

# **ICP Test Report Certification Packet**

| Company name:                                                                        | Littelfuse, Inc.                                                                                 |                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Series:                                                                      | 216 series Axial Lea                                                                             | aded Fuse                                                                                                                                                                                                                                                       |
| Product #:                                                                           | 216XEP                                                                                           |                                                                                                                                                                                                                                                                 |
| Issue Date:                                                                          | April 11, 2013                                                                                   |                                                                                                                                                                                                                                                                 |
| recasting 2002/95/EC)-re<br>for packing/packaging ma<br>In addition, it is hereby re | stricted substance nor iterials, and for additive ported to you that the proceeding materials, a | ere is neither RoHS (EU Directive 2011/65/EU such use, for materials to be used for unit parts es and the like in the manufacturing processes. Darts and sub-materials, the materials to be used and the additives and the like in the manufacturing emponents. |
|                                                                                      | Issued by:<br>-                                                                                  | JENNY DINGLASAN <global ehs="" specialist=""></global>                                                                                                                                                                                                          |
| (1) Parts, sub-materials a This document cov Littelfuse, Inc.                        | •                                                                                                | HS-Compliant series products manufactured by                                                                                                                                                                                                                    |
| < Raw Materials U<br>Please see Tab                                                  |                                                                                                  |                                                                                                                                                                                                                                                                 |
| (2) The ICP data on all I                                                            | measurable substance<br>ropriate pages as iden                                                   |                                                                                                                                                                                                                                                                 |
| Remarks :                                                                            |                                                                                                  |                                                                                                                                                                                                                                                                 |



Table 1: List of Raw Materials covered by this report

| Total Parts | Raw Material Part Number | Raw Material Description      | Page(s) |
|-------------|--------------------------|-------------------------------|---------|
| 1           | 910-005                  | Сар                           | 3-6     |
| 2           | 692539-002               | Solder                        | 7-11    |
| 3           | 909-444                  | Body                          | 12-18   |
| 4           | 091251                   | Sand Filler (RoHs & Halogens) | 19-25   |
| 5           | 082xxx                   | Wire-AgCu                     | 26-30   |
| 6           | C030210                  | Overcap                       | 31-34   |



NO.: A002R12050740-1R02 Date: May. 09, 2012 Page 1 of 4

Customer: SuZhou FuHong Electronic Industrial Co., Ltd.

Address: NO. 89 WEI DU ROAD, WANGTING TOWN, XIANGCHENG DISTRICT, SUZHOU, CHINA

Report on the submitted sample said to be

Sample name: Copper shell

Model: /

Item/Lot No.: / Material: / Buyer: / Supplier: /

Manufacturer: /

Sample received date: May. 07, 2012

Testing period: From May. 07, 2012 to May. 09, 2012

#### **Testing Requested**

As specified by client, to determine the Lead, Cadmium, Mercury & Hexavalent Chromium content in the submitted sample in accordance with Directive 2002/95/EC (RoHS).

### Testing method:

| Testing Item     | Pretreatment method        | Measuring instrument | MQL        |
|------------------|----------------------------|----------------------|------------|
| Lead (Pb)        | IEC 62321: 2008, section 9 | ICP-OES              | 2mg/kg     |
| Cadmium (Cd)     | IEC 62321: 2008, section 9 | ICP-OES              | 2 mg/kg    |
| Mercury (Hg)     | IEC 62321: 2008, section 7 | ICP-OES              | 2 mg/kg    |
| Chromium (Cr VI) | IEC 62321: 2008, Annex B   | UV-VIS               | 0.02mg/kg* |

#### Note:

## Conclusion:

-When tested as specified the submitted sample complied with the requirements of commission Decision of 18 Aug 2005 amending Directive 2002/95/EC notified under document 2005/618/EC.

\*\*\*\*\*\*FOR FURTHER DETAILS, PLEASE REFER TO THE FOLLOWING PAGE(S)\*\*\*\*\*\*

Signed for and on behalf of Shenzhen AOV Testing Technology Co., Ltd, Kunshan Branch

Project Leader:

Li Tingting, Maggie

Chemical Test Director

Reviewed by: Weik

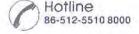
Wang Wexin, Weikin

Technical Director

Approved by:

Yuan Qi, Mickey

Lab Manager



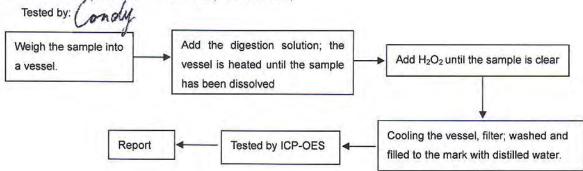
<sup>-\* 0.02</sup> mg/kg refers to the MQL of sample extraction liquid.



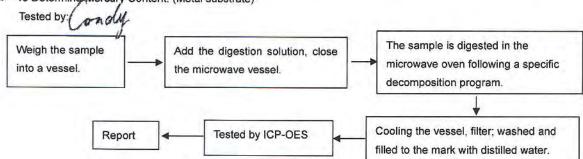
NO.: A002R12050740-1R02 Date: May. 09, 2012 Page 2 of 4

#### Test Flow:

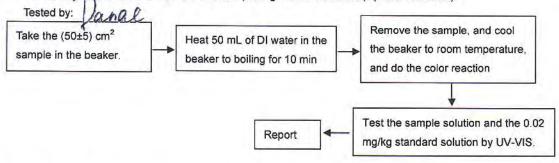
1. To Determine Lead, Cadmium Content: (Metal substrate)



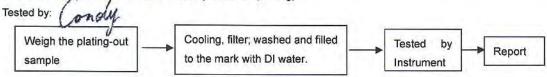
2. To Determine Mercury Content: (Metal substrate)



3. To Determine Hexavalent Chromium Content (boiling- water- extraction): (Metal substrate)



4. To Determine Lead, Cadmium and Mercury Content: (Plating)







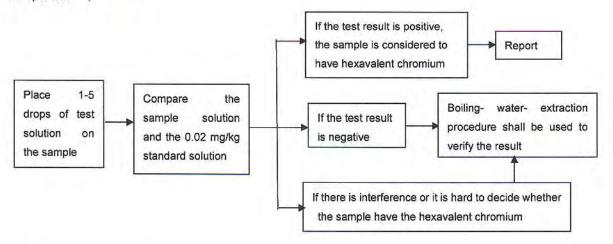
NO.: A002R12050740-1R02

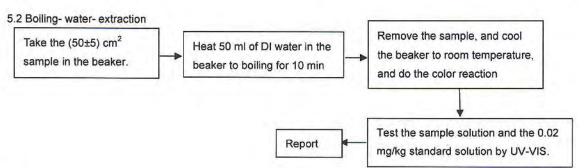
Date: May. 09, 2012

Page 3 of 4

To Determine Hexavalent Chromium Content in colorless and colored chromate coating on metals: (Plating)
 Tested by: 1







#### Sample Description:

| Code | Sample Description |
|------|--------------------|
| 1-1  | Substrate          |
| 1-2  | Plating            |

### Test Results:

| Item            | Unit  | RoHS Limit | Results  |          |  |
|-----------------|-------|------------|----------|----------|--|
| _               |       |            | 1-1      | 1-2**    |  |
| Lead (Pb)       | mg/kg | 1000       | N.D.     | N.D.     |  |
| Cadmium (Cd)    | mg/kg | 100        | N.D.     | N.D.     |  |
| Mercury (Hg)    | mg/kg | 1000       | N.D.     | N.D.     |  |
| Chromium (CrVI) | mg/kg | 1000       | Negative | Negative |  |





NO.: A002R12050740-1R02 Date: May. 09, 2012

Page 4 of 4

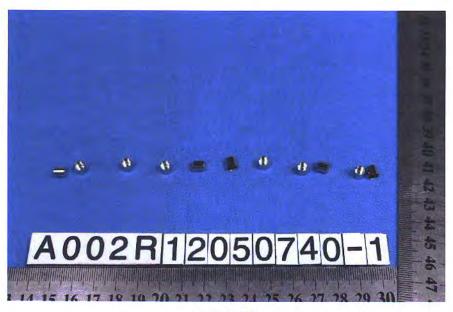
#### Note:

- -The new RoHS directive 2011/65/EU, on Jul. 21, 2011 come into force, on Jan. 03, 2013 the formal implementation, Directive 2002/95/EC shall be repealed simultaneously.
- -Specimens, which requested to determine Lead, Cadmium and Mercury Content, have been dissolved completely.
- -mg/kg=ppm
- -N.D.=not detected(<MQL)
- -MQL=Method Quantitation Limit
- -Negative=Absence of Cr (VI);
- -Positive=Presence of Cr (VI);

Uncertain= can not verify whether the sample have Hexavalent Chromium by spot-test.

- (The tested sample should be further verified by boiling-water-extraction method if the spot test result is uncertain or negative.)
- -\*\*The test is based on the following assumption: The sample plating is a single layer and each part is uniform. The test result maybe cannot stand for the physical truth of sample plating.
- -Photo is included

#### Photograph of Sample



Copper shell

\*\*\*End of Report\*\*\*





**Test Report** 

No. SHAEC1216714750

Date: 25 Sep 2012

Page 1 of 5

ZHEJIANG ASIA GENERAL SOLDERING&BRAZING MATERIAL CO., LTD XIHU INDUSTRIAL PARK, SANDUN, HANGZHOU CITY, ZHEJIANG, PROVINCE, CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as: LEAD-FREE SOLDER WIRE

SGS Job No. :

SP12-028285 - SH

Part No. (P/N):

YTW102 (692539-002)

Composition:

Sn2.0CuRE

Date of Sample Received:

21 Sep 2012

Testing Period:

21 Sep 2012 - 25 Sep 2012

Test Requested:

Selected test(s) as requested by client.

Test Method:

Please refer to next page(s).

Test Results:

Please refer to next page(s).

Conclusion:

Based on the performed tests on submitted samples, the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE) comply with the limits as set by RoHS

Directive 2011/65/EU Annex II; recasting 2002/95/EC.

Signed for and on behalf of SGS-CSTC Ltd.

Fan Jingjie, JJ Approved Signatory

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**Test Report** 

No. SHAEC1216714750

Date: 25 Sep 2012

Page 2 of 5

Test Results:

## Test Part Description:

Specimen No. SGS Sample ID Description SHA12-167147.043 Silvery wire

Remarks:

(1) 1 mg/kg = 1 ppm = 0.0001%

(2) MDL = Method Detection Limit

(3) ND = Not Detected ( < MDL )

(4) "-" = Not Regulated

### RoHS Directive 2011/65/EU

Test Method: With reference to IEC 62321:2008

(1) Determination of Cadmium by ICP-OES.

(2) Determination of Lead by ICP-OES.

(3) Determination of Mercury by ICP-OES.

(4) Determination of Hexavalent Chromium by Spot test / Colorimetric Method using UV-Vis.

(5) Determination of PBBs / PBDEs by GC-MS.

| Test Item(s)                 | <u>Limit</u> | <u>Unit</u> | MDL       | 043      |
|------------------------------|--------------|-------------|-----------|----------|
| Cadmium (Cd)                 | 100          | mg/kg       | 2         | ND       |
| Lead (Pb)                    | 1000         | mg/kg       | 2         | 168      |
| Mercury (Hg)                 | 1000         | mg/kg       | 2         | ND       |
| Hexavalent Chromium (Cr(VI)) | -            | -           | <b>\Q</b> | Negative |
| Sum of PBBs                  | 1000         | mg/kg       | -         | ND       |
| Monobromobiphenyl            | -            | mg/kg       | 5         | ND       |
| Dibromobiphenyl              | 4            | mg/kg       | 5         | ND       |
| Tribromobiphenyl             | *            | mg/kg       | 5         | ND       |
| Tetrabromobiphenyl           | 4            | mg/kg       | 5         | ND       |
| Pentabromobiphenyl           | 2            | mg/kg       | 5         | ND       |
| Hexabromobiphenyl            | -            | mg/kg       | 5         | ND       |
| Heptabromobiphenyl           | -            | mg/kg       | 5         | ND       |
| Octabromobiphenyl            | - 2          | mg/kg       | 5         | ND       |
| Nonabromobiphenyl            | =            | mg/kg       | 5         | ND       |
| Decabromobiphenyl            | 2            | mg/kg       | 5         | ND       |
| Sum of PBDEs                 | 1000         | mg/kg       | -         | ND       |
| Monobromodiphenyl ether      | -            | mg/kg       | 5         | ND       |

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htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms\_e-document.htm. Attention is drawn to the limitation of its institution of the company is findings at the time of its instruction of the company is findings at the time of its instruction of the company is findings at the time of its instruction of the company is findings at the time of its instruction of the company is findings at the time of its instruction of the company is findings at the time of the company is findings at the company is findings at the time of the company is findings at the time of the company is findings at the company is findings at the time of the company is findings at the time of the company is findings. The company is findings at the time of the company is finding at the time of the company is finding at the company is finding

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3" Building, No. 889 Yishan Road Xuhul District, Shanghai China 中国・上海・徐汇区宜山路889号3号楼 邮编: 200233 HL: (86-21) 61402594 HL: (86-21)54500353

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| Test Report              | No. SHAEC121671475                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 50          | Date: 25 | Sep 2012   | Page 3 of 5 |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------|------------|-------------|
| Test Item(s)             | <u>Limit</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <u>Unit</u> | MDL      | <u>043</u> |             |
| Dibromodiphenyl ether    | The state of the s | mg/kg       | 5        | ND         |             |
| Tribromodiphenyl ether   | Sian .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | mg/kg       | 5        | ND         |             |
| Tetrabromodiphenyl ether | (*)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | mg/kg       | 5        | ND         |             |
| Pentabromodiphenyl ether | , i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | mg/kg       | 5        | ND         |             |
| Hexabromodiphenyl ether  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | mg/kg       | 5        | ND         |             |
| Heptabromodiphenyl ether | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | mg/kg       | 5        | ND         |             |
| Octabromodiphenyl ether  | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | mg/kg       | 5        | ND         |             |
| Nonabromodiphenyl ether  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | mg/kg       | 5        | ND         |             |
| Decabromodiphenyl ether  | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | mg/kg       | 5        | ND         |             |

#### Notes:

- (1) The maximum permissible limit is quoted from directive 2011/65/EU, Annex II
- (2) Spot-test:

Negative = Absence of Cr(VI) coating, Positive = Presence of Cr(VI) coating;

(The tested sample should be further verified by boiling-water-extraction method if the spot test result is Negative or cannot be confirmed.)

◇Boiling-water-extraction:

Negative = Absence of Cr(VI) coating

Positive = Presence of Cr(VI) coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm² sample surface area.

For corrosion protection coatings on metals: Information on storage conditions and production date of the tested sample is unavailable and thus results of Cr(VI) represent status of the sample at the time of testing.

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## **Test Report**

No. SHAEC1216714750

Date: 25 Sep 2012

Page 4 of 5

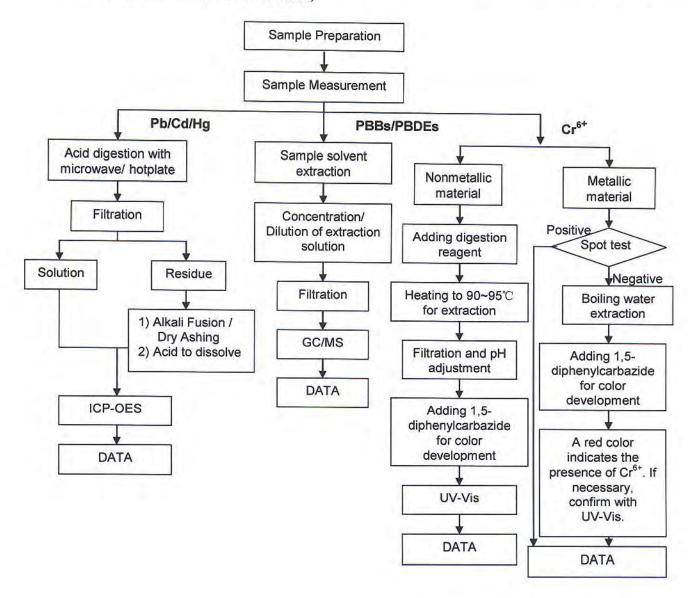
#### **ATTACHMENTS**

## **RoHS Testing Flow Chart**

1) Name of the person who made testing: Jan Shi/Yoyo Wang/Allen Xiao/Gary Xu

2) Name of the person in charge of testing: Jeff Zhang/George Xu/ Linda Li

These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded)



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# **Test Report**

No. SHAEC1216714750

Date: 25 Sep 2012

Page 5 of 5

Sample photo:



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\*\*\* End of Report \*\*\*

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Test Report Number: TWNC00304282

Applicant: Littelfuse Philippines Inc.

LIMA Technology Center, Lipa City,

Malvar, Batangas

Sample Description:

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

Part Description : Ceramic Body

Part Number : 909-444\_909-157\_909-438

Date Sample Received : Mar 21, 2013 : Mar 22, 2013 Date Test Started

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



Date : Mar 29, 2013



Test Conducted

### (I) Test Result Summary:

| (1) Test Result Summary:                |             |                                                                                                      |                      | •         |
|-----------------------------------------|-------------|------------------------------------------------------------------------------------------------------|----------------------|-----------|
| Test Item                               | <u>Unit</u> | Test Method                                                                                          | Result White ceramic | <u>RL</u> |
| 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                       | mqq         | 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         |
| Chromium VI (Cr <sup>6+</sup> ) Content | ppm         | With reference to IEC 62321: 2008, by alkaline digestion and determined by UV-Vis Spectrophotometer. | ND                   | 1         |
| Polybrominated Biphenyls (PBB           | 3)          |                                                                                                      |                      |           |
| Monobrominated Biphenyls (MonoBB)       | ppm         |                                                                                                      | ND                   | 5         |
| Dibrominated Biphenyls (DiBB)           | ppm         |                                                                                                      | ND                   | 5         |
| Tribrominated Biphenyls (TriBB)         | ppm         |                                                                                                      | ND                   | 5         |
| Tetrabrominated Biphenyls (TetraBB)     | ppm         | With reference to IEC                                                                                | ND                   | 5         |
| Pentabrominated Biphenyls (PentaBB)     | ppm         | - 62321: 2008, by solvent extraction and determined by GC-MS and                                     | ND                   | 5         |
| Hexabrominated Biphenyls (HexaBB)       | ppm         | further HPLC-DAD  confirmation when                                                                  | ND                   | 5         |
| Heptabrominated Biphenyls (HeptaBB)     | ppm         | necessary.                                                                                           | ND                   | 5         |
| Octabrominated Biphenyls (OctaBB)       | ppm         |                                                                                                      | ND                   | 5         |
| Nonabrominated Biphenyls (NonaBB)       | ppm         |                                                                                                      | ND                   | 5         |
| Decabrominated Biphenyl (DecaBB)        | ppm         |                                                                                                      | ND                   | 5         |





Test Conducted

|                                               |             |                                                                       | Result         |           |
|-----------------------------------------------|-------------|-----------------------------------------------------------------------|----------------|-----------|
| Test Item                                     | <u>Unit</u> | Test Method                                                           | White .        | <u>RL</u> |
|                                               |             |                                                                       | <u>ceramic</u> |           |
| Polybrominated Diphenyl Ethers                | (PBDEs)     |                                                                       |                | 1         |
| Monobrominated Diphenyl Ethers (MonoBDE)      | ppm         |                                                                       | ND             | 5         |
| Dibrominated Diphenyl Ethers (DiBDE)          | ppm         |                                                                       | ND             | 5         |
| Tribrominated Diphenyl Ethers (TriBDE)        | ppm         |                                                                       | ND             | 5         |
| Tetrabrominated Diphenyl Ethers (TetraBDE)    | ppm         | With reference to IEC                                                 | ND             | 5         |
| Pentabrominated Diphenyl<br>Ethers (PentaBDE) | ppm         | 62321: 2008, by solvent extraction and                                | ND             | 5         |
| Hexabrominated Diphenyl Ethers (HexaBDE)      | ppm         | determined by GC-MS and further HPLC-DAD confirmation when necessary. | ND             | 5         |
| Heptabrominated Diphenyl<br>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                                                  | ND             | 50        |
| Chlorine (Cl)                                 | ppm         | 14582:2007 by calorimetric bomb with                                  | ND             | 50        |
| Bromine (Br)                                  | ppm         | oxygen and determined                                                 | ND             | 50        |
| Iodine (I)                                    | ppm         | by Ion Chromatograph.                                                 | ND             | 50        |

ppm = parts per million based on weight of tested sample = mg/kg Remarks:

ND = Not detected

RL = Reporting Limit, Quantitation limit of analyte in sample

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

Date Sample Received : Mar 21, 2013

: Mar 22, 2013 To Mar 29, 2013 Test Period





Test Conducted

# (Ⅱ) Limit:

RoHS Limit

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



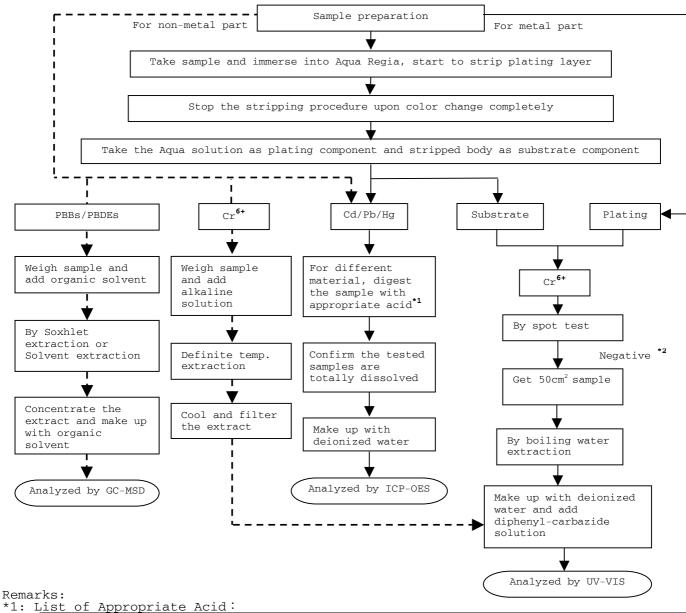
Tel: (+886-2) 6602-2888 · 2797-8885 Fax: (+886-2) 6602-2410



Test Conducted

## $( \ensuremath{\, { m I\hspace{-.1em} I}} )$ Measurement Flowchart:

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



| List of Appropriate Acid: |                                                                                            |
|---------------------------|--------------------------------------------------------------------------------------------|
| Material                  | Acid Added for Digestion                                                                   |
| Polymers                  | HNO <sub>3</sub> , HCl, HF, H <sub>2</sub> O <sub>2</sub> , H <sub>3</sub> BO <sub>3</sub> |
| Metals                    | HNO <sub>3</sub> ,HCl,HF                                                                   |
| Electronics               | $HNO_3 HC1, H_2O_2 HBF_4$                                                                  |

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

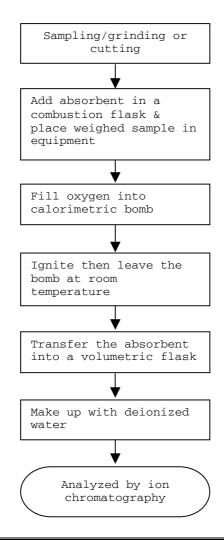


## Intertek Testing Services Taiwan Ltd.



Test Conducted

Test for Halogen Content Reference Standard: EN 14582



End of Report

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## Intertek Testing Services Taiwan Ltd.



Test Conducted

Number: TWNC00304282

### Photo







## Intertek Testing Services Taiwan Ltd.



Number: TWNC00282887 Test Report

Littelfuse Philippines Inc. Applicant:

Date : Oct 31, 2012

LIMA Technology Center, Lipa City,

Malvar, Batangas

Sample Description:

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

Part Description : Filler : 091251 Part Number

: Oct 24, 2012 Date Sample Received Date Test Started : Oct 25, 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





Test Conducted

(I) Test Result Summarv:

| ) Test Result Summary :                    |                   |
|--------------------------------------------|-------------------|
| Togt Itom                                  | Result (ppm)      |
| Test Item                                  | Submitted Samples |
| Heavy Metal                                |                   |
| Cadmium (Cd) content                       | ND                |
| Lead (Pb) content                          | ND                |
| Mercury (Hg) content                       | ND                |
| Chromium VI (Cr <sup>6+</sup> ) 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                |
| Halogen Content                            |                   |
| Fluorine (F)                               | ND                |
| Chlorine (Cl)                              | ND                |
| Bromine (Br)                               | ND                |
| Iodine (I)                                 | ND                |

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg

ND = Not detected

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

Date Sample Received : Oct 24, 2012

Test Period : Oct 25, 2012 To Oct 30, 2012





## Test Conducted

## (Ⅱ) RoHS Limits:

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

## (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           |
| 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 <sup>6+</sup> ) content                                                                                                                                                  | With reference to IEC 62321 edition 1.0:2008 in annex C, by alkaline digestion and determined by UV-Vis spectrophotometer.                                      | 1 ppm           |





## Test Conducted

## (Ⅲ) Test Method:

| Test Item                                    | Test Method                                                                                                                                              | Reporting Limit |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Polybrominated<br>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<br>Diphenyl Ethers<br>(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           |
| Halogen Content                              | With reference to EN 14582:2007 by calorimetric bomb with oxygen and determined by Ion Chromatograph.                                                    | 50 ppm          |

Remark: Reporting limit = Quantitation limit of analyte in sample



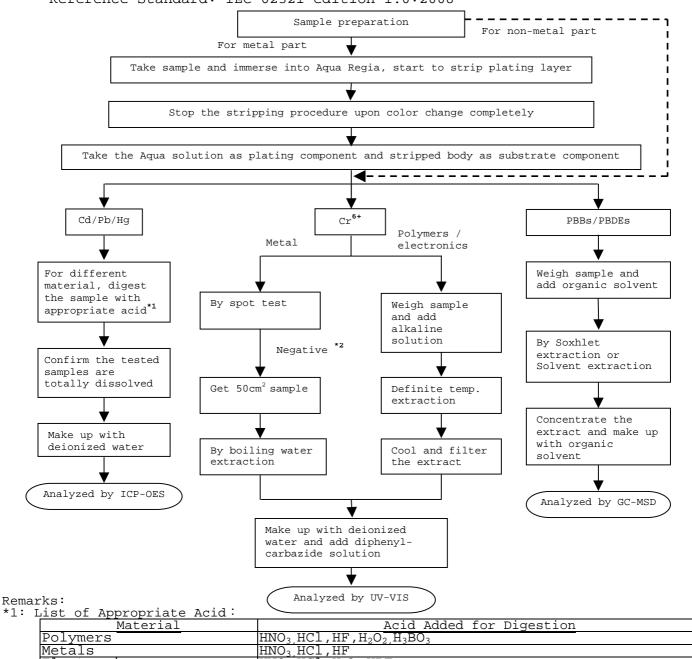


#### Test Conducted

(IV) Measurement Flowchart:

Electronics

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



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

HNO3 HCl, H2O2 HBF4

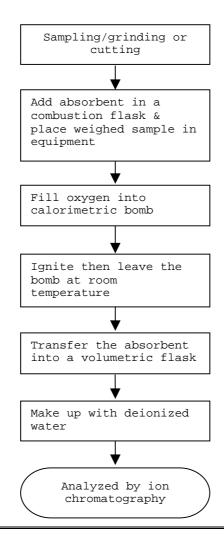




Test Conducted

(N) Measurement Flowchart:

Test for Halogen Content Reference Standard: EN 14582



End of Report

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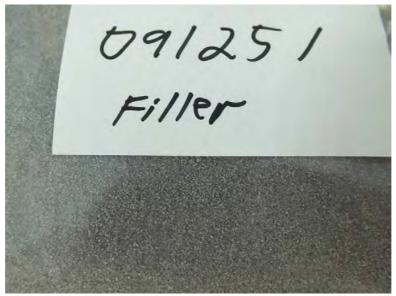


Test Conducted

Number: TWNC00282887

### Photo









**Test Report** Number: SHAH0036227401

Applicant: ELSCHUKOM ELEKTROSCHUTZKOMPONENTENBAU

GEWERBESTRASSE 87, D-98669 VEILSDORF,

**GERMANY** 

Sample Description:

Two(2) pieces of submitted samples said to be:

(1) Mixed all kinds of metal substrates.

(2) Mixed all kinds of plating layers.

Item Name : Silver Plated & Pure Silver Wires.

Item No. : (B-1) 101.014 -. ----

- silver plated copper wire - Cu, Ag--%

(B-2) 101.0131.----

- pure silver wire - Ag 1000

(B-3) 101.0123.0---

- silver plated purest nickel wire - Ni99.98%, Ag1%

(B-4) 101.0182.0---

- silver-copper alloy plated copper plated iron nickel alloy wire

Date:

JAN 18, 2013

- ElconD, AgCu5%

(B-5) 101.0120.0---

- silver plated constantan wire - CuNi44, Ag5%

(B-6) 101.0151.0---

- silver plated copper - nickel 44 alloy wire

- CuNi44, Ag10%

(B-7) 1050--31.----

pure silver strips – Ag 1000 pure

Country Of Origin Germany.

Tests Conducted:

As requested by the applicant, for details refer to attached page(s).

To Be Continued

Authorized by:

For intertek testing services Ltd., Shanghai

Jacob Lin

General Manager





**Test Report** SHAH0036227401 Number:

#### **Tests Conducted**

## (A) Test result of RoHS Directive:

| Testing item                                                                                                   | Result |  |  |
|----------------------------------------------------------------------------------------------------------------|--------|--|--|
| resund item                                                                                                    | (1)    |  |  |
| Cadmium (Cd) content (mg/kg)                                                                                   | ND     |  |  |
| Lead (Pb) content (mg/kg)                                                                                      | ND     |  |  |
| Mercury (Hg) content (mg/kg)                                                                                   | ND     |  |  |
| Chromium (VI)(Cr <sup>6+</sup> ) result (by boiling water extraction on metal) (mg/kg with 50cm <sup>2</sup> ) | ND     |  |  |

| Testing item                                                                                                            | Result |  |  |
|-------------------------------------------------------------------------------------------------------------------------|--------|--|--|
| resung item                                                                                                             | (2)    |  |  |
| Cadmium (Cd) content (mg/kg) /Plating                                                                                   | ND     |  |  |
| Lead (Pb) content (mg/kg) /Plating                                                                                      | ND     |  |  |
| Mercury (Hg) content (mg/kg) /Plating                                                                                   | ND     |  |  |
| Chromium (VI)(Cr <sup>6+</sup> ) result (by boiling water extraction on metal) (mg/kg with 50cm <sup>2</sup> ) /Plating | ND     |  |  |

Remark: mg/kg with 50cm<sup>2</sup> = milligram per kilogram with 50 square centimeter

ND = not detected

(B) RoHS Requirement:

| (B) None requirement.             |                   |
|-----------------------------------|-------------------|
| Restricted substances             | Limits            |
| Cadmium (Cd)                      | 0.01% (100 mg/kg) |
| Lead (Pb)                         | 0.1% (1000 mg/kg) |
| Mercury (Hg)                      | 0.1% (1000 mg/kg) |
| Chromium (VI) (Cr <sup>o+</sup> ) | 0.1% (1000 mg/kg) |

The above limits were quoted from RoHS Directive 2011/65/EU for homogeneous material.

(C) Test method:

| Testing item                                          | Testing method                                                                                                                             | Reporting limit                                        |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Cadmium (Cd) content                                  | determined by ICP-OES.                                                                                                                     | 2 mg/kg                                                |
| Lead (Pb) content                                     | determined by ICP-OES.                                                                                                                     | 2 mg/kg                                                |
| Mercury (Hg) content                                  | With reference to IEC 62321 Edition 1.0: 2008, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES. | 2 mg/kg                                                |
| Chromium (VI) (Cr <sup>6+</sup> ) content (for metal) | With reference to IEC 62321 Edition 1.0: 2008, by boiling water extraction and determined by UV-VIS Spectrophotometer.                     | 0.02mg/kg with 50cm <sup>2</sup> (in testing solution) |

Date sample received: Jan.14, 2013 Testing period: Jan.14, 2013 To Jan.17, 2013

To Be Continued

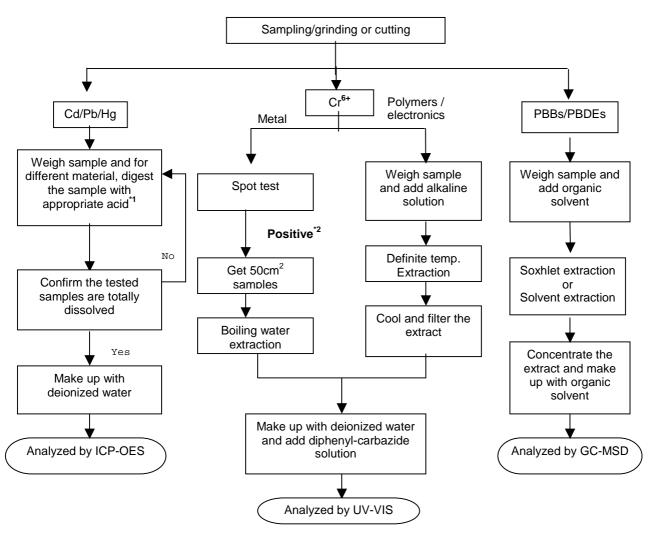


Test Report Number: SHAH0036227401

**Tests Conducted** 

(D) Measurement flowchart:

Test for Cd/Pb/Hg/Cr (VI)/PBBs/PBDEs contents Reference standard: IEC 62321 Edition 1.0: 2008



### Remarks:

\*1: list of appropriate acid:

|   | . appropriate actar               |                                                                                        |  |  |
|---|-----------------------------------|----------------------------------------------------------------------------------------|--|--|
| ĺ | Material Acid added for digestion |                                                                                        |  |  |
| ĺ | Polymers                          | HNO <sub>3</sub> ,HCL,HF,H <sub>2</sub> O <sub>2</sub> ,H <sub>3</sub> BO <sub>3</sub> |  |  |
|   | Metals                            | HNO <sub>3</sub> ,HCL,HF                                                               |  |  |
| ſ | 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.

To Be Continued



**Test Report** Number: SHAH0036227401



To Be Continued



**Test Report** Number: SHAH0036227401

**Tests Conducted** 



**End Of Report** 

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NO.: A002R121008024-2R02

Date: Oct.10, 2012

Page 1 of 4

Customer: SuZhou FuHong Electronic Industrial Co., Ltd.

Address: NO. 89 WEI DU ROAD, WANGTING TOWN, XIANGCHENG DISTRICT, SUZHOU, CHINA

Report on the submitted sample said to be

Sample name: Lead wire copper shell

Model: /

Item/Lot No.: /

Material: /

Buyer: /

Supplier: / Manufacturer: /

Comple resolved date.

Sample received date: Oct. 08, 2012

Testing period: From Oct. 08, 2012 to Oct. 10, 2012

#### **Testing Requested**

As specified by client, to determine the Lead, Cadmium, Mercury & Hexavalent Chromium content in the submitted sample in accordance with Directive 2002/95/EC (RoHS).

### Testing method:

| Testing Item     | Pretreatment method        | Measuring instrument | MQL        |
|------------------|----------------------------|----------------------|------------|
| Lead (Pb)        | IEC 62321: 2008, section 9 | ICP-OES              | 2mg/kg     |
| Cadmium (Cd)     | IEC 62321: 2008, section 9 | ICP-OES              | 2 mg/kg    |
| Mercury (Hg)     | IEC 62321: 2008, section 7 | ICP-OES              | 2 mg/kg    |
| Chromium (Cr VI) | IEC 62321: 2008, Annex B   | UV-VIS               | 0.02mg/kg* |

#### Note:

#### Conclusion:

-When tested as specified the submitted sample complied with the requirements of commission Decision of 18 Aug 2005 amending Directive 2002/95/EC notified under document 2005/618/EC.

\*\*\*\*\*\*FOR FURTHER DETAILS, PLEASE REFER TO THE FOLLOWING PAGE(S)\*\*\*\*\*\*

Signed for and on behalf of Shenzhen AOV Testing Technology Co., Ltd, Kunshan Branch

Project Leader:

Li Tingting, Maggie

**Chemical Test Director** 

Reviewed by: WEIKIN

Wang Wexin, Weikin

Technical Director

Approved by:

Yuan Qi, Mickey

Lab Manager

<sup>-\* 0.02</sup> mg/kg refers to the MQL of sample extraction liquid.



out sample

# **TEST REPORT**

NO.: A002R121008024-2R02 Date: Oct.10, 2012 Page 2 of 4 Test Flow: 1. To Determine Lead, Cadmium Content: (Metal substrate) Tested by: onoul Weigh the sample into Add the digestion solution; the Add H2O2 until the sample is clear vessel is heated until the sample a vessel. has been dissolved Cooling the vessel, filter; washed and Tested by ICP-OES Report filled to the mark with distilled water. 2. To Determine Mercury Content: (Metal substrate) Tested by: The sample is digested in the Weigh the sample Add the digestion solution, close microwave oven following a specific into a vessel. the microwave vessel. decomposition program. Cooling the vessel, filter; washed and Tested by ICP-OES Report filled to the mark with distilled water. 3. To Determine Hexavalent Chromium Content (boiling- water- extraction): (Metal substrate) Tested by: Remove the sample, and cool Take the (50±5) cm2 Heat 50 mL of DI water in the beaker to room temperature, sample in the beaker. the beaker to boiling for 10 and do the color reaction Test the sample solution and the 0.02 Report mg/kg standard solution by UV-VIS. 4. To Determine Lead, Cadmium and Mercury Content: (Plating) Tested by: now Cooling, filter; washed and Weigh the plating-Tested by Report

filled to the mark with DI water.

Instrument



NO.: A002R121008024-2R02

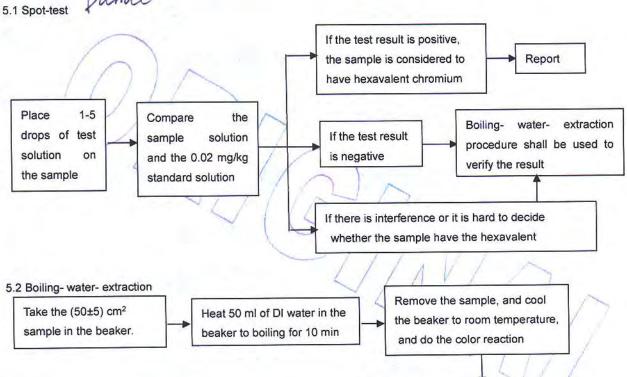
Date: Oct.10, 2012

Page 3 of 4

Test the sample solution and the 0.02

mg/kg standard solution by UV-VIS.

5. To Determine Hexavalent Chromium Content in colorless and colored chromate coating on metals: (Plating) Tested by:



Report

| ample Description. |                     |      |                        |  |
|--------------------|---------------------|------|------------------------|--|
| Code               | Sample Description  | Code | Sample Description     |  |
| 2-1                | Lead wire substrate | 2-3  | Copper shell substrate |  |
| 2-2                | Lead wire Plating   | 2-4  | Copper shell Plating   |  |

#### st Results:

| Item Unit       | Unit  | RoHS Limit | Result   |          |          |          |
|-----------------|-------|------------|----------|----------|----------|----------|
|                 |       |            | 2-1      | 2-2**    | 2-3      | 2-4**    |
| Lead (Pb)       | mg/kg | 1000       | N.D.     | N.D.     | N.D.     | N.D.     |
| Cadmium (Cd)    | mg/kg | 100        | N.D.     | N.D.     | N.D.     | N.D.     |
| Mercury (Hg)    | mg/kg | 1000       | N.D.     | N.D.     | N.D.     | N.D.     |
| Chromium (CrVI) | mg/kg | 1000       | Negative | Negative | Negative | Negative |





NO.: A002R121008024-2R02

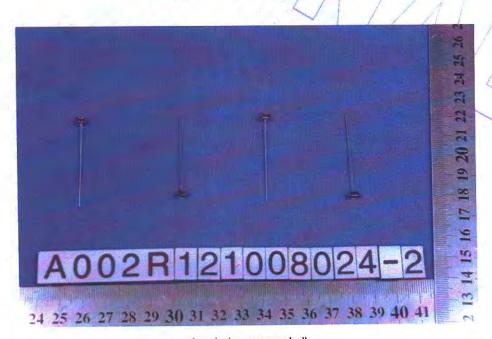
Date: Oct.10, 2012

Page 4 of 4

#### Note:

- -The new RoHS directive 2011/65/EU, on Jul. 21, 2011 come into force, on Jan. 03, 2013 the formal implementation, Directive 2002/95/EC shall be repealed simultaneously.
- -Specimens, which requested to determine Lead, Cadmium and Mercury Content, have been dissolved completely.
- -mg/kg=ppm
- -N.D.=not detected(<MQL)
- -MQL=Method Quantitation Limit
- -Negative=Absence of Cr (VI);
- -Positive=Presence of Cr (VI);
- Uncertain= can not verify whether the sample have Hexavalent Chromium by spot-test.
- ( The tested sample should be further verified by boiling-water-extraction method if the spot test result is uncertain or negative.)
- -\*\*The test is based on the following assumption: The sample plating is a single layer and each part is uniform. The test result maybe cannot stand for the physical truth of sample plating.
- -Photo is included

Photograph of Sample



Lead wire copper shell

\*\*\*End of Report\*\*\*

