



ICP Test Report Certification Packet

Company name: Littelfuse, Inc.

Product Series: 5x20 Cartridge

Product #: 213xxxXEP Series

Issue Date: April 23, 2014

It is hereby certified by Littelfuse, Inc. that there is neither RoHS (EU Directive 2002/95/EC, 2011/65/EU)-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: 
JORDANUFF H. CABILAN

[Global EHS Engineer]

(1) Parts, sub-materials and unit parts

This document covers the 5x20 Cartridge 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

ICP ID	Raw Material Part Number	Raw Material Description	Page(s)
ICP-052	910-555	Cap – Base & plating	3-10
ICP-053	C909543	Soda Lime Glass Tubes	11-15
ICP-054	C909542	Borosilicate Glass Body	16-20
ICP-0294	082xxx-001	Element - 99% Sn Plated Cu	21-24
ICP-056	687xxx-001	Element – Ag-Cu Sn Plated	25-30
ICP-080	934-077 (C030208)	Overcap – Cap & Lead (Base & plating)	31-34
ICP-061	648115	Yarn	35-40
ICP-060	648150	Yarn	41-46
ICP-0118	692535-005	Solder Wire	47-52



Test Report

No. CANEC1317187402

Date: 12 Nov 2013

Page 1 of 4

LITTELFUSE PHILIPPINES INC.
LIMA TECHNOLOGY CENTER, LIPA CITY,
MALVAR, BATANGAS

The following sample(s) was/were submitted and identified on behalf of the clients as : FUSE CAP

SGS Job No. : CP13-057503 - SZ
Client Ref. Info. : H65 ,Ni
Date of Sample Received : 06 Nov 2013
Testing Period : 06 Nov 2013 - 12 Nov 2013
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).

Signed for and on behalf of
SGS-CSTC Ltd.

Merry Lv
Approved Signatory

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Test Report

No. CANEC1317187402

Date: 12 Nov 2013

Page 2 of 4

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
1	CAN13-171874.002	Silvery plating on metal

Remarks :

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected (< MDL)
- (4) "-" = Not Regulated

Elementary Analysis

Test Method : (1)Determination of Cadmium and Lead by ICP-OES after application of modified surface etching digestion based on IEC62321-5:2013
(2)Determination of Mercury by ICP-OES after application of modified surface etching digestion based on IEC 62321-4:2013
(3)With reference to IEC 62321:2008, determination of Hexavalent Chromium by spot test / Colorimetric Method using UV-Vis.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Cadmium (Cd)	mg/kg	10	ND
Lead (Pb)	mg/kg	10	ND
Mercury (Hg)	mg/kg	10	ND
Hexavalent Chromium (CrVI)	-	◇	Negative

Notes :

(1)◇Spot-test:

Negative = Absence of CrVI coating, Positive = Presence of CrVI 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 CrVI coating

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

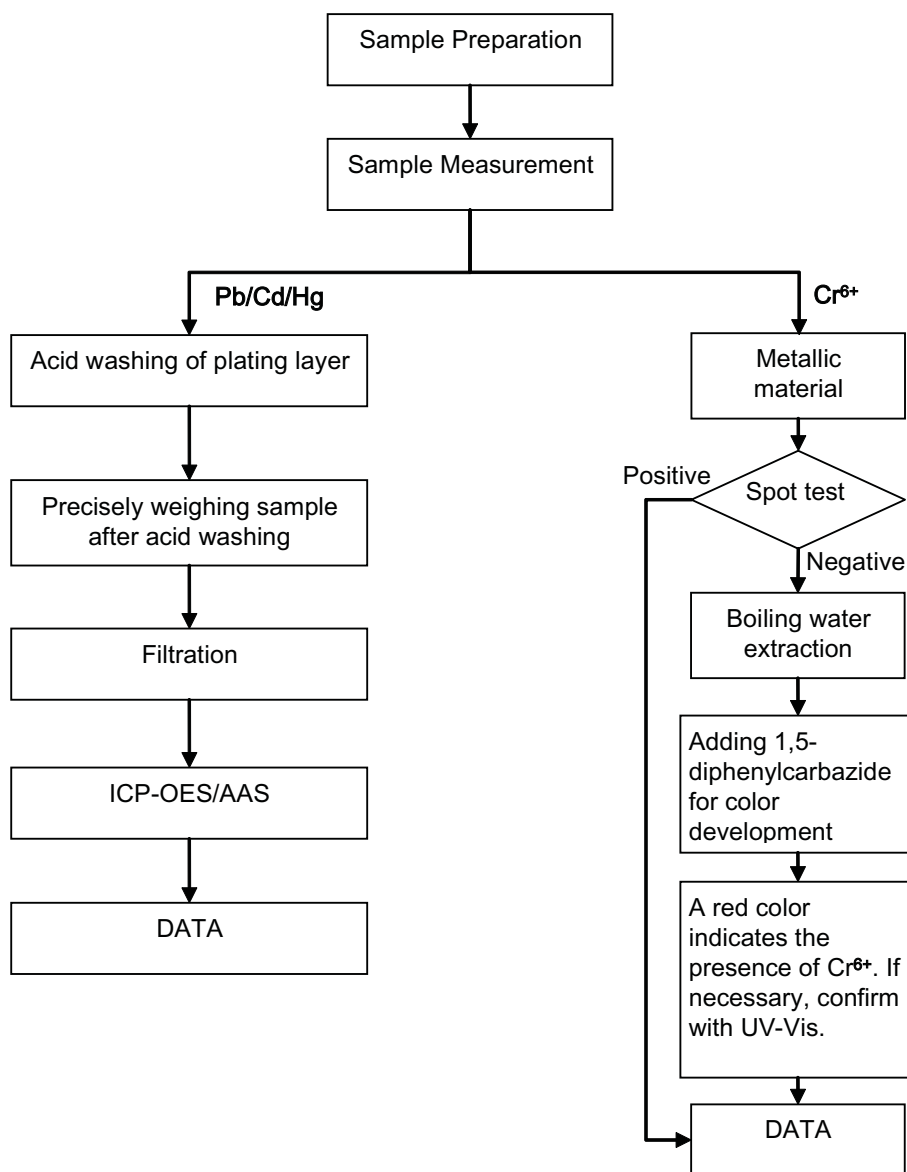
Information on storage conditions and production date of the tested sample is unavailable and thus results of Cr(VI) represent status of the sample at the time of testing.

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ATTACHMENTS

Plating Pb/Cd/Hg/Cr⁶⁺ Testing Flow Chart

- 1) Name of the person who made testing: Michael Tso
- 2) Name of the person in charge of testing: Adams Yu



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Test Report

No. CANEC1317187402

Date: 12 Nov 2013

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Sample photo:



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Test Report

No. CANEC1317187401

Date: 12 Nov 2013

Page 1 of 4

LITTELFUSE PHILIPPINES INC.
LIMA TECHNOLOGY CENTER, LIPA CITY,
MALVAR, BATANGAS

The following sample(s) was/were submitted and identified on behalf of the clients as : FUSE CAP

SGS Job No. : CP13-057503 - SZ
Client Ref. Info. : H65 ,Ni
Date of Sample Received : 06 Nov 2013
Testing Period : 06 Nov 2013 - 12 Nov 2013
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).

Signed for and on behalf of
SGS-CSTC Ltd.

Merry Lv
Approved Signatory

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Test Report

No. CANEC1317187401

Date: 12 Nov 2013

Page 2 of 4

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
1	CAN13-171874.001	Silvery plated metal

Remarks :

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected (< MDL)
- (4) "-" = Not Regulated

Elementary Analysis

Test Method : (1)With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
 (2)With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
 (3)With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
 (4)With reference to IEC 62321:2008, determination of Hexavalent Chromium by spot test / Colorimetric Method using UV-Vis.

Test Item(s)	Unit	MDL	001
Cadmium (Cd)	mg/kg	2	ND
Lead (Pb)	mg/kg	2	ND
Mercury (Hg)	mg/kg	2	ND
Hexavalent Chromium (CrVI)	-	◇	Negative

Notes :

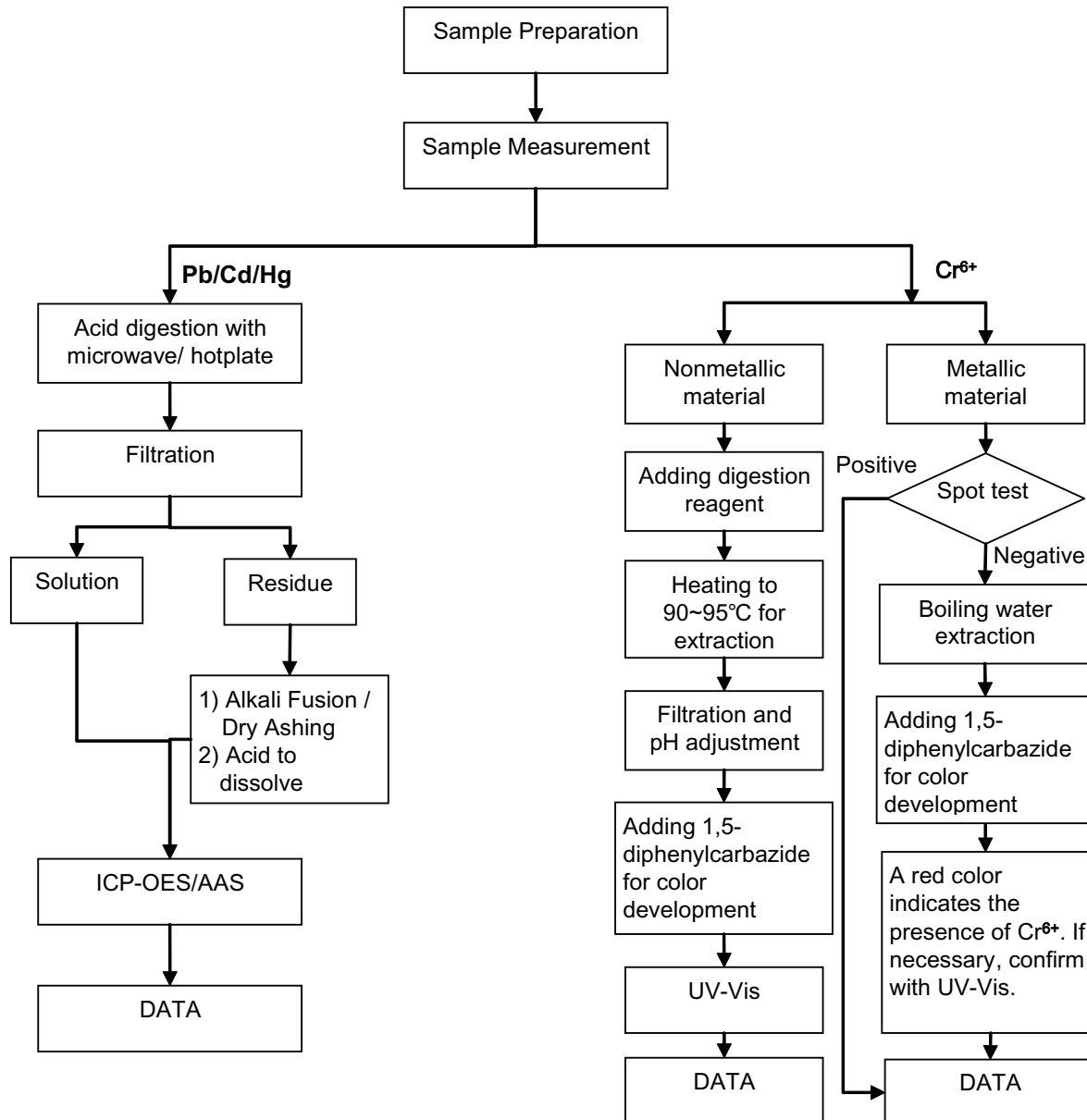
- (1)◇Spot-test:
 Negative = Absence of CrVI coating, Positive = Presence of CrVI coating;
 (The tested sample should be further verified by boiling-water-extraction method if the spot test result is Negative or cannot be confirmed.)
- ◇Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.
 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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ATTACHMENTS

RoHS Testing Flow Chart

- 1) Name of the person who made testing: Michael Tso
- 2) Name of the person in charge of testing: Adams Yu
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart (Cr⁶⁺ test method excluded).



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Test Report

No. CANEC1317187401

Date: 12 Nov 2013

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Sample photo:



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Test Report

No. CANEC1309150303

Date: 24 Jun 2013

Page 1 of 5

LITTELFUSE PHILIPPINES INC.
LIMA TECHNOLOGY CENTER, LIPA CITY,
MALVAR, BATANGAS

The following sample(s) was/were submitted and identified on behalf of the clients as : Bosi glass tube

SGS Job No. : XM14644726EC - XM
Date of Sample Received : 18 Jun 2013
Testing Period : 18 Jun 2013 - 24 Jun 2013
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.

Almay Gao
Approved Signatory

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Member of the SGS Group (SGS SA)

Test Report

No. CANEC1309150303

Date: 24 Jun 2013

Page 2 of 5

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
1	CAN13-091503.002	Transparent glass tube

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 Colorimetric Method using UV-Vis.
- (5) Determination of PBBs / PBDEs content by GC-MS.

Test Item(s)	Limit	Unit	MDL	002
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	ND
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND
Sum of PBBs	1,000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1,000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

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Test Report

No. CANEC1309150303

Date: 24 Jun 2013

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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>002</u>
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

Notes :

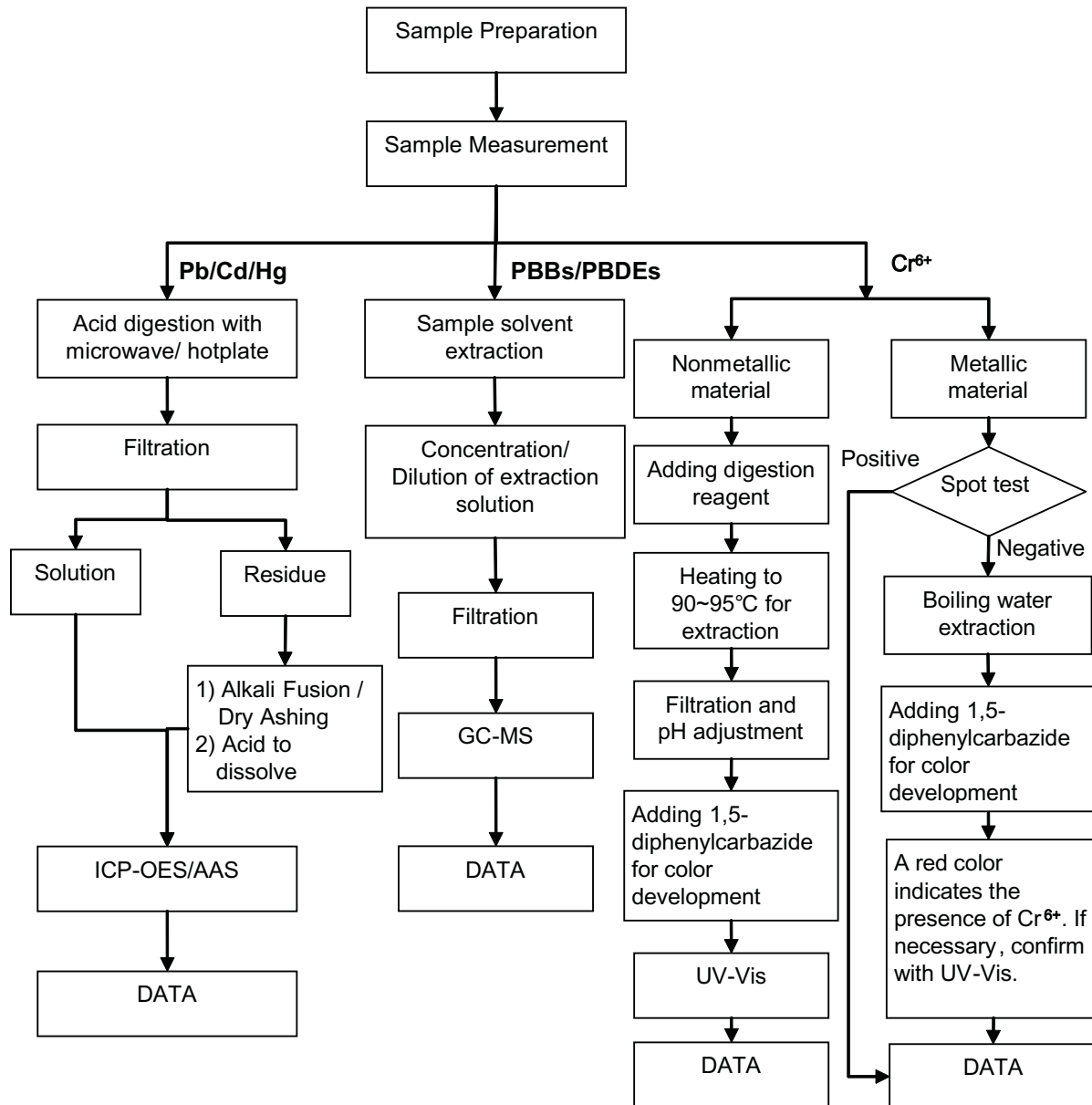
- (1) The maximum permissible limit is quoted from the directive 2011/65/EU, Annex II

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ATTACHMENTS

RoHS Testing Flow Chart

- 1) Name of the person who made testing: Michael Tso / Cutey Yu
- 2) Name of the person in charge of testing: Adams Yu / Yolanda Wei
- 3) These samples were dissolved totally by pre -conditioning method according to below flow chart (Cr⁶⁺ and PBBs/PBDEs test method excluded).



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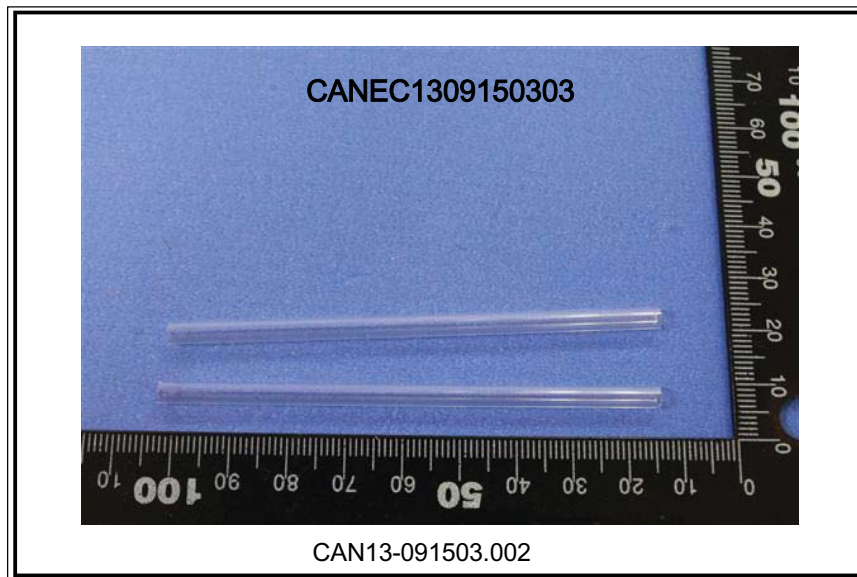
Test Report

No. CANEC1309150303

Date: 24 Jun 2013

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Sample photo:



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Test Report

No. CANEC1309150301

Date: 24 Jun 2013

Page 1 of 5

LITTELFUSE PHILIPPINES INC.
LIMA TECHNOLOGY CENTER, LIPA CITY,
MALVAR, BATANGAS

The following sample(s) was/were submitted and identified on behalf of the clients as : Soda lime glass tube

SGS Job No. : XM14644726EC - XM
Date of Sample Received : 18 Jun 2013
Testing Period : 18 Jun 2013 - 24 Jun 2013
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.

Almay Gao
Approved Signatory

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Test Report

No. CANEC1309150301

Date: 24 Jun 2013

Page 2 of 5

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
1	CAN13-091503.001	Transparent glass tube

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 Colorimetric Method using UV-Vis.
- (5) Determination of PBBs / PBDEs content by GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	142
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND
Sum of PBBs	1,000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1,000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

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Test Report

No. CANEC1309150301

Date: 24 Jun 2013

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Test Item(s)	Limit	Unit	MDL	001
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

Notes :

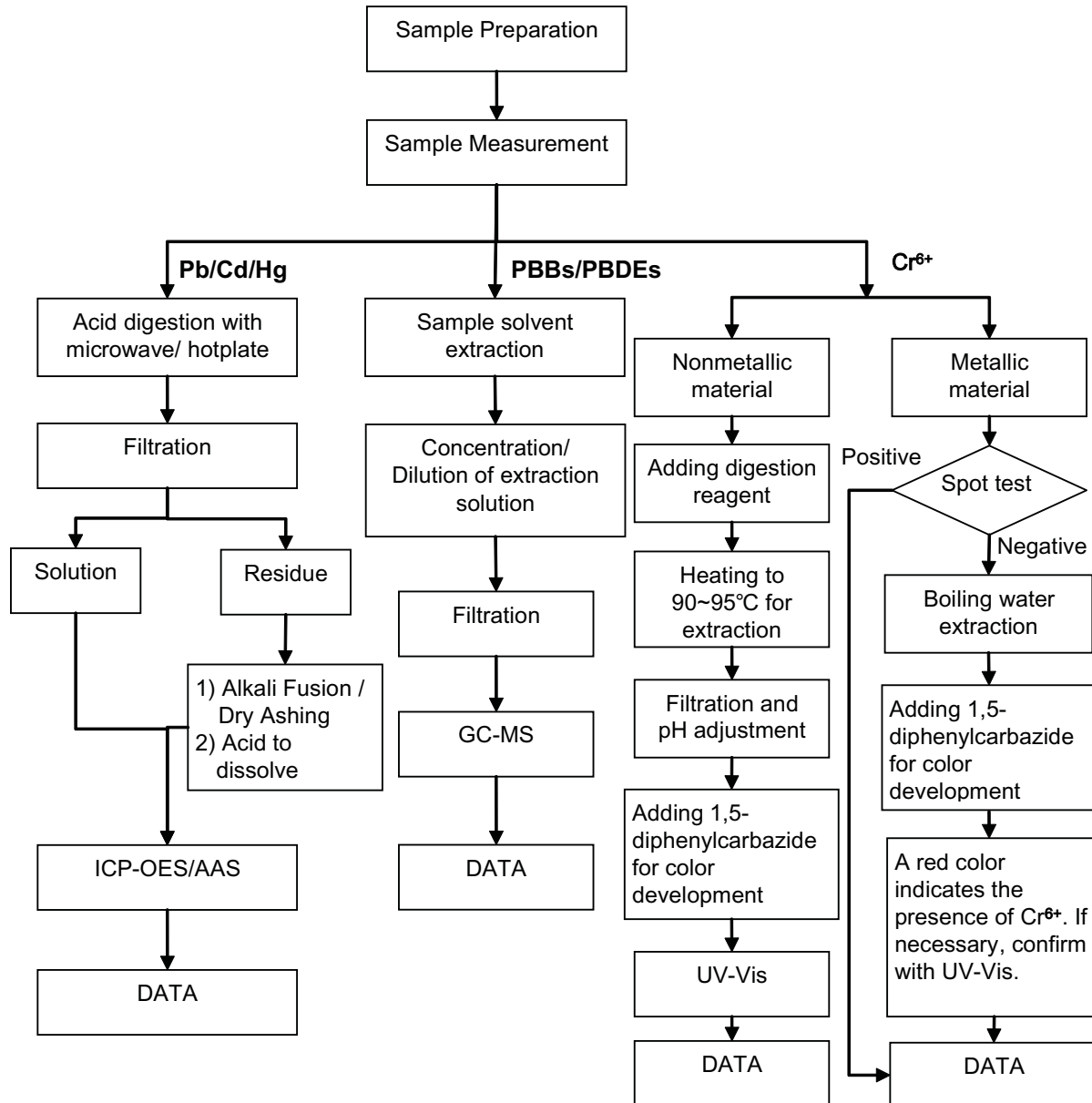
(1) The maximum permissible limit is quoted from the directive 2011/65/EU, Annex II

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ATTACHMENTS

RoHS Testing Flow Chart

- 1) Name of the person who made testing: Michael Tso / Cutey Yu
- 2) Name of the person in charge of testing: Adams Yu / Yolanda Wei
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart (Cr⁶⁺ and PBBs/PBDEs test method excluded).



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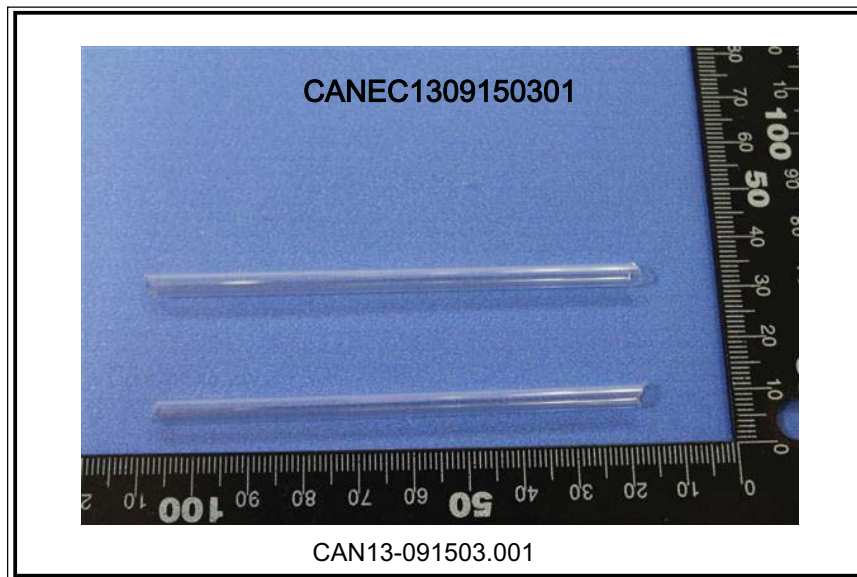
Test Report

No. CANEC1309150301

Date: 24 Jun 2013

Page 5 of 5

Sample photo:



SGS authenticate the photo on original report only

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Littelfuse Philippines Inc.
Arsenio M. Cesista Jr.
LIMA Technology Center, SEZ

4233 Malvar / Batangas

Fürth, 2013-12-17

Test report No. FUHLP2013-3898

Testing of a material sample according to the RoHS directive 2011/65/EC

Sample description: Cu99.9MSn

Arrival in lab: 2013-12-02; Period of analysis: 2013-12-04 – 2013-12-13
Head of Inorganic Lab: Claudia List

Copying this test report is permitted only in agreement with the contracted lab. The test results refer only to the tested item.
This report consists of 6 page(s).
The test methods signed with * are not listed in the attachment of the accreditation certificate.

Conclusion based on tested item

Test order	Status
testing according to the RoHS directive 2011/65/EC	pass [°]

[°] Please see overview of test results

- Test results see next pages -

Sample description: Cu99.9MSn

nM = non Metal

M = Metal

cM = composite Material

List of component parts:

Sample No.	Part No.	Material	Description
334031	1	M	Tinned copper wire

Photo:



Sample No.

334031

Part No. 1

Analysis of metals by ICP-MS, results in mg/kg

Method: Pb, Cd, Cr: DIN EN ISO 17294-2**

Digestion: with conc. HNO₃ + HCl**

Detection limit: Pb 5.0 mg/kg, Cd 1.0 mg/kg, Cr 10 mg/kg, Hg: 0.5 mg/kg

Sample No.	Part No.	Pb	Hg	Cd	Cr _{total}	Status
334031	1	50	<0.5	<1.0	<10	pass

Comment:

Elements	RoHS-limit value
Lead (Pb)	1000 mg/kg
Mercury (Hg)	1000 mg/kg
Cadmium (Cd)	100 mg/kg
Chromium VI (Cr VI)	1000 mg/kg
Polybrominated Biphenyle (PBBs)	1000 mg/kg
Polybrominated Diphenyl ether (PBDEs)	1000 mg/kg

Intertek Consumer Goods GmbH

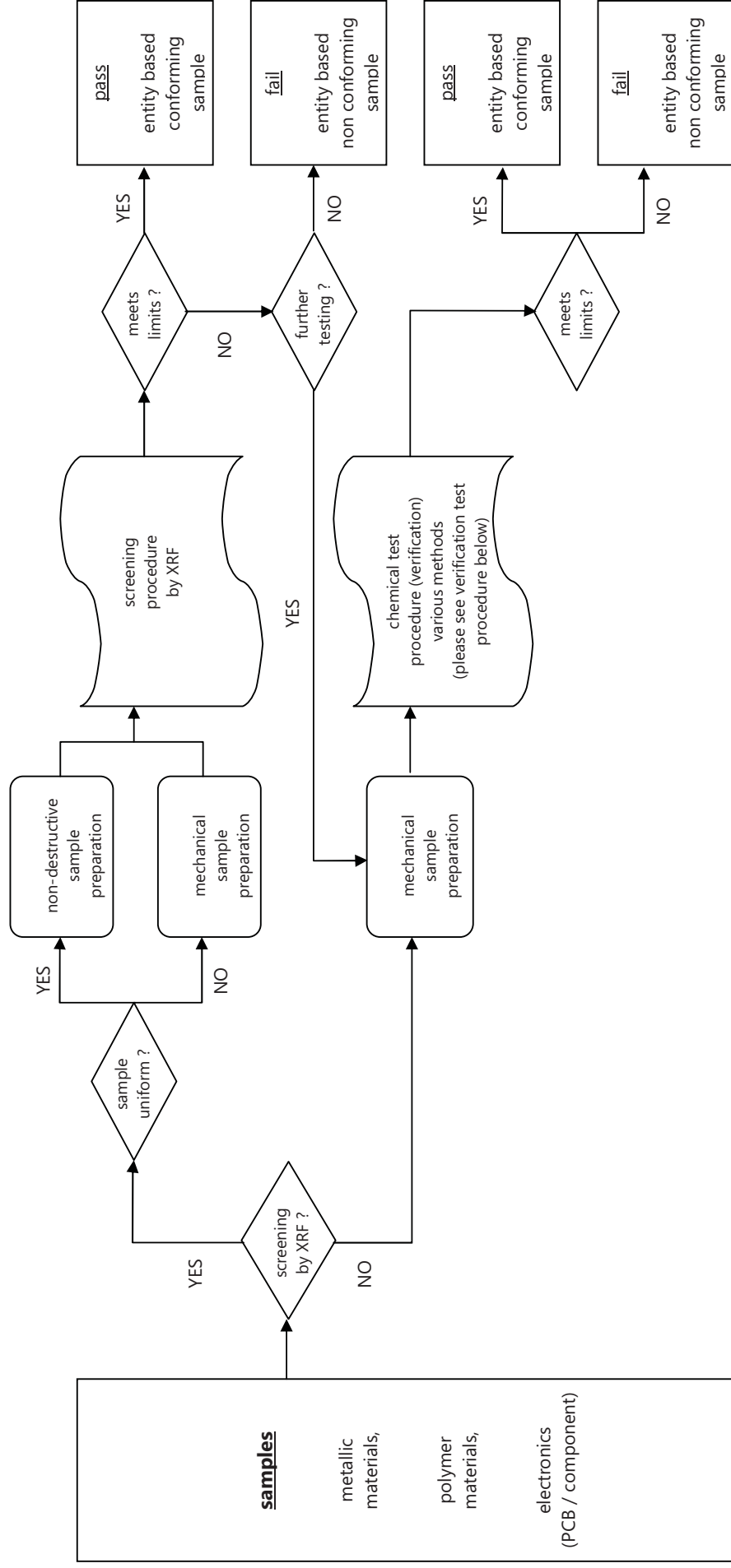


Prüfleitung / Lab Manager

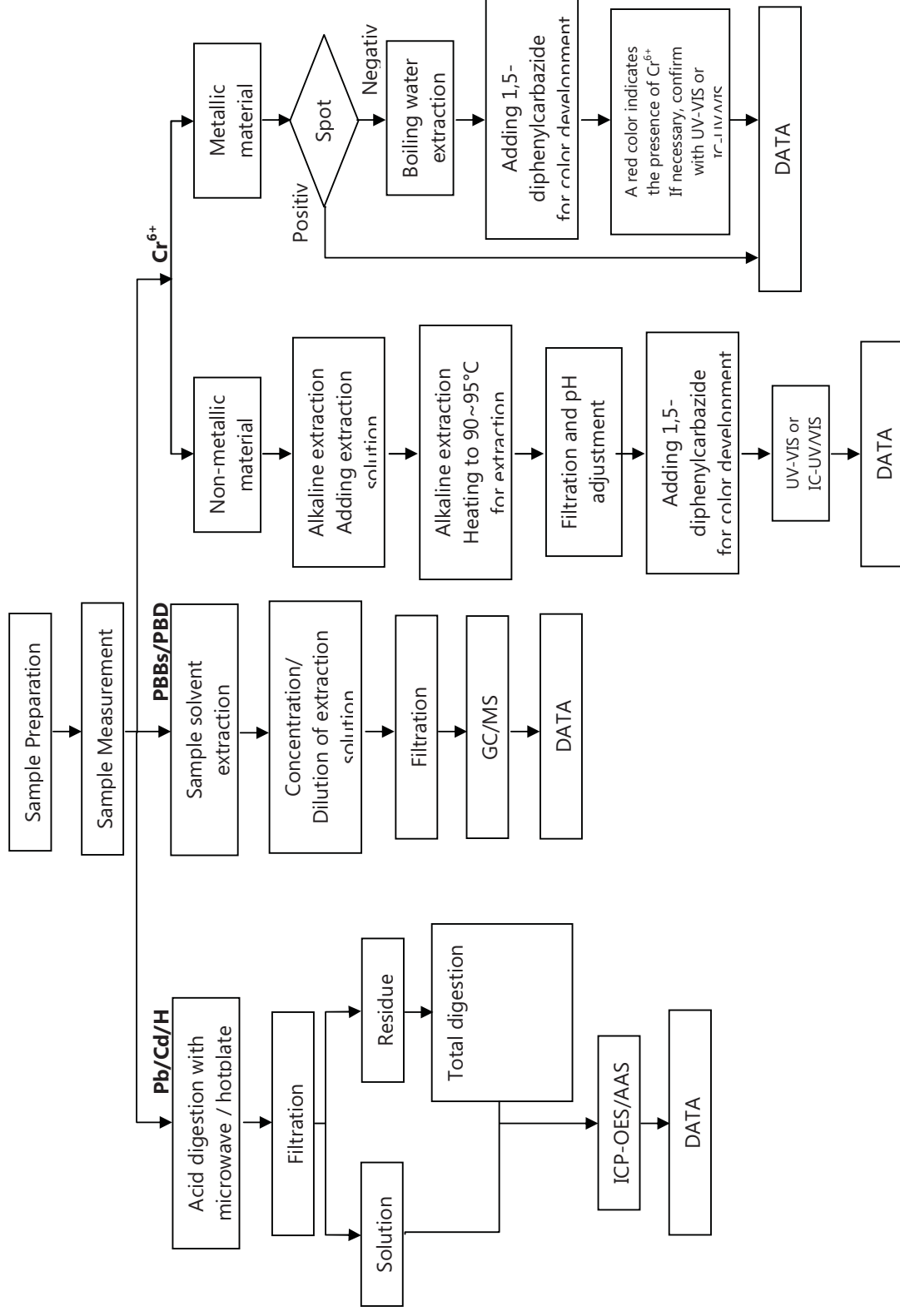
☐ A. Breunig, ☐ K. Grönhardt, ☐ Dr. K. Laue-Schuler, ☒ C. List, ☐ D. Löw
☐ R. Micolay, ☐ M. Neumeister, ☐ Dr. R. Rätze, ☐ K. Scharer, ☐ M. Tutsch

- Flow charts see next page(s) -

Test procedure



Verification test procedure





Test Report

Number: 140100488SHA-002

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

Date: Jan. 21, 2014

Sample Description:

One (1) submitted sample said to be:

Item Name : Wires with plating
Item No. : 101--23-.-tin plated silver copper alloy wire – AgCu, Sn--%
Country of Origin : GERMANY

Tests conducted:

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

Conclusion:

<u>Tested sample</u>	<u>Standard</u>	<u>Result</u>
Tested components of submitted sample	Restriction of the use of certain hazardous substance in electrical and electronic equipment (RoHS Directive 2011/65/EU)	See Test Conducted

To be continued

Prepared and check by:
For Intertek Testing Services Ltd., Shanghai


Joy Zhou

Authorized by:
For Intertek testing services Ltd., Shanghai


Jonny Jing
Manager



Tests Conducted
(A) Test result of RoHS Directive:

Testing item	Result
	(1)
Cadmium (Cd) content (mg/kg) /plating	ND
Lead (Pb) content (mg/kg) /plating	17
Mercury (Hg) content (mg/kg) /plating	ND
Chromium (VI)(Cr ⁶⁺) result (by boiling water extraction on metal) (mg/kg with 50cm ²) /plating	ND

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

Remark: mg/kg with 50cm² = milligram per kilogram with 50 square centimeter
 ND = not detected

Tested components:

- (1) Silver color metal wire plating
- (2) Silver color metal wire substrate

(B) RoHS 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 ⁶⁺)	0.1% (1000 mg/kg)
Polybrominated biphenyls (PBBs)	0.1% (1000 mg/kg)
Polybrominated diphenyl ethers (PBDEs)	0.1% (1000 mg/kg)

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

To be continued

Tests Conducted

(C) Test method:

<u>Testing item</u>	<u>Testing method</u>	<u>Reporting limit</u>
Cadmium (Cd) content	With reference to IEC 62321-5 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 mg/kg
Lead (Pb) content	With reference to IEC 62321-5 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 mg/kg
Mercury (Hg) content	With reference to IEC 62321-4 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 mg/kg
Chromium (VI) (Cr ⁶⁺) content (for metal)	With reference to IEC 62321 Edition 1.0: 2008, by boiling water extraction and determined by UV-VIS Spectrophotometer.	Positive/Negative (Threshold of 0.02mg/kg with 50cm ²)

Date sample received: Jan. 13, 2014

Testing period: Jan. 13, 2014 To Jan. 16, 2014

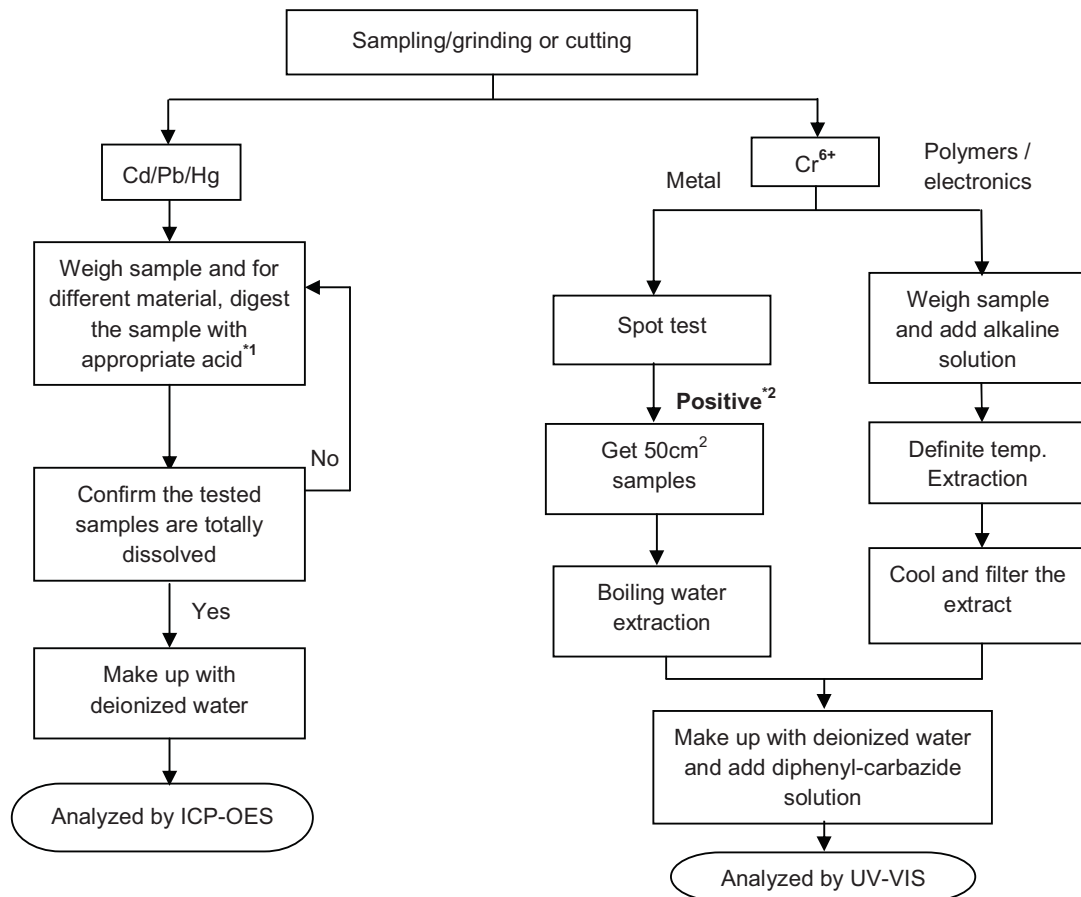
To be continued

Tests Conducted

(D) Measurement flowchart:

Test for Cd/Pb/Hg/Cr (VI) contents

Reference standard: IEC 62321 Edition 1.0: 2008&2013



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.

To be continued

Tests Conducted



To be continued

Tests Conducted



End of report

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TEST REPORT

NO.: A002R131010052-2R02

Date: Oct. 12, 2013

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 copper shell**Model:** /**Item/Lot No.:** /**Material:** /**Buyer:** /**Supplier:** /**Manufacturer:** /**Sample received date:** Oct. 10, 2013**Testing period:** From Oct. 10, 2013 to Oct. 12, 2013**Testing Requested**

As specified by client, to determine the Lead, Cadmium, Mercury, Hexavalent Chromium content in the submitted sample in accordance with Directive 2011/65/EU (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:

* 0.02 mg/kg refers to the MQL of sample extraction liquid.

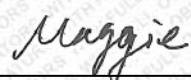
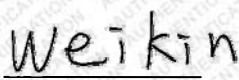
Conclusion:

When tested as specified, the submitted sample complied with the requirements of Directive 2011/65/EU (RoHS).

*****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 DirectorReviewed by: Wang Wexin, Weikin
Technical DirectorApproved by: Yuan Qi, Mickey
Lab Manager

TEST REPORT

NO.: A002R131010052-2R02

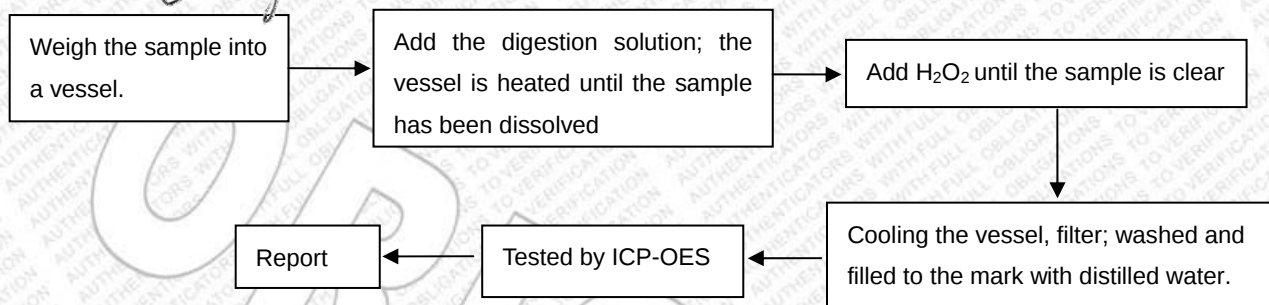
Date: Oct. 12, 2013

Page 2 of 4

Test Flow:

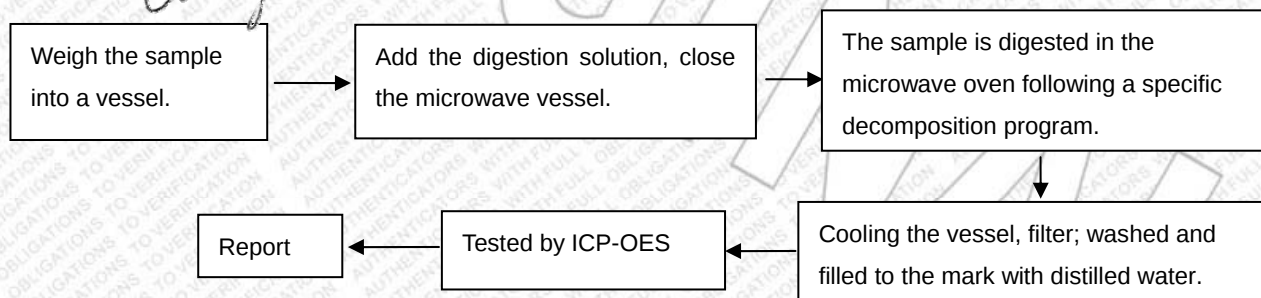
1. To Determine Lead, Cadmium Content: (Metal parent metal)

Tested by: *Condy*



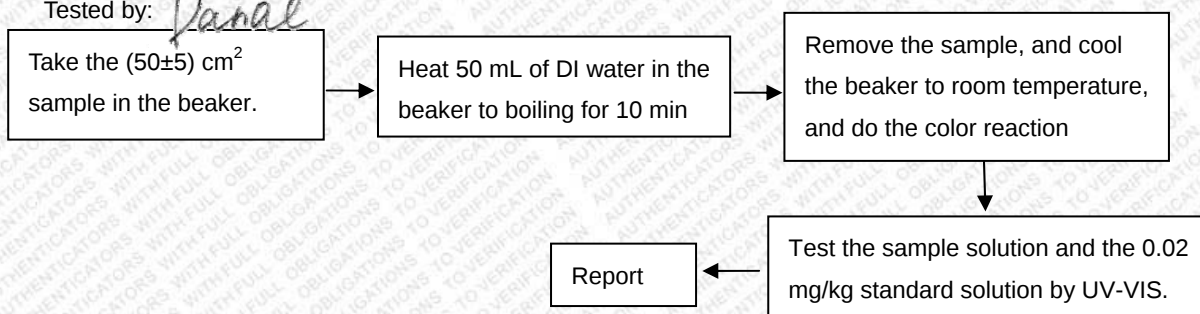
2. To Determine Mercury Content: (Metal parent metal)

Tested by: *Condy*



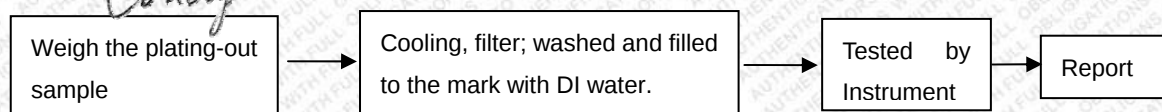
3. To Determine Hexavalent Chromium Content (boiling- water- extraction): (Metal parent metal)

Tested by: *Danae*



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

Tested by: *Condy*



TEST REPORT

NO.: A002R131010052-2R02

Date: Oct. 12, 2013

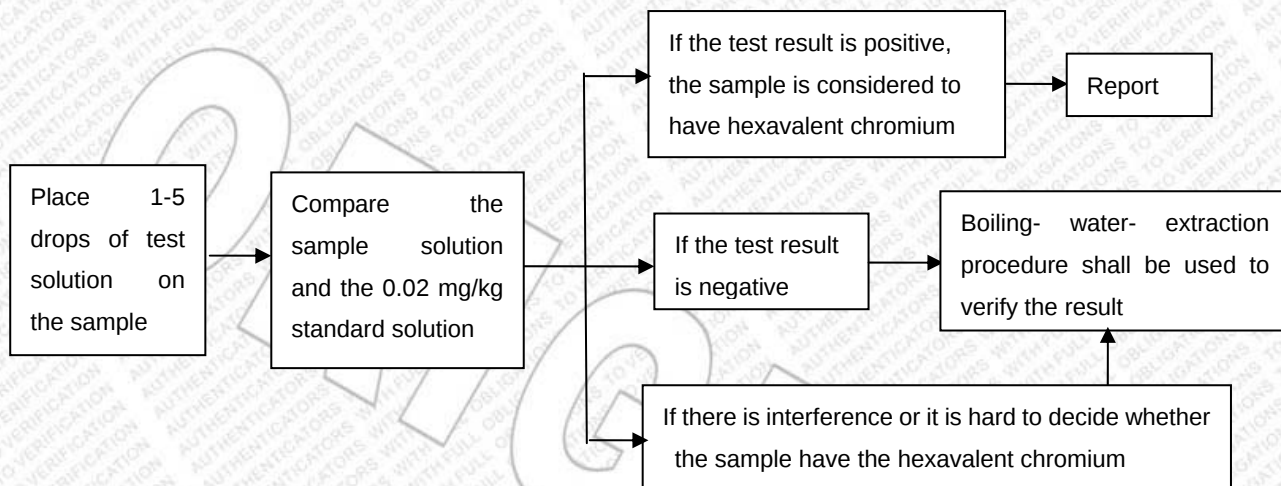
Page 3 of 4

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

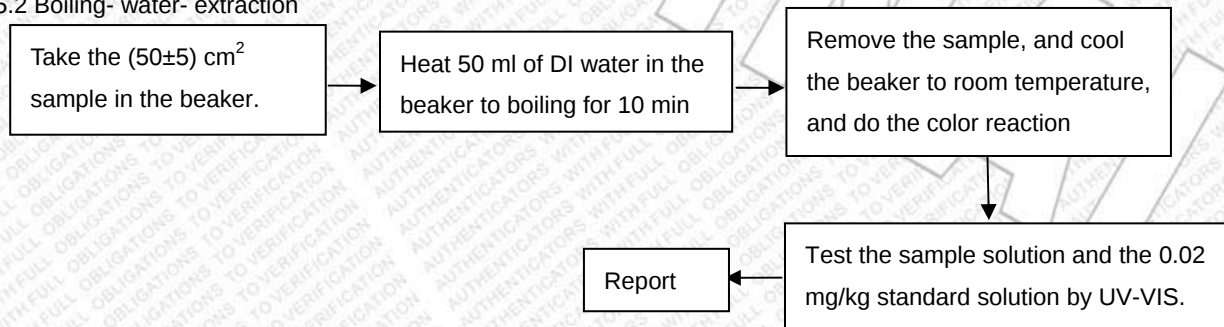
Tested by:

Danae

5.1 Spot-test



5.2 Boiling- water- extraction



Test Results:

Item	Unit	RoHS Limit	Results			
			Lead substrate	Lead Plating**	Copper shell substrate	Copper shell Plating**
Lead (Pb)	mg/kg	1000	N.D.	3	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	阴性	阴性	阴性

TEST REPORT

NO.: A002R131010052-2R02

Date: Oct. 12, 2013

Page 4 of 4

Note:

-N.D.=not detected(<MQL)

-MQL=Method Quantitation Limit

-Negative=Absence of Cr (VI) coating;

Positive=Presence of Cr (VI) coating;

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

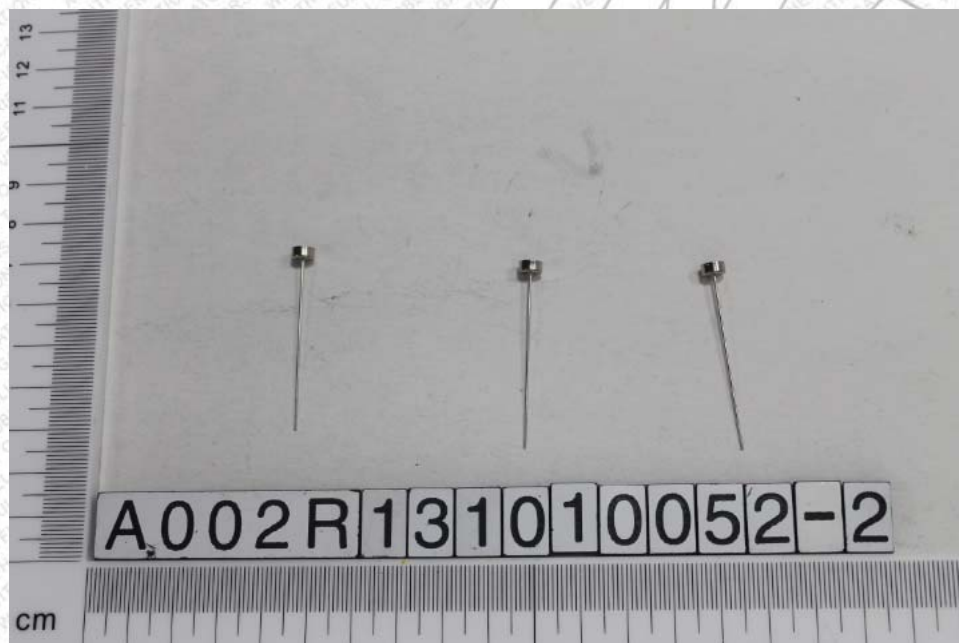
(The tested sample should be further verified by boiling-water-extraction method if the spot test result is uncertain or negative.)

-**Testing part-- Plating

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 copper shell

End of Report



Test Report

Number: 140100201SHA-004

Applicant: LITTELFUSE, INC.
800 E. NORTHWEST HWY
DES PLAINES, IL 60016
ATTN: J. CABILAN / A. CESISTA JR

Date: Jan. 15, 2014

Sample Description:

One (1) submitted sample said to be: **White yarn**
Part Description : YARN
Part Number : 648115

Tests conducted:

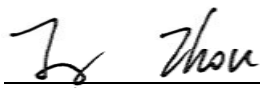
As requested by the applicant, for details refer to attached page(s).

Conclusion:

<u>Tested sample</u>	<u>Standard</u>	<u>Result</u>
Submitted sample	Restriction of the use of certain hazardous substance in electrical and electronic equipment (RoHS Directive 2011/65/EU)	Pass

To be continued

Prepared and check by:
For Intertek Testing Services Ltd., Shanghai


Joy Zhou

Authorized by:
For Intertek testing services Ltd., Shanghai


Jonny Jing
Manager



Tests Conducted

(I) Test Result Summary:

Testing Item	Result (ppm)
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
Halogen Content	
Fluorine (F)	ND
Chlorine (Cl)	ND
Bromine (Br)	ND
Iodine (I)	ND

Remarks: ppm = parts per million = mg/kg
ND = not detected

Responsibility of Chemist: John Zeng / Leaf Liu

Date sample received: Jan. 07, 2014

Testing period: Jan. 07, 2014 To Jan. 09, 2014

To be continued

Tests Conducted

(II) RoHS Requirement:

<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 RoHS Directive 2011/65/EU for homogeneous material.

(III) Test Method:

<u>Testing Item</u>	<u>Testing Method</u>	<u>Reporting Limit</u>
Cadmium (Cd) content	With reference to IEC 62321-5 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 ppm
Lead (Pb) content	With reference to IEC 62321-5 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 ppm
Mercury (Hg) content	With reference to IEC 62321-4 Edition 1.0: 2013, by acid digestion until the tested sample was 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-MSD and further HPLC 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-MSD and further HPLC confirmation when necessary.	5 ppm
Halogen Content	With reference to EN 14582:2007 by combustion flask with oxygen and determined by Ion Chromatography	50 ppm

Remark: Reporting limit = Quantitation Limit of Analyze in Sample

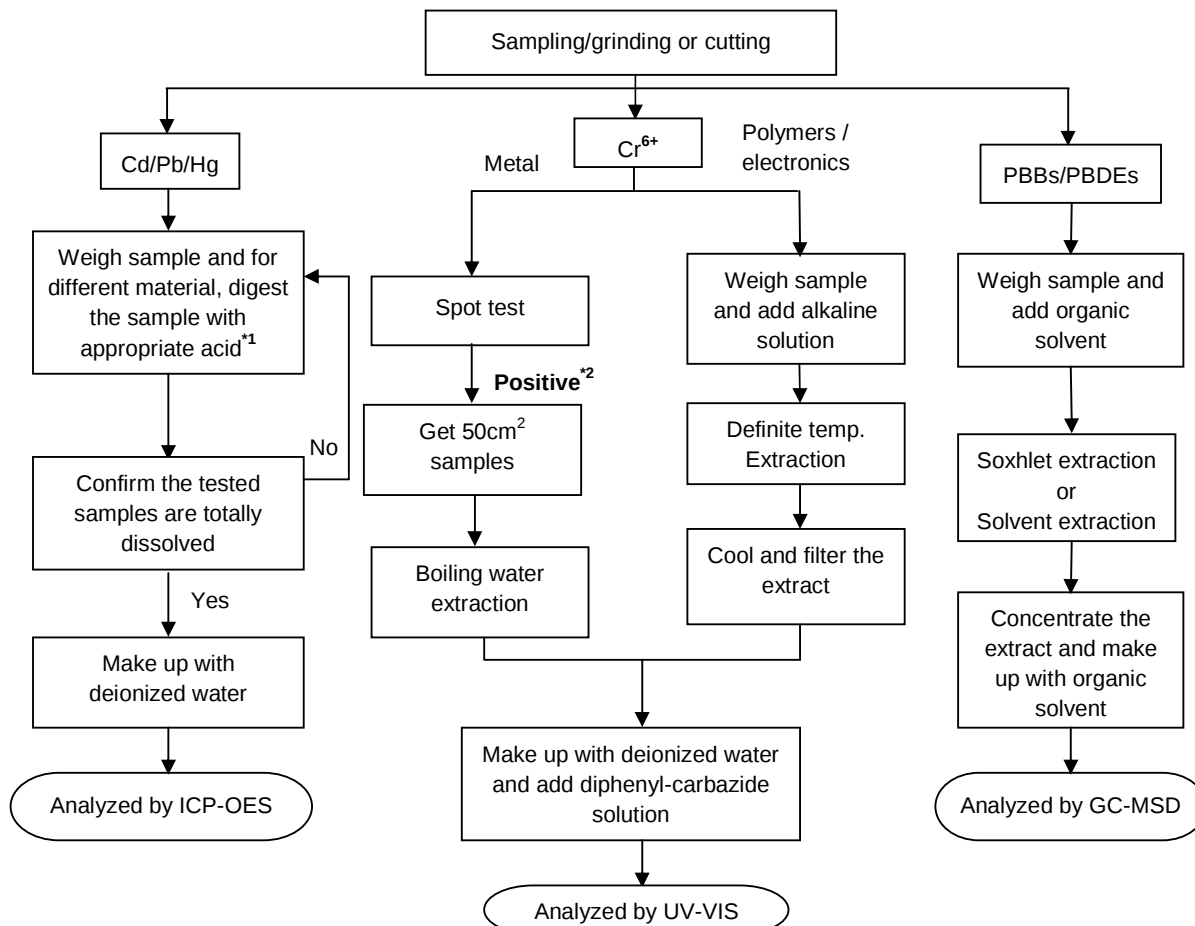
To be continued

Tests Conducted

(IV) Measurement Flowchart:

Test for Cd/ Pb/ Hg/Cr (VI)/ PBBs/PBDEs Contents

Reference Standard: IEC 62321 Edition 1.0: 2008 & 2013



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.

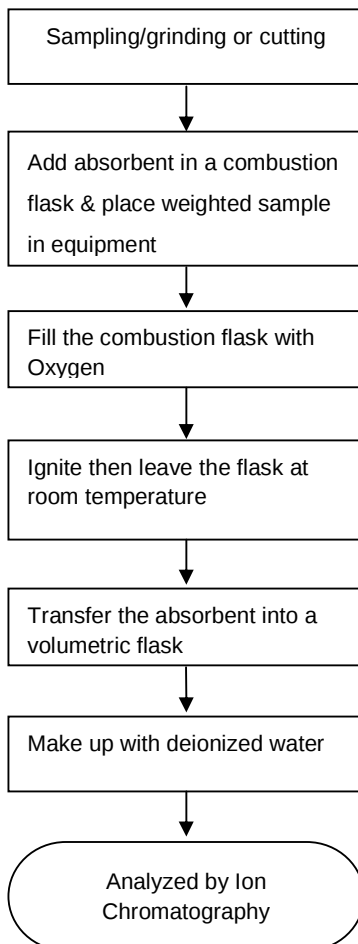
To be continued

Tests Conducted

(V) Measurement flowchart:

Test or Halogen content

Reference standard: EN 14582



To be continued

Tests Conducted



End of report

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Test Report

Number: 140100201SHA-002

Applicant: LITTELFUSE, INC.
800 E. NORTHWEST HWY
DES PLAINES, IL 60016
ATTN: J. CABILAN / A. CESISTA JR

Date: Jan. 15, 2014

Sample Description:

One (1) submitted sample said to be: **White yarn**
Part Description : GLASS YARN
Part Number : 648150

Tests conducted:

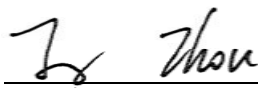
As requested by the applicant, for details refer to attached page(s).

Conclusion:

<u>Tested sample</u>	<u>Standard</u>	<u>Result</u>
Submitted sample	Restriction of the use of certain hazardous substance in electrical and electronic equipment (RoHS Directive 2011/65/EU)	Pass

To be continued

Prepared and check by:
For Intertek Testing Services Ltd., Shanghai


Joy Zhou

Authorized by:
For Intertek testing services Ltd., Shanghai


Jonny Jing
Manager



Tests Conducted
(I) Test Result Summary:

Testing Item	Result (ppm)
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
Halogen Content	
Fluorine (F)	1100
Chlorine (Cl)	ND
Bromine (Br)	ND
Iodine (I)	ND

Remarks: ppm = parts per million = mg/kg
ND = not detected

Responsibility of Chemist: John Zeng / Leaf Liu

Date sample received: Jan. 07, 2014

Testing period: Jan. 07, 2014 To Jan. 09, 2014

To be continued

Tests Conducted

(II) RoHS Requirement:

<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 RoHS Directive 2011/65/EU for homogeneous material.

(III) Test Method:

<u>Testing Item</u>	<u>Testing Method</u>	<u>Reporting Limit</u>
Cadmium (Cd) content	With reference to IEC 62321-5 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 ppm
Lead (Pb) content	With reference to IEC 62321-5 Edition 1.0: 2013, by acid digestion until the tested sample was totally dissolved, and determined by ICP-OES.	2 ppm
Mercury (Hg) content	With reference to IEC 62321-4 Edition 1.0: 2013, by acid digestion until the tested sample was 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-MSD and further HPLC 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-MSD and further HPLC confirmation when necessary.	5 ppm
Halogen Content	With reference to EN 14582:2007 by combustion flask with oxygen and determined by Ion Chromatography	50 ppm

Remark: Reporting limit = Quantitation Limit of Analyze in Sample

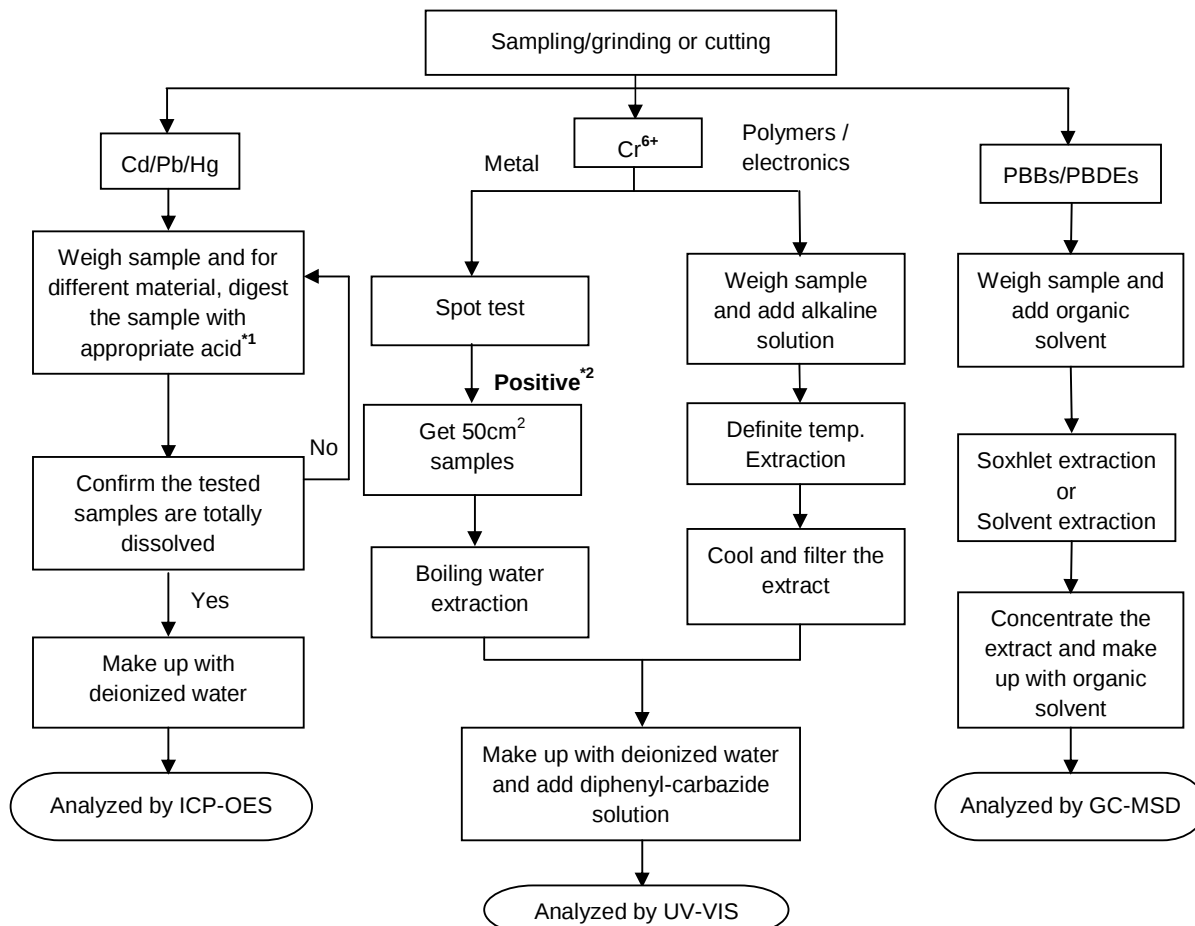
To be continued

Tests Conducted

(IV) Measurement Flowchart:

Test for Cd/ Pb/ Hg/Cr (VI)/ PBBs/PBDEs Contents

Reference Standard: IEC 62321 Edition 1.0: 2008 & 2013



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.

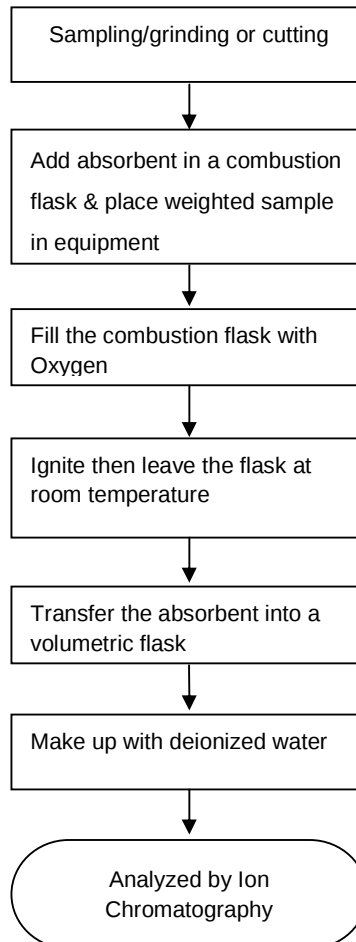
To be continued

Tests Conducted

(V) Measurement flowchart:

Test or Halogen content

Reference standard: EN 14582



To be continued

Tests Conducted



End of report

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Test Report

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Date: 16 Sep 2013

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LITTELFUSE PHILIPPINES INC.
LIMA TECHNOLOGY CENTER, LIPA CITY,
MALVAR, BATANGAS

THIS REPORT IS TO SUPERSEDE TEST REPORT NO.SHAEC1317518848, DATE:2013/09/06.

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

SGS Job No. : SP13-026309 - SH
Model No. : YTW102 (692535-005)
Composition : Sn1.5CuRE
Date of Sample Received : 03 Sep 2013
Testing Period : 03 Sep 2013 - 06 Sep 2013
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.

JJ Fan
Approved Signatory

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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
1	SHA13-175188.041	Silvery metal 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 :
- (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
 - (2) With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
 - (3) With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
 - (4) With reference to IEC 62321:2008, determination of Hexavalent Chromium by spot test / Colorimetric Method using UV-Vis.
 - (5) With reference to IEC 62321:2008, determination of PBBs and PBDEs by GC-MS.

Test Item(s)	Limit	Unit	MDL	041
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	122
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	-	-	◇	Negative
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>041</u>
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	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.

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

Halogen

Test Method : With reference to EN 14582: 2007, analysis was performed by Ion Chromatograph (IC).

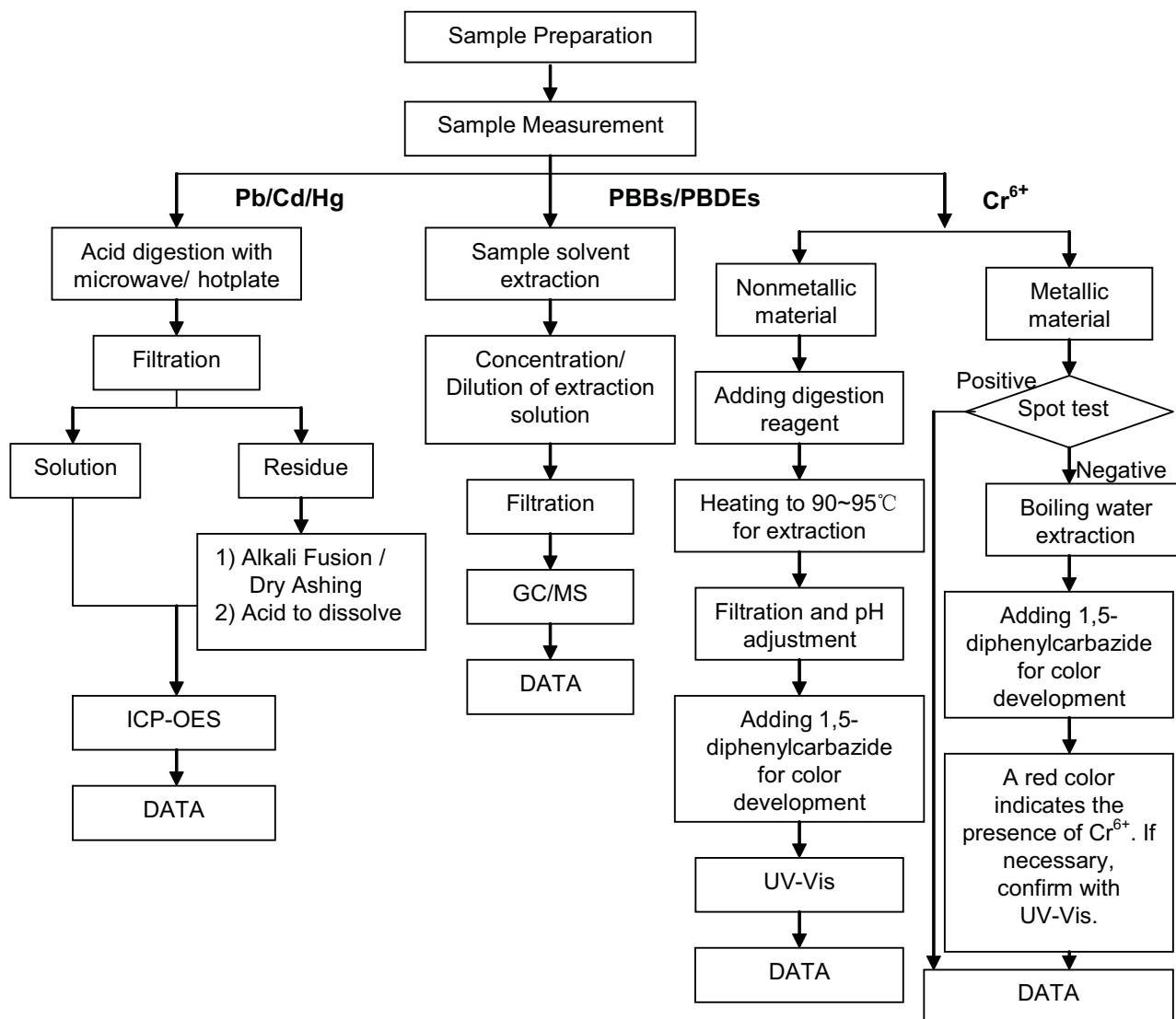
<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>041</u>
Fluorine (F)	mg/kg	50	ND
Chlorine (Cl)	mg/kg	50	367
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

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ATTACHMENTS

RoHS Testing Flow Chart

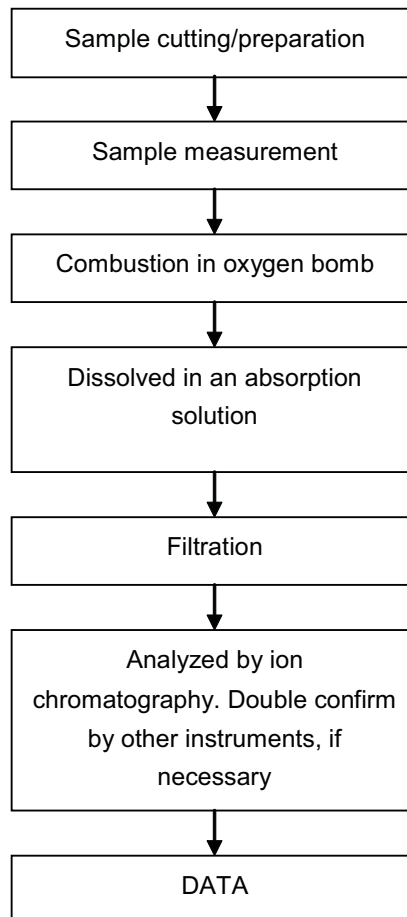
- 1) Name of the person who made testing: Jan Shi/Star Wang/Shara Wang/Gary Xu
- 2) Name of the person in charge of testing: Jeff Zhang/George Xu/ Jessy Huang
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr⁶⁺ and PBBs/PBDEs test method excluded)



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Halogen Testing (oxygen bomb) Flow Chart

- 1) Name of the person who made testing: Sisily Yin
- 2) Name of the person in charge of testing: Linda Li



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Sample photo:



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