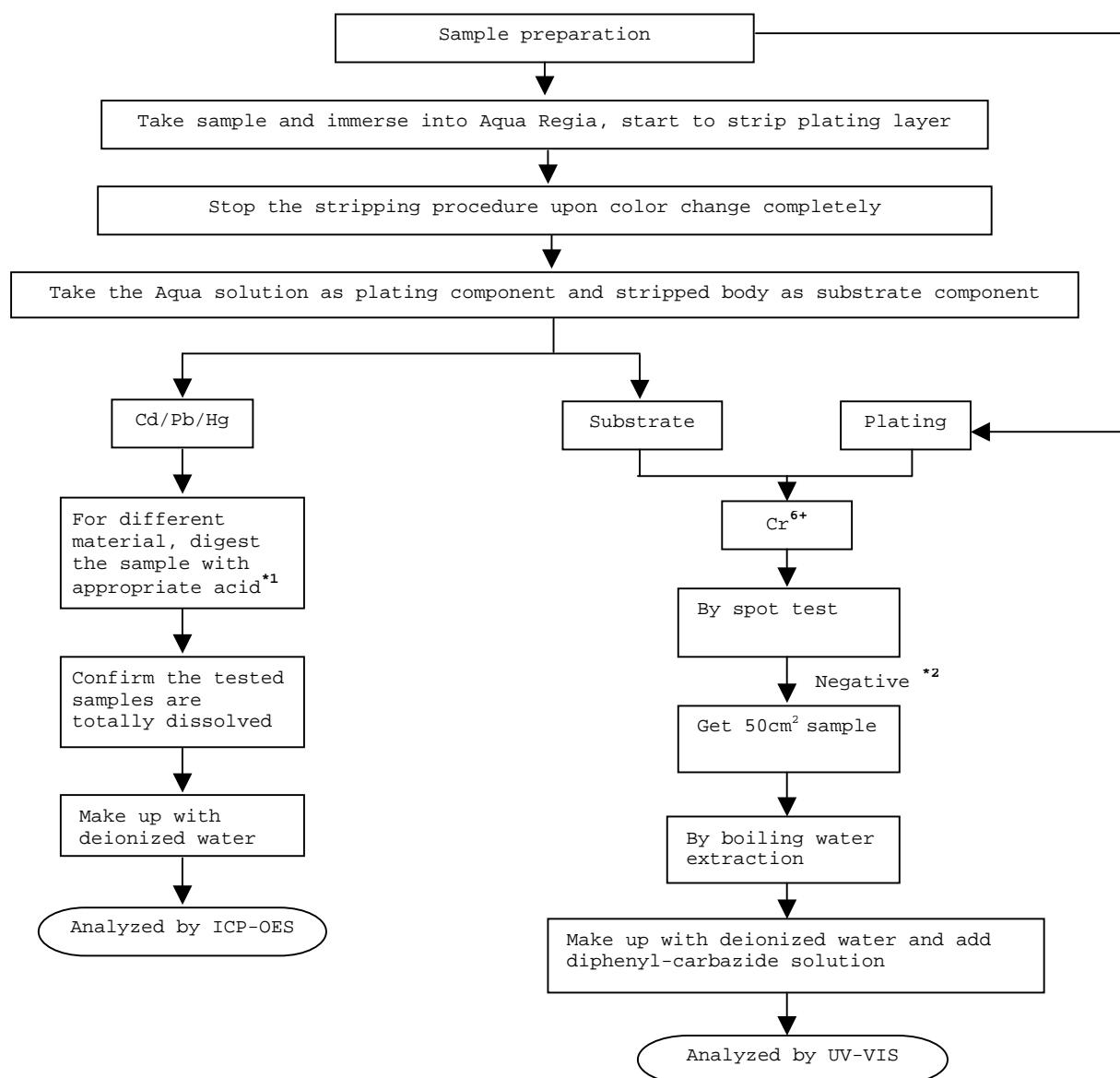


Test Conducted

(IV) Measurement Flowchart:

Test For Cd/Pb/Hg/Chromium (VI)

Reference Standard : IEC 62321 edition 1.0:2008





Number : TWNC00285779

Test Conducted

Remarks:

*1: List Of Appropriate Acid:

| <u>Material</u> | <u>Acid Added For Digestion</u> |
|-----------------|--|
| Polymers | HNO ₃ ,HCl, HF, H ₂ O ₂ ,H ₃ BO ₃ |
| Metals | HNO ₃ ,HCl, HF |
| Electronics | HNO ₃ ,HCl, H ₂ O ₂ ,HBF ₄ |

*2: If the result of spot test is positive, Chromium VI would be determined as detected.

End of Report

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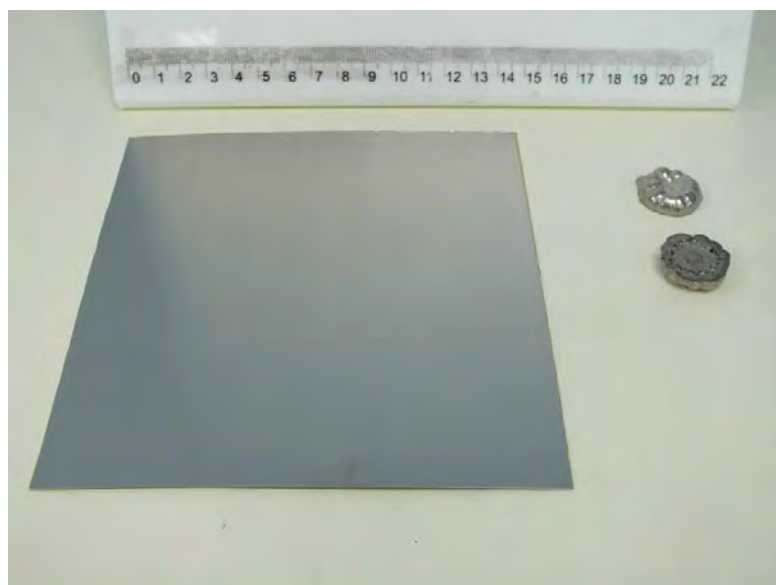
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Number : TWNC00285779

Test Conducted

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Test Report

Number : TWNC00290388

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Date : Dec 19, 2012

Sample Description:

One (1) group of submitted samples said to be :

Part Description : LPI-Green (Peters)

Part Number : 090410

Date Sample Received : Dec 11, 2012

Date Test Started : Dec 12, 2012

Test Conducted :

As requested by the applicant, for details please refer to attached pages.

Authorized by:

On Behalf of Intertek Testing Services
Taiwan Limited



K. Y. Liang
Director



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Number : TWNC00290388

Test Conducted

(I) Test Result Summary :

| Test Item | Result (ppm) |
|---|--------------|
| | Green paste |
| Heavy Metal | |
| Cadmium (Cd) content | ND |
| Lead (Pb) content | ND |
| Mercury (Hg) content | ND |
| Chromium VI (Cr ⁶⁺) content | ND |
| Polybrominated Biphenyls (PBBs) | |
| Monobrominated Biphenyls (MonoBB) | ND |
| Dibrominated Biphenyls (DiBB) | ND |
| Tribrominated Biphenyls (TriBB) | ND |
| Tetrabrominated Biphenyls (TetraBB) | ND |
| Pentabrominated Biphenyls (PentaBB) | ND |
| Hexabrominated Biphenyls (HexaBB) | ND |
| Heptabrominated Biphenyls (HeptaBB) | ND |
| Octabrominated Biphenyls (OctaBB) | ND |
| Nonabrominated Biphenyls (NonaBB) | ND |
| Decabrominated Biphenyl (DecaBB) | ND |
| Polybrominated Diphenyl Ethers (PBDEs) | |
| Monobrominated Diphenyl Ethers (MonoBDE) | ND |
| Dibrominated Diphenyl Ethers (DiBDE) | ND |
| Tribrominated Diphenyl Ethers (TriBDE) | ND |
| Tetrabrominated Diphenyl Ethers (TetraBDE) | ND |
| Pentabrominated Diphenyl Ethers (PentaBDE) | ND |
| Hexabrominated Diphenyl Ethers (HexaBDE) | ND |
| Heptabrominated Diphenyl Ethers (HeptaBDE) | ND |
| Octabrominated Diphenyl Ethers (OctaBDE) | ND |
| Nonabrominated Diphenyl Ethers (NonaBDE) | ND |
| Decabrominated Diphenyl Ether (DecaBDE) | ND |



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Number : TWNC00290388

Test Conducted

(I) Test Result Summary :

| <u>Test Item</u> | <u>Result (ppm)</u> |
|-----------------------------------|---------------------|
| | <u>Green paste</u> |
| Halogen Content | |
| Fluorine (F) | 133 |
| Chlorine (Cl) | 377 |
| Bromine (Br) | ND |
| Iodine (I) | ND |
| Phthalates | |
| Di(2-ethylhexyl) Phthalate (DEHP) | ND |
| Dibutyl Phthalate (DBP) | ND |
| Benzyl Butyl Phthalate (BBP) | ND |
| Others | |
| Hexabromocyclododecane (HBCDD) | ND |

Remarks: ppm = Parts per million based on wet weight of tested sample =
mg/kg
ND = Not detected

Responsibility of Chemist : Irene Chiou / Kevin Liu / Cathy Chen

Date Sample Received : Dec 11, 2012

Test Period : Dec 12, 2012 to Dec 17, 2012

(II) RoHS Limits:

| <u>Restricted Substances</u> | <u>Limits</u> |
|---|----------------|
| Cadmium (Cd) Content | 0.01% (100ppm) |
| Lead (Pb) Content | 0.1% (1000ppm) |
| Mercury (Hg) Content | 0.1% (1000ppm) |
| Chromium VI (Cr ⁶⁺) Content | 0.1% (1000ppm) |
| Polybrominated Biphenyls (PBBs) | 0.1% (1000ppm) |
| Polybrominated Diphenyl Ehters (PBDEs) | 0.1% (1000ppm) |

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.



Test Conducted

(III) Test Method:

| Test Item | Test Method | Reporting Limit |
|--|---|-----------------|
| Cadmium (Cd) content | With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Lead (Pb) content | With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Mercury (Hg) content | With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES. | 2 ppm |
| Chromium VI (Cr^{6+}) content | With reference to IEC 62321 edition 1.0:2008 in annex C, by alkaline digestion and determined by UV-Vis spectrophotometer. | 1 ppm |
| Polybrominated Biphenyls (PBBs) | With reference to IEC 62321 edition 1.0:2008 in annex A, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary. | 5 ppm |
| Polybrominated Diphenyl Ethers (PBDEs) | With reference to IEC 62321 edition 1.0:2008 in annex A, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary. | 5 ppm |



Number : TWNC00290388

Test Conducted

(Ⅲ) Test Method:

| Test Item | Test Method | Reporting Limit |
|--------------------------------|---|-----------------|
| Halogen Content | With reference to EN 14582:2007 by calorimetric bomb with oxygen and determined by Ion Chromatograph. | 50 ppm |
| Phthalates | With reference to EN 14372: 2004, by solvent extraction and determined by GC-MS. | 50 ppm |
| Hexabromocyclododecane (HBCDD) | With reference to USEPA 3540C, by solvent extraction and determined by GC-MS. | 10 ppm |

Remark: Reporting limit = Quantitation limit of analyte in sample



Page 5 of 10

Intertek Testing Services Taiwan Ltd.

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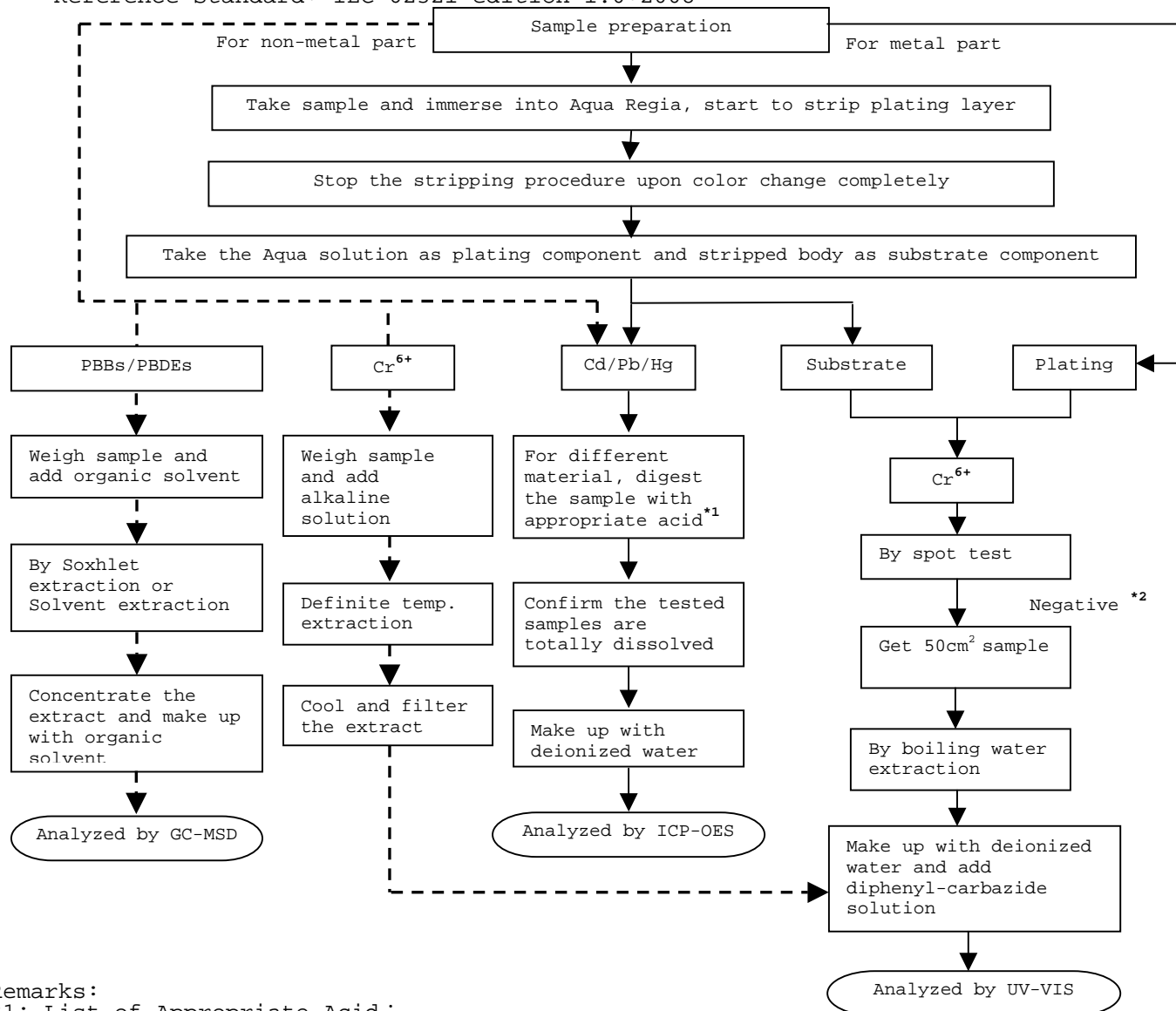
11492 台北市內湖區瑞光路 423 號 8 樓

Tel: (+886-2) 6602-2888 · 2797-8885 Fax: (+886-2) 6602-2410

Test Conducted

(IV) Measurement Flowchart:

Test for Cd/Pb/Hg/Chromium (VI)/PBBS/PBDES Contents
Reference Standard: IEC 62321 edition 1.0:2008



Remarks:

*1: List of Appropriate Acid :

| Material | Acid Added for Digestion |
|-------------|--|
| Polymers | HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃ |
| Metals | HNO ₃ , HCl, HF |
| Electronics | HNO ₃ , HCl, H ₂ O ₂ , HBF ₄ |

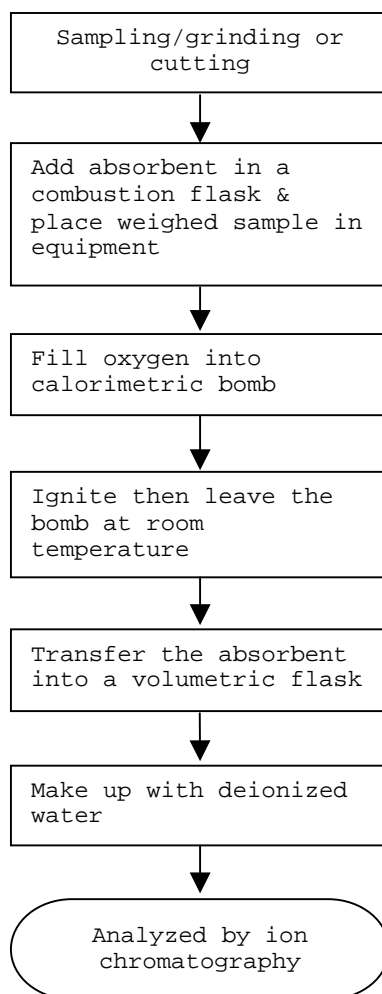
*2: If the result of spot test is positive, Chromium VI would be determined as detected.



Test Conducted

(IV) Measurement Flowchart:

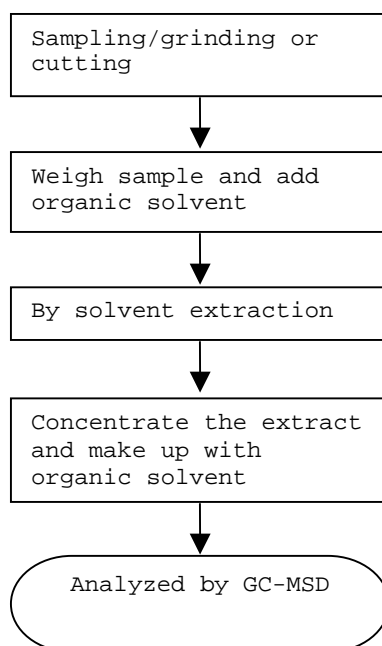
Test for Halogen Content
Reference Standard: EN 14582



Test Conducted

(IV) Measurement Flowchart:

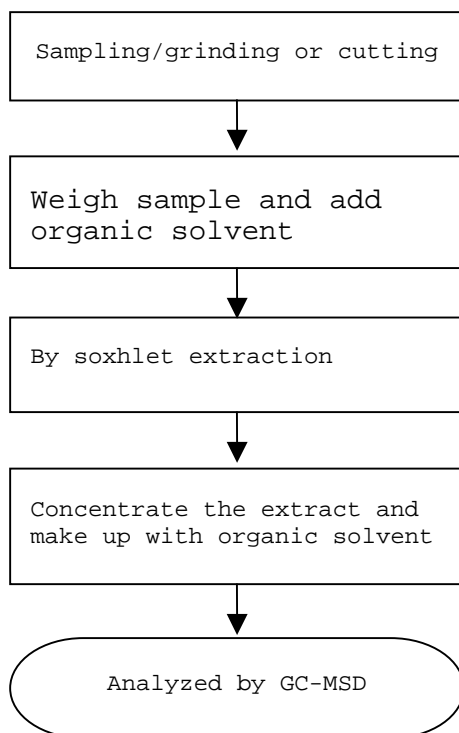
Test For Phthalates Contents
Reference Method: EN 14372: 2004



Test Conducted

(IV) Measurement Flowchart:

Test For Hexabromocyclododecane (HBCDD)
Reference Standard : USEPA 3540C



End of Report

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Number : TWNC00290388

Test Conducted

Photo



Test Report

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Number : TWNC00323876
Date : Jul 25, 2013

Sample Description:

One (1) group of submitted samples said to be :
Part Description : VV Material
Part Number : 4501-006
Date Sample Received : Jul 18, 2013
Date Test Started : Jul 19, 2013

Test Conducted :

As requested by the applicant, for details please refer to attached pages.

Authorized by:
On Behalf of Intertek Testing Services
Taiwan Limited



K. Y. Liang
Director



Test Report

Number: TWNC00323876

Test Conducted
Test Result Summary:

| Test Result Summary: | | | | |
|---|------|--|------------|----|
| Test Item | Unit | Test Method | Result | RL |
| | | | Grey paste | |
| Heavy Metal | | | | |
| Cadmium (Cd) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Lead (Pb) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Mercury (Hg) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Antimony (Sb) Content | ppm | With reference to USEPA 3052, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Chromium VI (Cr ⁶⁺) content | ppm | With reference to IEC 62321: 2008, by alkaline digestion and determined by UV-Vis Spectrophotometer. | ND | 1 |
| Polybrominated Biphenyls (PBBs) | | | | |
| Monobrominated Biphenyls (MonoBB) | ppm | With reference to IEC 62321: 2008, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary. | ND | 5 |
| Dibrominated Biphenyls (DiBB) | ppm | | ND | 5 |
| Tribrominated Biphenyls (TriBB) | ppm | | ND | 5 |
| Tetrabrominated Biphenyls (TetraBB) | ppm | | ND | 5 |
| Pentabrominated Biphenyls (PentaBB) | ppm | | ND | 5 |
| Hexabrominated Biphenyls (HexaBB) | ppm | | ND | 5 |
| Heptabrominated Biphenyls (HeptaBB) | ppm | | ND | 5 |
| Octabrominated Biphenyls (OctaBB) | ppm | | ND | 5 |
| Nonabrominated Biphenyls (NonaBB) | ppm | | ND | 5 |
| Decabrominated Biphenyl (DecaBB) | ppm | | ND | 5 |



Test Report

Test Conducted

Number: TWNC00323876

| Test Item | Unit | Test Method | Result | RL |
|--|------|--|------------|----|
| | | | Grey paste | |
| Polybrominated Diphenyl Ethers (PBDEs) | | | | |
| Monobrominated Diphenyl Ethers (MonoBDE) | ppm | With reference to IEC 62321: 2008, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary. | ND | 5 |
| Dibrominated Diphenyl Ethers (DiBDE) | ppm | | ND | 5 |
| Tribrominated Diphenyl Ethers (TriBDE) | ppm | | ND | 5 |
| Tetrabrominated Diphenyl Ethers (TetraBDE) | ppm | | ND | 5 |
| Pentabrominated Diphenyl Ethers (PentaBDE) | ppm | | ND | 5 |
| Hexabrominated Diphenyl Ethers (HexaBDE) | ppm | | ND | 5 |
| Heptabrominated Diphenyl Ethers (HeptaBDE) | ppm | | ND | 5 |
| Octabrominated Diphenyl Ethers (OctaBDE) | ppm | | ND | 5 |
| Nonabrominated Diphenyl Ethers (NonaBDE) | ppm | | ND | 5 |
| Decabrominated Diphenyl Ether (DecaBDE) | ppm | | ND | 5 |
| Halogen Content | | | | |
| Fluorine (F) | ppm | With reference to EN 14582:2007 by calorimetric bomb with oxygen and determined by Ion Chromatograph. | 27286 | 50 |
| Chlorine (Cl) | ppm | | ND | 50 |
| Bromine (Br) | ppm | | ND | 50 |
| Iodine (I) | ppm | | ND | 50 |
| Phthalates | | | | |
| Di(2-ethylhexyl) Phthalate (DEHP) | ppm | With reference to EN 14372: 2004, by solvent extraction and determined by GC-MS. | ND | 10 |
| Dibutyl Phthalate (DBP) | ppm | | ND | 10 |
| Benzyl Butyl Phthalate (BBP) | ppm | | ND | 10 |
| Diisobutyl Phthalate (DIBP) | ppm | | ND | 10 |



Test Report

Test Conducted

Number: TWNC00323876

| Test Item | Unit | Test Method | Result | RL |
|--------------------------------|------|---|------------|----|
| | | | Grey paste | |
| Others | | | | |
| Hexabromocyclododecane (HBCDD) | ppm | With reference to USEPA 3540C, by solvent extraction and determined by GC-MS. | ND | 10 |

Remarks: ppm = parts per million based on wet weight of tested sample = mg/kg
 ND = Not detected
 RL = Reporting Limit, Quantitation limit of analyte in sample

Responsibility of Chemist: Kevin Liu/ Irene Chiou/ Vico Lin

Date Sample Received : Jul 18, 2013

Test Period : Jul 19, 2013 To Jul 25, 2013

RoHS Limit

| Restricted Substances | Limits |
|---|----------------|
| Cadmium (Cd) content | 0.01% (100ppm) |
| Lead (Pb) content | 0.1% (1000ppm) |
| Mercury (Hg) content | 0.1% (1000ppm) |
| Chromium VI (Cr ⁶⁺) content | 0.1% (1000ppm) |
| Polybrominated Biphenyls (PBBs) | 0.1% (1000ppm) |
| Polybrominated Diphenyl Ethers (PBDEs) | 0.1% (1000ppm) |

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.

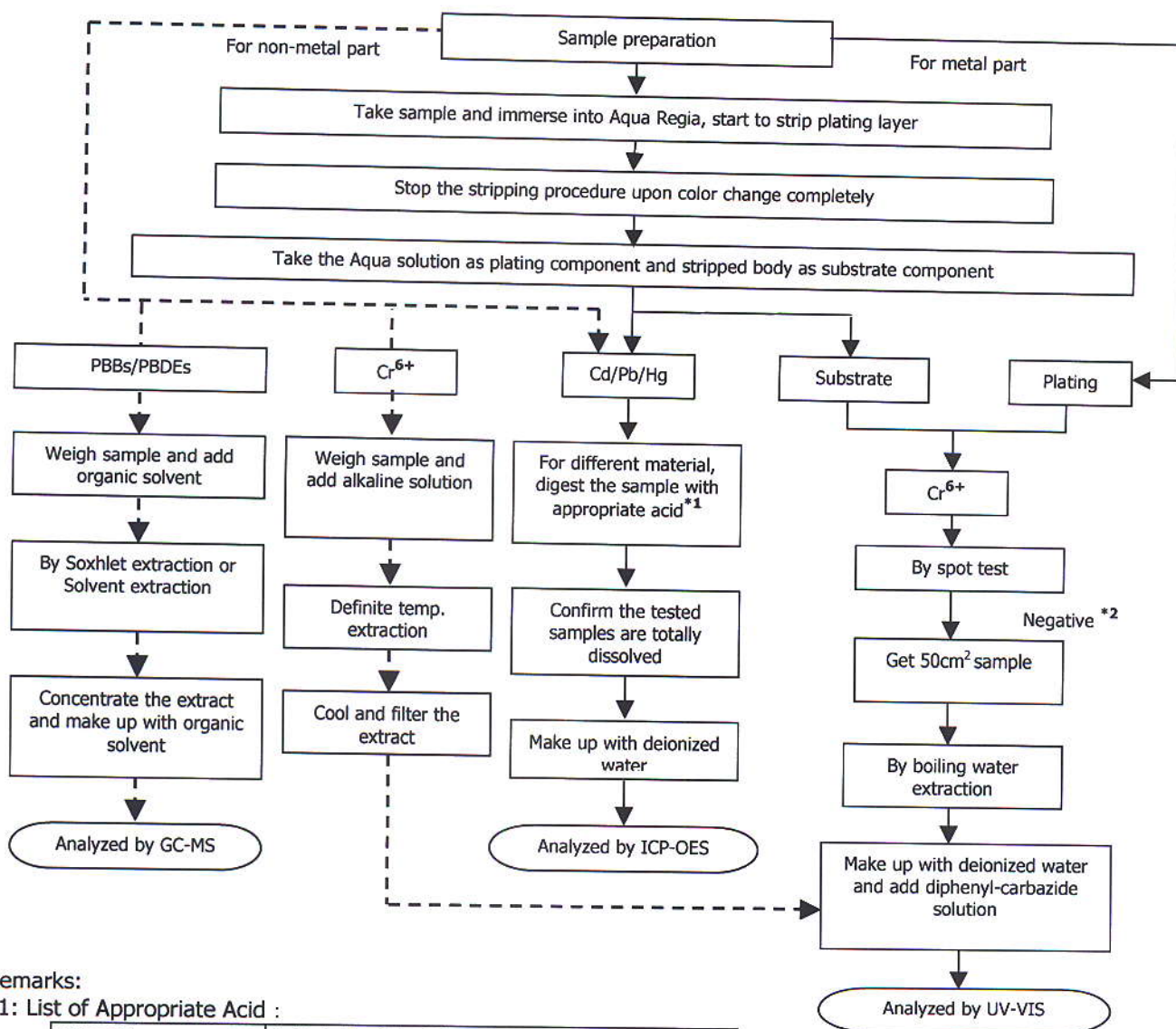


Test Report

Test Conducted
Measurement Flowchart:

Number: TWNC00323876

Test for Cd/Pb/Hg/Chromium (VI)/PBBs/PBDEs Contents
Reference Method: IEC 62321 edition 1.0:2008



Remarks:

*1: List of Appropriate Acid :

| Material | Acid Added for Digestion |
|-------------|--|
| Polymers | HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃ |
| Metals | HNO ₃ , HCl, HF |
| Electronics | HNO ₃ , HCl, H ₂ O ₂ , HBF ₄ |

*2: If the result of spot test is positive, Chromium VI would be determined as detected.



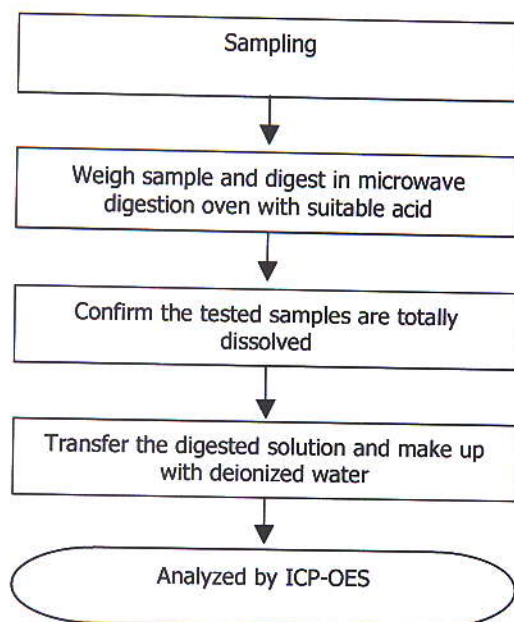
Test Report

Test Conducted

Number: TWNC00323876

Measurement Flowchart:

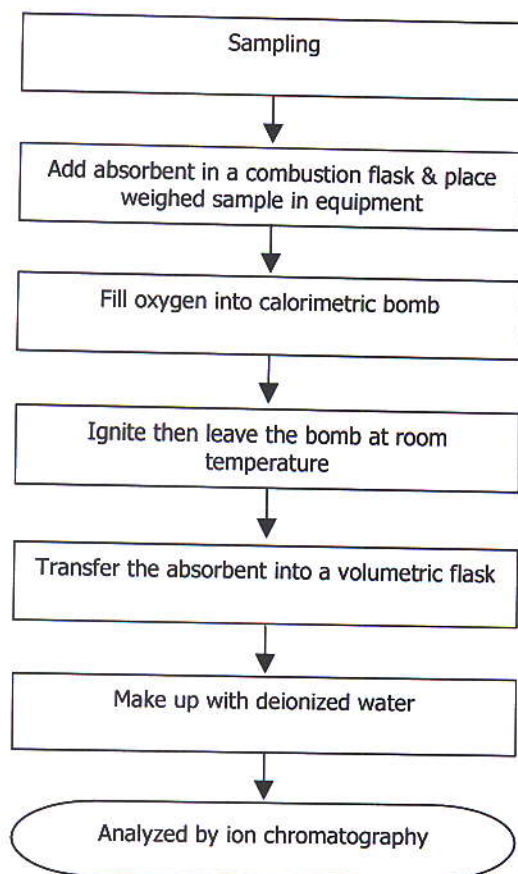
Test for Heavy Metal (Sb) Contents
Reference Method : USEPA 3052



Test Report

Test Conducted
Test for Halogen Contents
Reference Method : EN 14582

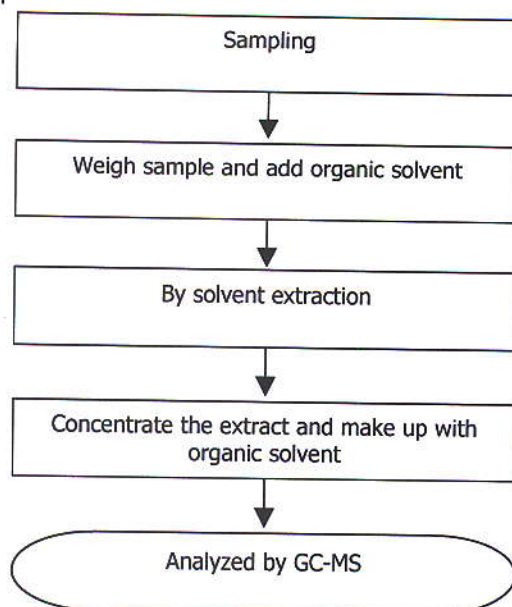
Number: TWNC00323876



Test Report

Number: TWNC00323876

Test Conducted
Test for Phthalates Contents
Reference Method: EN 14372: 2004

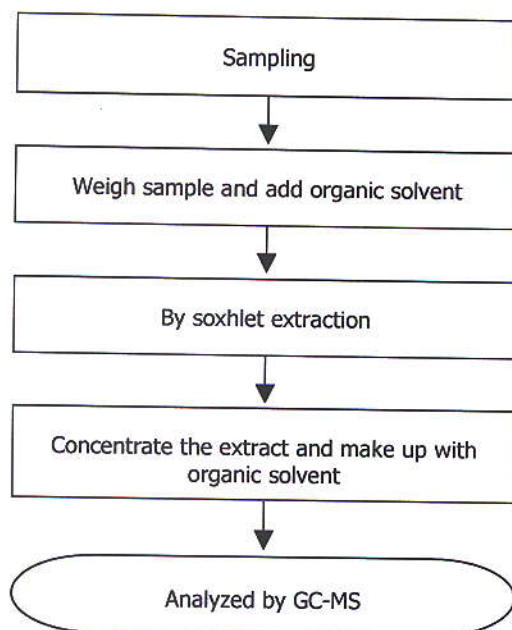


Test Report

Test Conducted

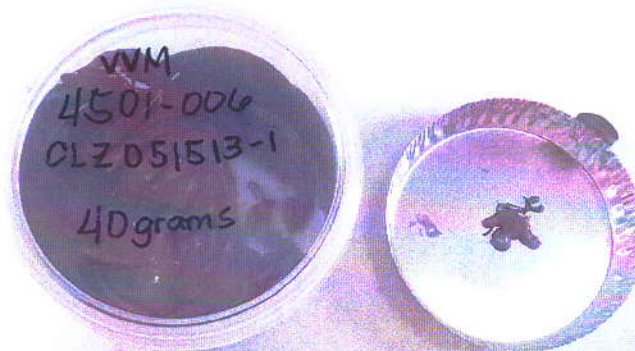
Number: TWNC00323876

Test for Hexabromocyclododecane (HBCDD) Content
Reference Method : USEPA 3540C



Test Report

Number: TWNC00323876



End of Report

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Test Report

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Number : TWNC00319519
Date : Jun 27, 2013

Sample Description:

One (1) group of submitted samples said to be :

Part Description : FR-4 PGB_TFF non-HF copper clad laminate
Part Number : 039611, 039612, 039613, 039608, 039609, 039610, 039618
Date Sample Received : Jun 21, 2013
Date Test Started : Jun 24, 2013

Test Conducted :

As requested by the applicant, for details please refer to attached pages.

Authorized by:
On Behalf of Intertek Testing Services
Taiwan Limited



K. Y. Liang
Director



Test Report

Number: TWNC00319519

Test Conducted

Test Result Summary:

| Test Result Summary: | | | | |
|---|------|--|-------------------|----|
| Test Item | Unit | Test Method | Result | RL |
| | | | Submitted samples | |
| Heavy Metal | | | | |
| Cadmium (Cd) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Lead (Pb) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Mercury (Hg) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Antimony (Sb) Content | ppm | With reference to USEPA 3052, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Chromium VI (Cr ⁶⁺) content | ppm | With reference to IEC 62321: 2008, by alkaline digestion and determined by UV-Vis Spectrophotometer. | ND | 1 |
| Polybrominated Biphenyls (PBBs) | | | | |
| Monobrominated Biphenyls (MonoBB) | ppm | With reference to IEC 62321: 2008, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary. | ND | 5 |
| Dibrominated Biphenyls (DiBB) | ppm | | ND | 5 |
| Tribrominated Biphenyls (TriBB) | ppm | | ND | 5 |
| Tetrabrominated Biphenyls (TetraBB) | ppm | | ND | 5 |
| Pentabrominated Biphenyls (PentaBB) | ppm | | ND | 5 |
| Hexabrominated Biphenyls (HexaBB) | ppm | | ND | 5 |
| Heptabrominated Biphenyls (HeptaBB) | ppm | | ND | 5 |
| Octabrominated Biphenyls (OctaBB) | ppm | | ND | 5 |
| Nonabrominated Biphenyls (NonaBB) | ppm | | ND | 5 |
| Decabrominated Biphenyl (DecaBB) | ppm | | ND | 5 |



Test Report

Number: TWNC00319519

Test Conducted

| Test Item | Unit | Test Method | Result | RL |
|--|------|--|-------------------|----|
| | | | Submitted samples | |
| Polybrominated Diphenyl Ethers (PBDEs) | | | | |
| Monobrominated Diphenyl Ethers (MonoBDE) | ppm | With reference to IEC 62321: 2008, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary. | ND | 5 |
| Dibrominated Diphenyl Ethers (DiBDE) | ppm | | ND | 5 |
| Tribrominated Diphenyl Ethers (TriBDE) | ppm | | ND | 5 |
| Tetrabrominated Diphenyl Ethers (TetraBDE) | ppm | | ND | 5 |
| Pentabrominated Diphenyl Ethers (PentaBDE) | ppm | | ND | 5 |
| Hexabrominated Diphenyl Ethers (HexaBDE) | ppm | | ND | 5 |
| Heptabrominated Diphenyl Ethers (HeptaBDE) | ppm | | ND | 5 |
| Octabrominated Diphenyl Ethers (OctaBDE) | ppm | | ND | 5 |
| Nonabrominated Diphenyl Ethers (NonaBDE) | ppm | | ND | 5 |
| Decabrominated Diphenyl Ether (DecaBDE) | ppm | | ND | 5 |
| Halogen Content | | | | |
| Fluorine (F) | ppm | With reference to EN 14582:2007 by calorimetric bomb with oxygen and determined by Ion Chromatograph. | 317 | 50 |
| Chlorine (Cl) | ppm | | 285 | 50 |
| Bromine (Br) | ppm | | 24974 | 50 |
| Iodine (I) | ppm | | ND | 50 |
| Phthalates | | | | |
| Di(2-ethylhexyl) Phthalate (DEHP) | ppm | With reference to EN 14372: 2004, by solvent extraction and determined by GC-MS. | ND | 10 |
| Dibutyl Phthalate (DBP) | ppm | | ND | 10 |
| Benzyl Butyl Phthalate (BBP) | ppm | | ND | 10 |
| Diisobutyl Phthalate (DIBP) | ppm | | ND | 10 |
| Others | | | | |
| Hexabromocyclododecane (HBCDD) | ppm | With reference to USEPA 3540C, by solvent extraction and determined by GC-MS. | ND | 10 |



Test Report

Number: TWNC00319519

Test Conducted

Remarks: ppm = parts per million based on weight of tested sample = mg/kg
ND = Not detected
RL = Reporting Limit, Quantitation limit of analyte in sample

Responsibility of Chemist: Kevin Liu/ Irene Chiou/ Vico Lin

Date Sample Received : Jun 21, 2013
Test Period : Jun 24, 2013 To Jun 26, 2013

RoHS Limit

| <u>Restricted Substances</u> | <u>Limits</u> |
|---|----------------|
| Cadmium (Cd) content | 0.01% (100ppm) |
| Lead (Pb) content | 0.1% (1000ppm) |
| Mercury (Hg) content | 0.1% (1000ppm) |
| Chromium VI (Cr ⁶⁺) content | 0.1% (1000ppm) |
| Polybrominated Biphenyls (PBBs) | 0.1% (1000ppm) |
| Polybrominated Diphenyl Ethers (PBDEs) | 0.1% (1000ppm) |

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.

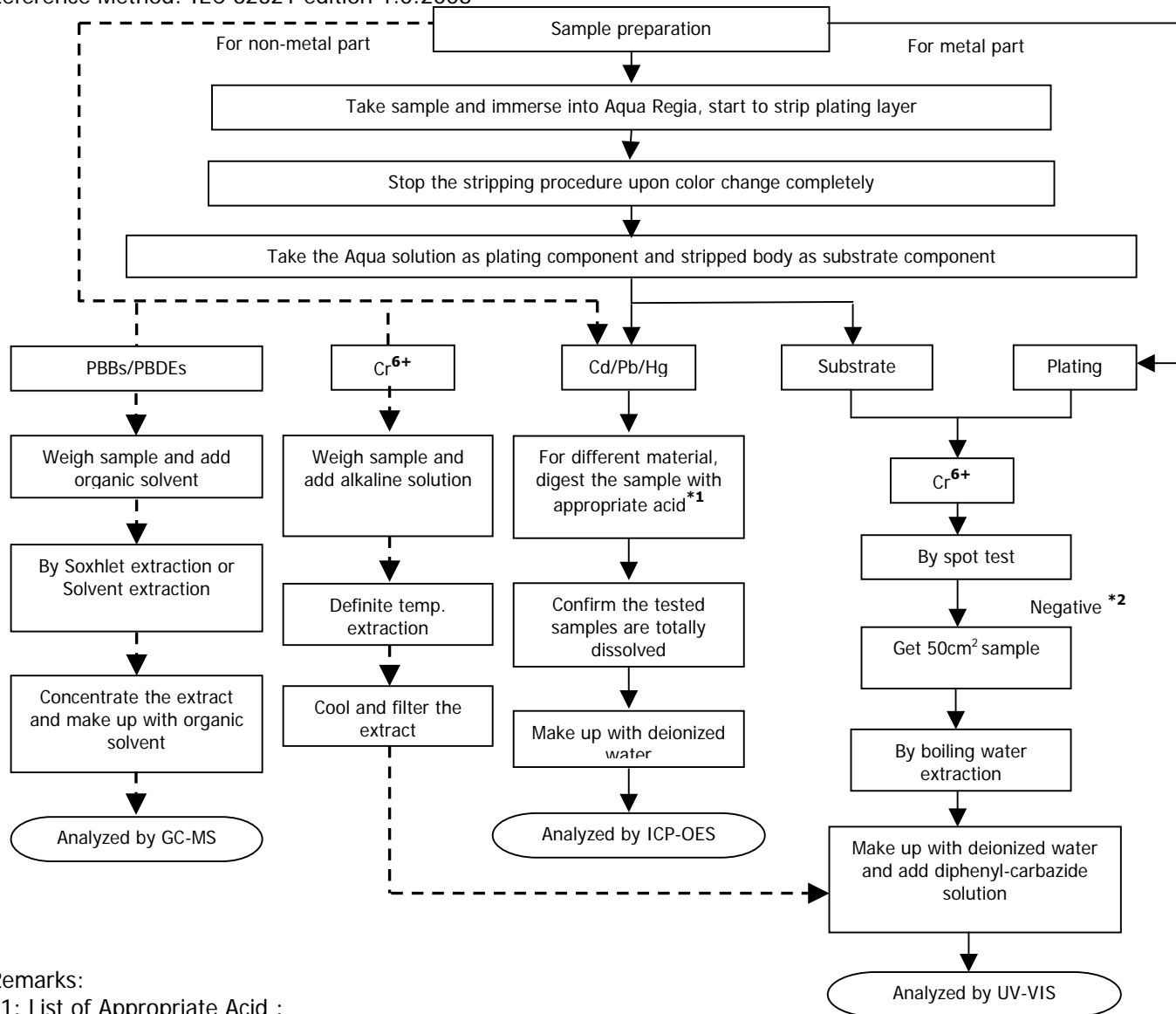


Test Report

Number: TWNC00319519

Test Conducted
Measurement Flowchart:

Test for Cd/Pb/Hg/Chromium (VI)/PBBs/PBDEs Contents
Reference Method: IEC 62321 edition 1.0:2008



Remarks:

*1: List of Appropriate Acid :

| Material | Acid Added for Digestion |
|-------------|--|
| Polymers | HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃ |
| Metals | HNO ₃ , HCl, HF |
| Electronics | HNO ₃ , HCl, H ₂ O ₂ , HBF ₄ |

*2: If the result of spot test is positive, Chromium VI would be determined as detected.



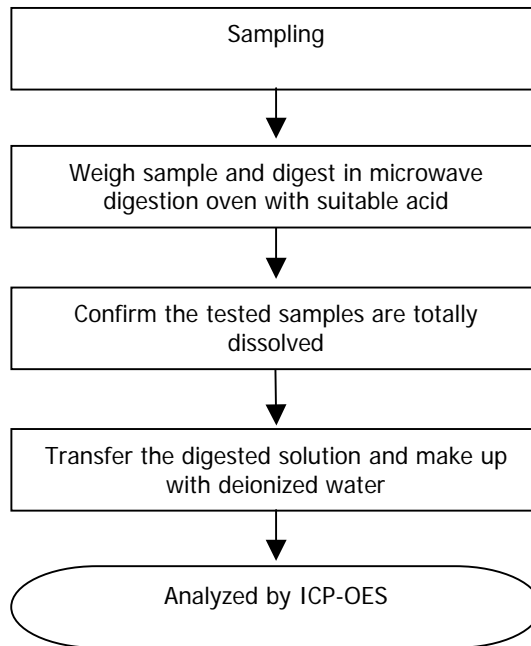
Test Report

Number: TWNC00319519

Test Conducted

Measurement Flowchart:

Test for Heavy Metal (Sb) Contents
Reference Method : USEPA 3052

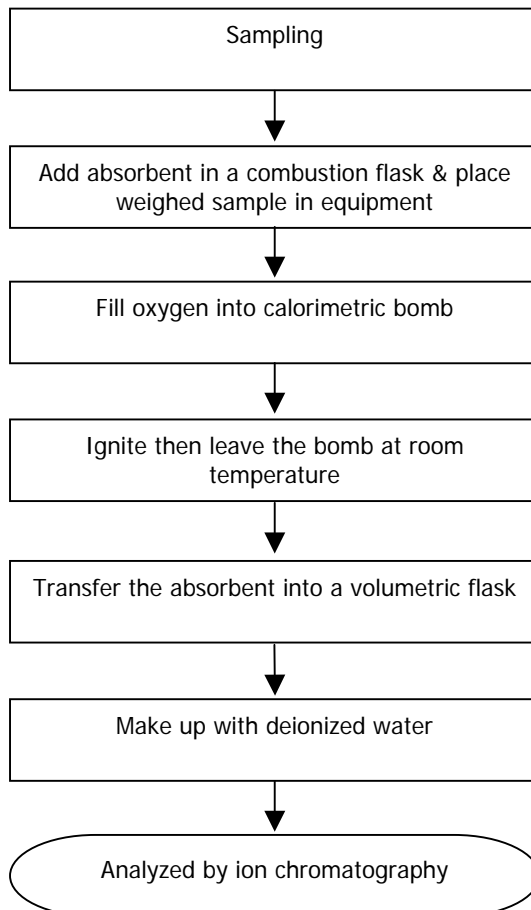


Test Report

Number: TWNC00319519

Test Conducted

Measurement Flowchart:
Test for Halogen Contents
Reference Method : EN 14582

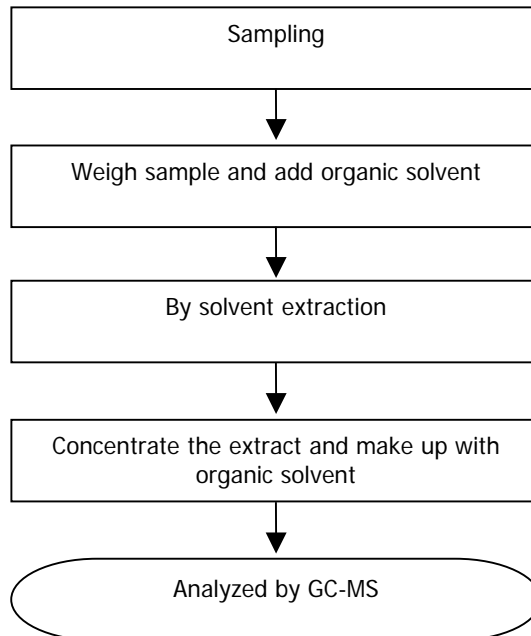


Test Report

Number: TWNC00319519

Test Conducted

Measurement Flowchart:
Test for Phthalates Contents
Reference Method: EN 14372: 2004



Test Report

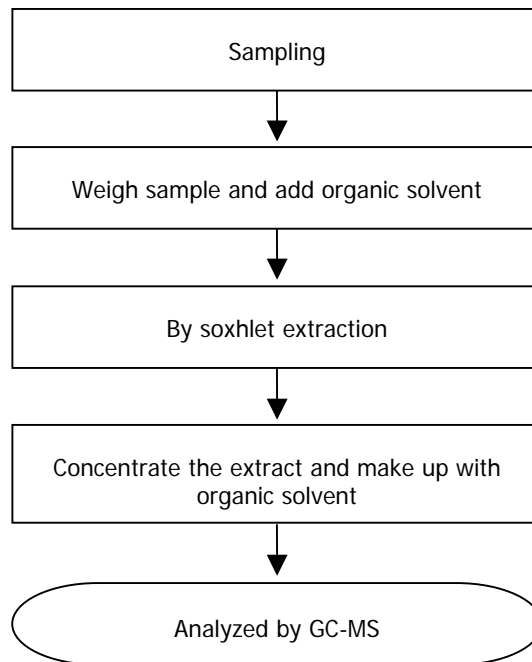
Number: TWNC00319519

Test Conducted

Measurement Flowchart:

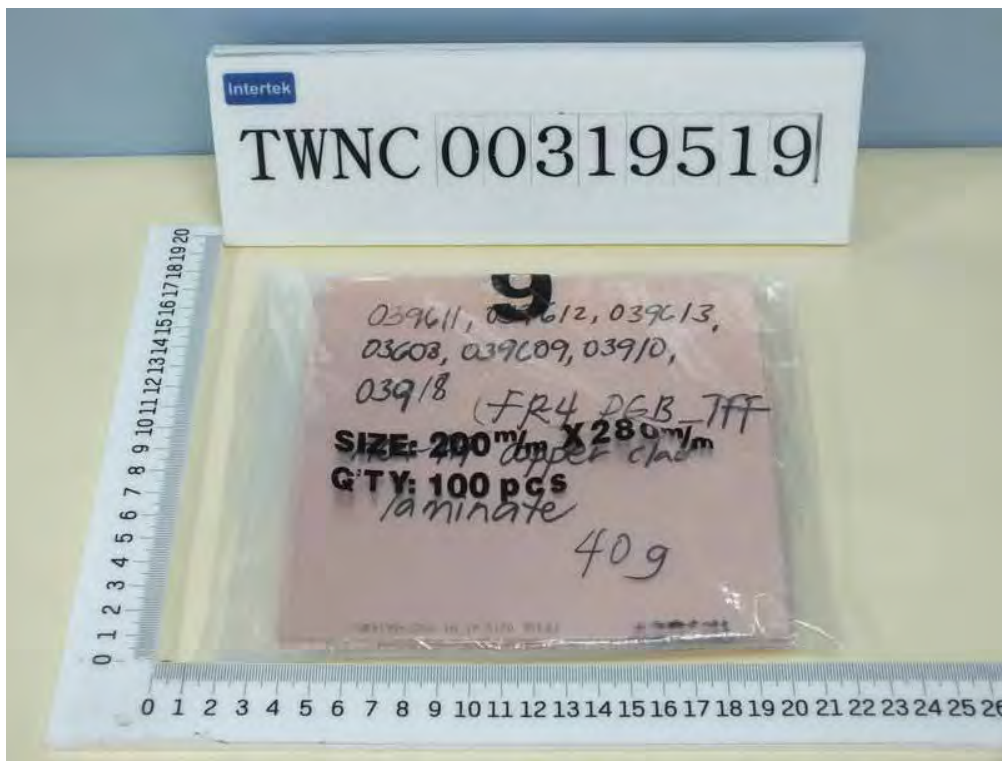
Test for Hexabromocyclododecane (HBCDD) Content

Reference Method : USEPA 3540C



Test Report

Number: TWNC00319519



End of Report

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Test Report

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Number : TWNC00319521
Date : Jun 27, 2013

Sample Description:

One (1) group of submitted samples said to be :

Part Description : Photoimageable Soldermask White(Peters)
Part Number : 090417
Date Sample Received : Jun 21, 2013
Date Test Started : Jun 24, 2013

Test Conducted :

As requested by the applicant, for details please refer to attached pages.

Authorized by:

On Behalf of Intertek Testing Services
Taiwan Limited



K. Y. Liang
Director



Test Report

Number: TWNC00319521

Test Conducted
Test Result Summary:

| Test Result Summary: | | | | |
|---|------|--|-------------|----|
| Test Item | Unit | Test Method | Result | RL |
| | | | White paste | |
| Heavy Metal | | | | |
| Cadmium (Cd) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Lead (Pb) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Mercury (Hg) content | ppm | With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Antimony (Sb) Content | ppm | With reference to USEPA 3052, by microwave digestion and determined by ICP-OES. | ND | 2 |
| Chromium VI (Cr ⁶⁺) content | ppm | With reference to IEC 62321: 2008, by alkaline digestion and determined by UV-Vis Spectrophotometer. | ND | 1 |
| Polybrominated Biphenyls (PBBs) | | | | |
| Monobrominated Biphenyls (MonoBB) | ppm | With reference to IEC 62321: 2008, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary. | ND | 5 |
| Dibrominated Biphenyls (DiBB) | ppm | | ND | 5 |
| Tribrominated Biphenyls (TriBB) | ppm | | ND | 5 |
| Tetrabrominated Biphenyls (TetraBB) | ppm | | ND | 5 |
| Pentabrominated Biphenyls (PentaBB) | ppm | | ND | 5 |
| Hexabrominated Biphenyls (HexaBB) | ppm | | ND | 5 |
| Heptabrominated Biphenyls (HeptaBB) | ppm | | ND | 5 |
| Octabrominated Biphenyls (OctaBB) | ppm | | ND | 5 |
| Nonabrominated Biphenyls (NonaBB) | ppm | | ND | 5 |
| Decabrominated Biphenyl (DecaBB) | ppm | | ND | 5 |



Test Report

Number: TWNC00319521

Test Conducted

| Test Item | Unit | Test Method | Result | RL |
|--|------|--|-------------|----|
| | | | White paste | |
| Polybrominated Diphenyl Ethers (PBDEs) | | | | |
| Monobrominated Diphenyl Ethers (MonoBDE) | ppm | With reference to IEC 62321: 2008, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary. | ND | 5 |
| Dibrominated Diphenyl Ethers (DiBDE) | ppm | | ND | 5 |
| Tribrominated Diphenyl Ethers (TriBDE) | ppm | | ND | 5 |
| Tetrabrominated Diphenyl Ethers (TetraBDE) | ppm | | ND | 5 |
| Pentabrominated Diphenyl Ethers (PentaBDE) | ppm | | ND | 5 |
| Hexabrominated Diphenyl Ethers (HexaBDE) | ppm | | ND | 5 |
| Heptabrominated Diphenyl Ethers (HeptaBDE) | ppm | | ND | 5 |
| Octabrominated Diphenyl Ethers (OctaBDE) | ppm | | ND | 5 |
| Nonabrominated Diphenyl Ethers (NonaBDE) | ppm | | ND | 5 |
| Decabrominated Diphenyl Ether (DecaBDE) | ppm | | ND | 5 |
| Halogen Content | | | | |
| Fluorine (F) | ppm | With reference to EN 14582:2007 by calorimetric bomb with oxygen and determined by Ion Chromatograph. | ND | 50 |
| Chlorine (Cl) | ppm | | 111 | 50 |
| Bromine (Br) | ppm | | ND | 50 |
| Iodine (I) | ppm | | ND | 50 |
| Phthalates | | | | |
| Di(2-ethylhexyl) Phthalate (DEHP) | ppm | With reference to EN 14372: 2004, by solvent extraction and determined by GC-MS. | ND | 10 |
| Dibutyl Phthalate (DBP) | ppm | | ND | 10 |
| Benzyl Butyl Phthalate (BBP) | ppm | | ND | 10 |
| Diisobutyl Phthalate (DIBP) | ppm | | ND | 10 |



Test Report

Number: TWNC00319521

Test Conducted

| Test Item | Unit | Test Method | Result | RL |
|--------------------------------|------|---|-------------|----|
| | | | White paste | |
| Others | | | | |
| Hexabromocyclododecane (HBCDD) | ppm | With reference to USEPA 3540C, by solvent extraction and determined by GC-MS. | ND | 10 |

Remarks: ppm = parts per million based on wet weight of tested sample = mg/kg
 ND = Not detected
 RL = Reporting Limit, Quantitation limit of analyte in sample

Responsibility of Chemist: Kevin Liu/ Irene Chiou/ Vico Lin

Date Sample Received : Jun 21, 2013
 Test Period : Jun 24, 2013 To Jun 26, 2013

RoHS Limit

| Restricted Substances | Limits |
|---|----------------|
| Cadmium (Cd) content | 0.01% (100ppm) |
| Lead (Pb) content | 0.1% (1000ppm) |
| Mercury (Hg) content | 0.1% (1000ppm) |
| Chromium VI (Cr ⁶⁺) content | 0.1% (1000ppm) |
| Polybrominated Biphenyls (PBBs) | 0.1% (1000ppm) |
| Polybrominated Diphenyl Ethers (PBDEs) | 0.1% (1000ppm) |

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.

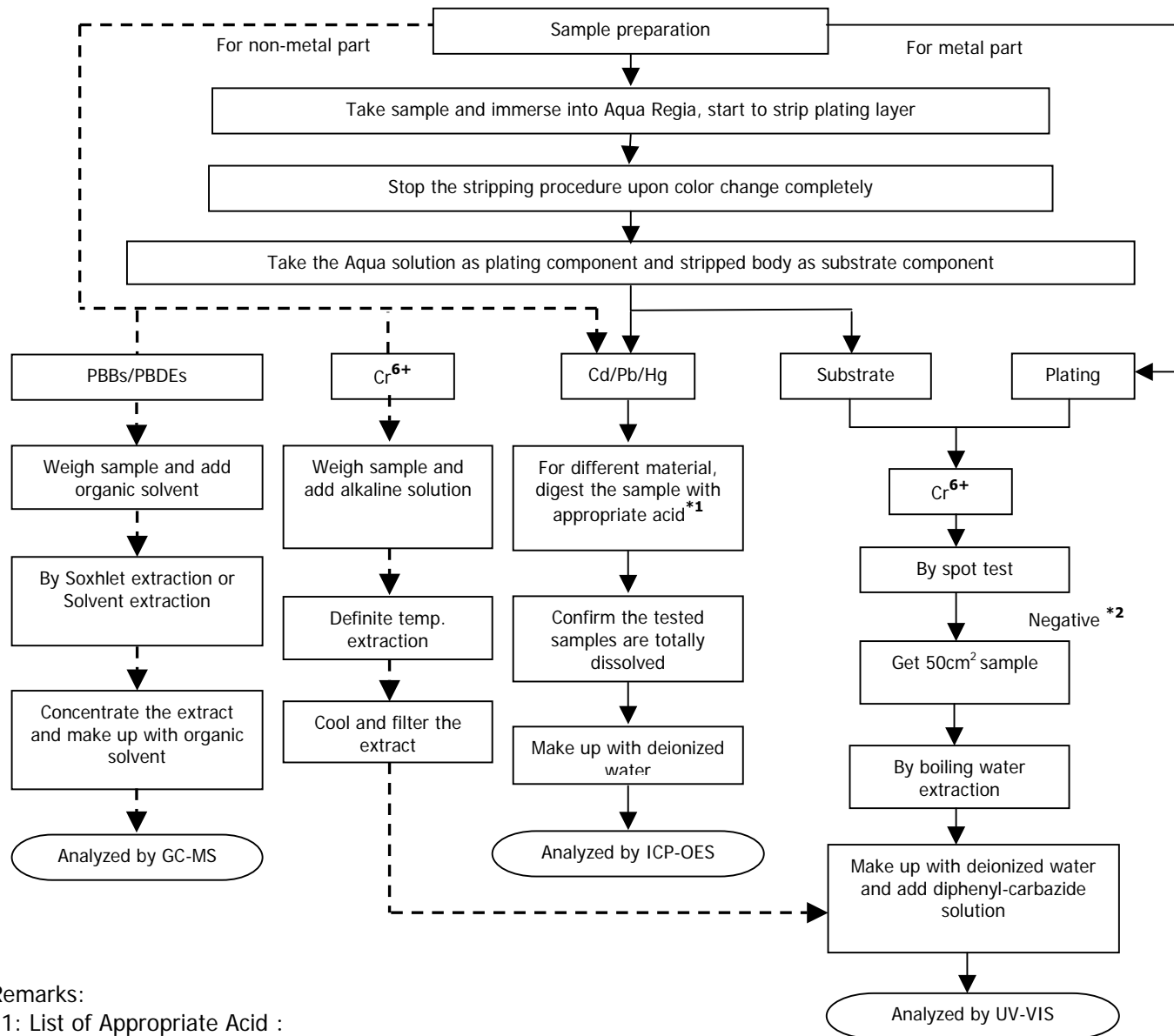


Test Report

Number: TWNC00319521

Test Conducted
Measurement Flowchart:

Test for Cd/Pb/Hg/Chromium (VI)/PBBs/PBDEs Contents
Reference Method: IEC 62321 edition 1.0:2008



Remarks:

*1: List of Appropriate Acid :

| Material | Acid Added for Digestion |
|-------------|--|
| Polymers | HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃ |
| Metals | HNO ₃ , HCl, HF |
| Electronics | HNO ₃ , HCl, H ₂ O ₂ , HBF ₄ |

*2: If the result of spot test is positive, Chromium VI would be determined as detected.



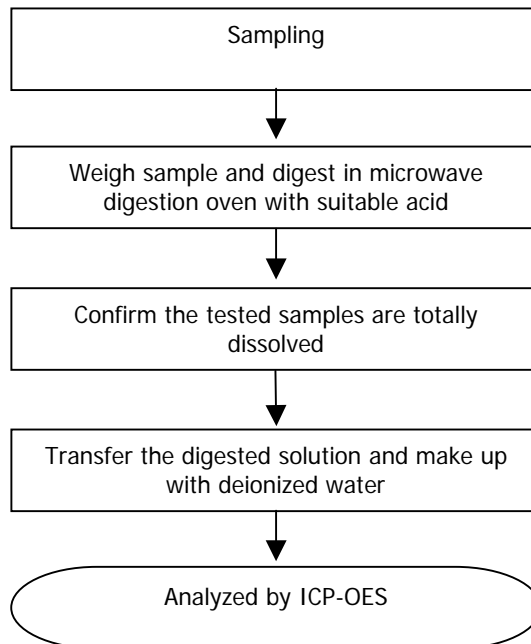
Test Report

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Test Conducted

Measurement Flowchart:

Test for Heavy Metal (Sb) Contents
Reference Method : USEPA 3052



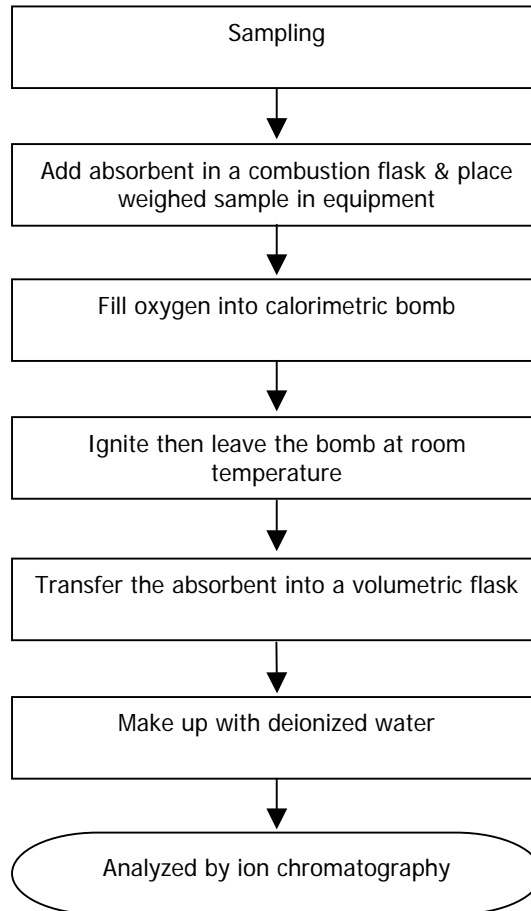
Test Report

Number: TWNC00319521

Test Conducted

Measurement Flowchart:

Test for Halogen Contents
Reference Method : EN 14582



Test Report

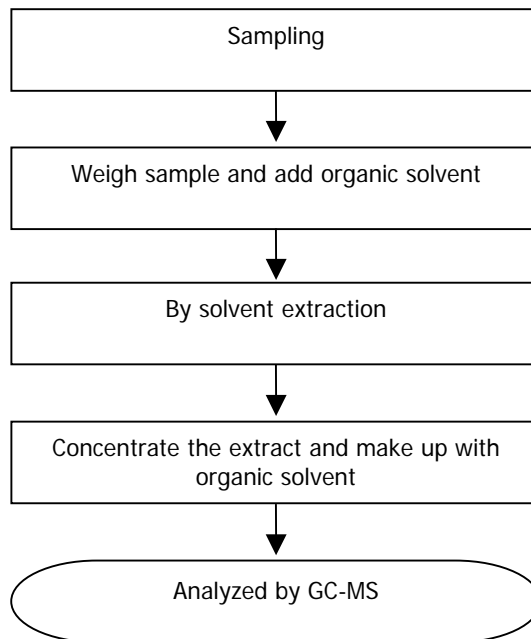
Number: TWNC00319521

Test Conducted

Measurement Flowchart:

Test for Phthalates Contents

Reference Method: EN 14372: 2004



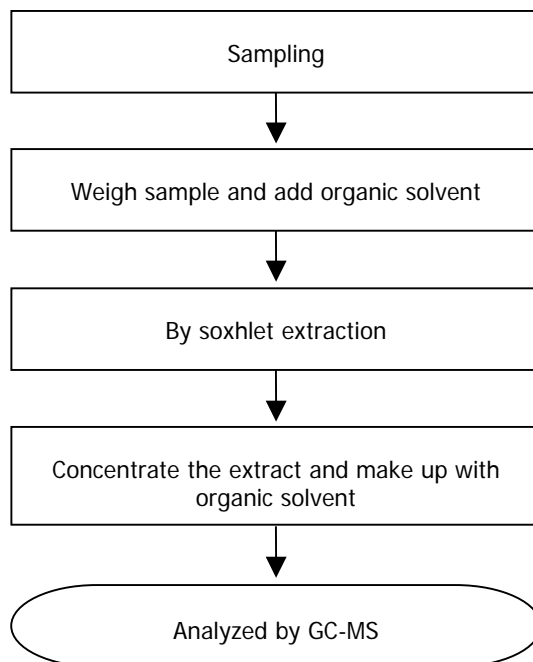
Test Report

Number: TWNC00319521

Test Conducted

Measurement Flowchart:

Test for Hexabromocyclododecane (HBCDD) Content
Reference Method : USEPA 3540C



Test Report

Number: TWNC00319521



End of Report

This report is made solely on the basis of your instructions and/or information and materials supplied by you. It is not intended to be a recommendation for any particular course of action. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as is expressly contained in the terms and conditions governing Intertek's provision of services to you. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in those terms and conditions. We have aimed to conduct the Review on a diligent and careful basis and we do not accept any liability to you for any loss arising out of or in connection with this report, in contract, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.



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