

ICP Test Report Certification Packet

Company Name:	Littelfuse, Inc.
Product Type:	Metal Oxide Varistors
Product Series:	ZA Series RoHS models
Issue Date:	August 19, 2013
RoHS(2011/65/E for unit parts, for the manufacturin In addition, it is h materials to be u	sereby reported to you that the parts and sub-materials, the sed for unit parts, the packing/packaging materials, and the like in the manufacturing processes, are all composed of the
	Issued by:
	< DGLF Environmental, Health & Safety Engineer >
(1) Parts, sub-ma	aterials and unit parts
This document c	overs Metal Oxide Varistors ZA series RoHS Compliant
models manufac	tured by Littelfuse, Inc.
Please see T	able 1 for raw materials used.
(2) The ICP data	on all measurable substances
Please see a	ppropriate pages as identified in Table 1
Remarks :	



Table 1: List of Raw Materials covered by this report

Total Parts	P/N	Raw Material Description	Page
1	N/A	Black Disc, type including DD,DM,DP and DV	3-30
2	N/A	Silver Paste	31-36
3	N/A	Pb-free Solder Bar	37-41
4	N/A	Tinned Copper Wire	42-46
5	N/A	Epoxy, type including red ,black and blue	47-70



Date:

Jun 18, 2013

LITTELFUSE, INC Applicant:

8755 WEST HIGGINS ROAD SUITE

500CHICAGO IL 60631 USA

KRISTEEN BACILA/ARSENIO CESISTA JR. Attn:

Sample Description:

One (1) submitted sample said to be **dull grey core (DD Black Disc)**.



Tests conducted:

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

Conclusion:

Tested Samples

Standard Submitted sample

Restriction of the use of certain hazardous substance

in electrical and electronic equipment (RoHS

Directive 2011/65/EU)

Test Item

Halogen (F, Cl, Br, I) Content

See test

Result

See test

conducted

conducted

Authorized by: For Intertek Testing Services

Shenzhen Ltd.

Ben N.L. Lin General Manager



Tests Conducted

1 RoHS Chemical Test

(A) Test Result Summary:

Testing Item	Result
Cadmium (Cd) Content (mg/kg)	ND(<2)
Lead (Pb) Content (mg/kg)	ND(<2)
Mercury (Hg) Content (mg/kg)	ND(<2)
Chromium (VI)(Cr ⁶⁺) Content (mg/kg)	3.1
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND(<5)
Dibromobiphenyl (DiBB)	ND(<5)
Tribromobiphenyl (TriBB)	ND(<5)
Tetrabromobiphenyl (TetraBB)	ND(<5)
Pentabromobiphenyl (PentaBB)	ND(<5)
Hexabromobiphenyl (HexaBB)	ND(<5)
Heptabromobiphenyl (HeptaBB)	ND(<5)
Octabromobiphenyl (OctaBB)	ND(<5)
Nonabromobiphenyl (NonaBB)	ND(<5)
Decabromobiphenyl (DecaBB)	ND(<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND(<5)
Dibromodiphenyl Ether (DiBDE)	ND(<5)
Tribromodiphenyl Ether (TriBDE)	ND(<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND(<5)
Pentabromodiphenyl Ether (PentaBDE)	ND(<5)
Hexabromodiphenyl Ether (HexaBDE)	ND(<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND(<5)
Octabromodiphenyl Ether (OctaBDE)	ND(<5)
Nonabromodiphenyl Ether (NonaBDE)	ND(<5)
Decabromodiphenyl Ether (DecaBDE)	ND(<5)

ND = Not detected



Tests Conducted

(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 2011/65/EU for homogeneous material.

(C) Test Method:

Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr ⁶⁺) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

Date sample received: Jun 07, 2013 Testing period: Jun 07, 2013 to Jun 15, 2013

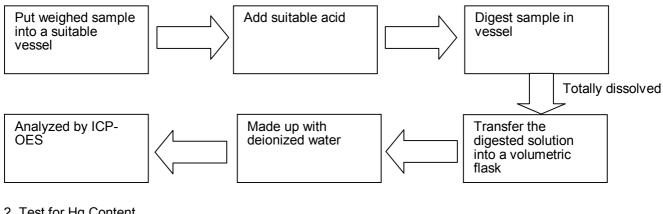
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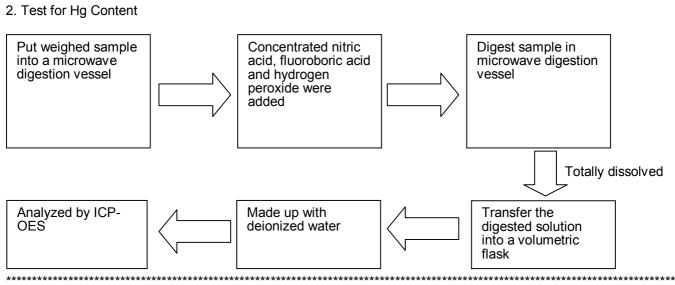


Tests Conducted

(D) Measurement Flowchart:

1. Test for Cd/Pb Contents

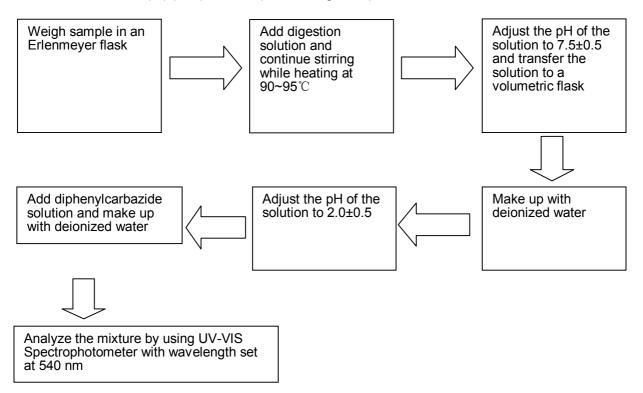




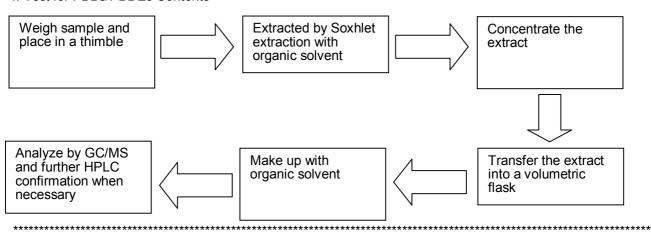


Tests Conducted

3. Test for Chromium (VI) (Cr⁶⁺) Content (Alkaline Digestion)



4. Test for PBBs/PBDEs Contents





Tests Conducted

2 **Halogen Content**

(I) Test Result Summary:

Testing Item	Result (mg/kg)
Fluorine (F) Content	ND
Chlorine (Cl) Content	ND
Bromine (Br) Content	ND
Iodine (I) Content	ND

mg/kg = milligram per kilogram = ppm ND = Not detected

(II) Test Method:

Testing Item	Testing Method	Reporting Limit
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

Date sample received : Jun 07, 2013 Testing period : Jun 07, 2013 to Jun 17, 2013

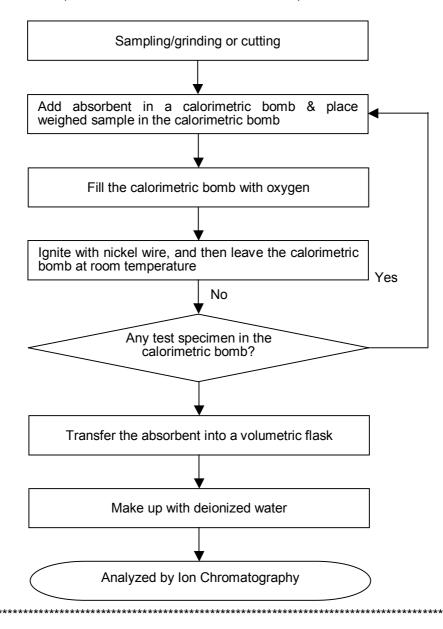


<u>Test Report</u> Number: SZHH0079239603

Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)



End of report

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Date:

Jun 18, 2013

LITTELFUSE, INC Applicant:

8755 WEST HIGGINS ROAD SUITE

500CHICAGO IL 60631 USA

KRISTEEN BACILA/ARSENIO CESISTA JR. Attn:

Sample Description:

One (1) submitted sample said to be dull grey core (DM Black Disc).



Tests conducted:

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

Conclusion:

Tested Samples

Standard Submitted sample Restriction of the use of certain hazardous substance

in electrical and electronic equipment (RoHS

Directive 2011/65/EU)

Test Item

Halogen (F, Cl, Br, I) Content

See test

Result

See test

conducted

conducted

Authorized by: For Intertek Testing Services

Shenzhen Ltd.

Ben N.L. Lin General Manager



Tests Conducted

1 RoHS Chemical Test

(A) Test Result Summary:

Testing Item	Result
Cadmium (Cd) Content (mg/kg)	ND(<2)
Lead (Pb) Content (mg/kg)	ND(<2)
Mercury (Hg) Content (mg/kg)	ND(<2)
Chromium (VI)(Cr ⁶⁺) Content (mg/kg)	ND(<1)
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND(<5)
Dibromobiphenyl (DiBB)	ND(<5)
Tribromobiphenyl (TriBB)	ND(<5)
Tetrabromobiphenyl (TetraBB)	ND(<5)
Pentabromobiphenyl (PentaBB)	ND(<5)
Hexabromobiphenyl (HexaBB)	ND(<5)
Heptabromobiphenyl (HeptaBB)	ND(<5)
Octabromobiphenyl (OctaBB)	ND(<5)
Nonabromobiphenyl (NonaBB)	ND(<5)
Decabromobiphenyl (DecaBB)	ND(<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND(<5)
Dibromodiphenyl Ether (DiBDE)	ND(<5)
Tribromodiphenyl Ether (TriBDE)	ND(<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND(<5)
Pentabromodiphenyl Ether (PentaBDE)	ND(<5)
Hexabromodiphenyl Ether (HexaBDE)	ND(<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND(<5)
Octabromodiphenyl Ether (OctaBDE)	ND(<5)
Nonabromodiphenyl Ether (NonaBDE)	ND(<5)
Decabromodiphenyl Ether (DecaBDE)	ND(<5)

ND = Not detected



Tests Conducted

(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 2011/65/EU for homogeneous material.

(C) Test Method:

Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr ⁶⁺) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

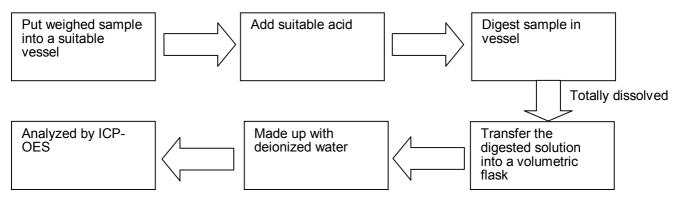
Date sample received: Jun 07, 2013 Testing period: Jun 07, 2013 to Jun 15, 2013

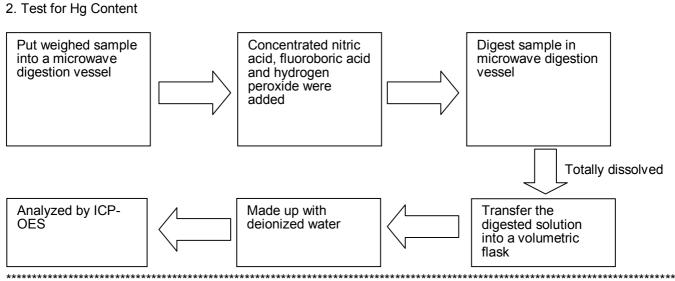


Tests Conducted

(D) Measurement Flowchart:

1. Test for Cd/Pb Contents

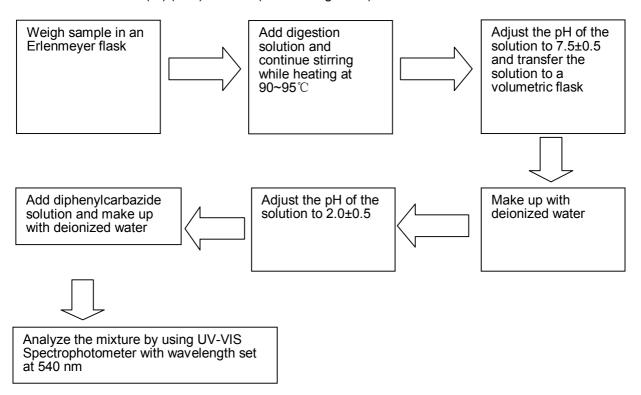




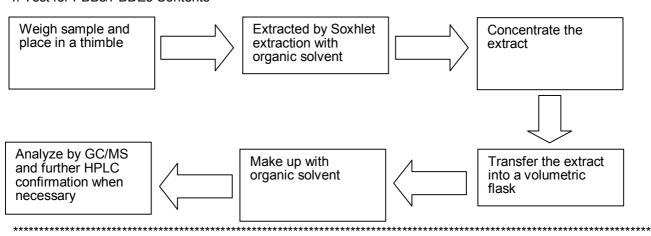


Tests Conducted

3. Test for Chromium (VI) (Cr⁶⁺) Content (Alkaline Digestion)



4. Test for PBBs/PBDEs Contents





Tests Conducted

2 **Halogen Content**

(I) Test Result Summary:

Testing Item	Result (mg/kg)
Fluorine (F) Content	ND
Chlorine (CI) Content	ND
Bromine (Br) Content	ND
Iodine (I) Content	ND

mg/kg = milligram per kilogram = ppm ND = Not detected

(II) Test Method:

Testing Item	Testing Method	Reporting Limit
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

Date sample received : Jun 07, 2013 Testing period : Jun 07, 2013 to Jun 17, 2013

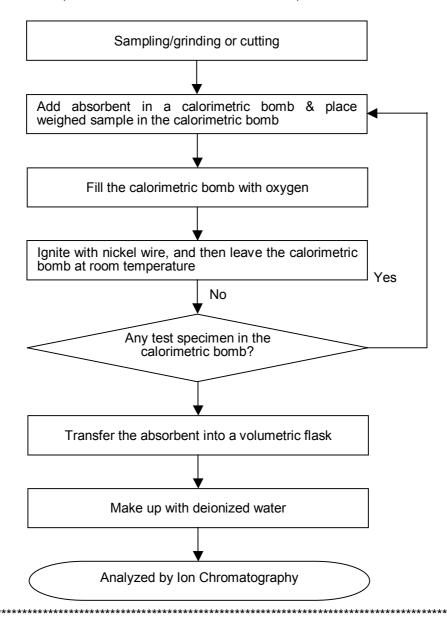
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Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)



End of report

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Date:

Jun 18, 2013

Applicant: LITTELFUSE, INC

8755 WEST HIGGINS ROAD SUITE

500CHICAGO IL 60631 USA

KRISTEEN BACILA/ARSENIO CESISTA JR. Attn:

Sample Description:

One (1) submitted sample said to be dull grey core (DP Black Disc).



Tests conducted:

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

Conclusion:

Tested Samples Submitted sample Standard

Restriction of the use of certain hazardous substance in electrical and electronic equipment (RoHS

Directive 2011/65/EU)

Test Item

Halogen (F, Cl, Br, I) Content

See test

Result

See test

conducted

conducted

Authorized by: For Intertek Testing Services

Shenzhen Ltd.

Ben N.L. Lin General Manager



Tests Conducted

1 RoHS Chemical Test

(A) Test Result Summary:

Testing Item	Result
Cadmium (Cd) Content (mg/kg)	ND(<2)
Lead (Pb) Content (mg/kg)	ND(<2)
Mercury (Hg) Content (mg/kg)	ND(<2)
Chromium (VI)(Cr ⁶⁺) Content (mg/kg)	5.2
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND(<5)
Dibromobiphenyl (DiBB)	ND(<5)
Tribromobiphenyl (TriBB)	ND(<5)
Tetrabromobiphenyl (TetraBB)	ND(<5)
Pentabromobiphenyl (PentaBB)	ND(<5)
Hexabromobiphenyl (HexaBB)	ND(<5)
Heptabromobiphenyl (HeptaBB)	ND(<5)
Octabromobiphenyl (OctaBB)	ND(<5)
Nonabromobiphenyl (NonaBB)	ND(<5)
Decabromobiphenyl (DecaBB)	ND(<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND(<5)
Dibromodiphenyl Ether (DiBDE)	ND(<5)
Tribromodiphenyl Ether (TriBDE)	ND(<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND(<5)
Pentabromodiphenyl Ether (PentaBDE)	ND(<5)
Hexabromodiphenyl Ether (HexaBDE)	ND(<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND(<5)
Octabromodiphenyl Ether (OctaBDE)	ND(<5)
Nonabromodiphenyl Ether (NonaBDE)	ND(<5)
Decabromodiphenyl Ether (DecaBDE)	ND(<5)

ND = Not detected



Tests Conducted

(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 2011/65/EU for homogeneous material.

(C) Test Method:

Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr ⁶⁺) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

Date sample received: Jun 07, 2013 Testing period: Jun 07, 2013 to Jun 15, 2013

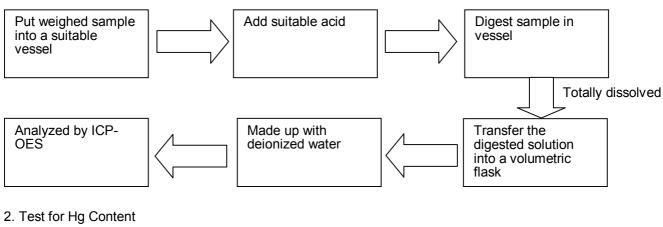
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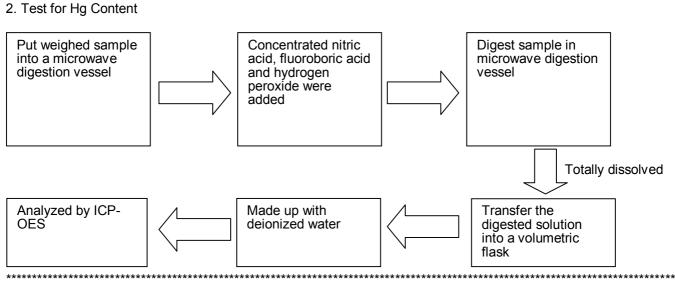


Tests Conducted

(D) Measurement Flowchart:

1. Test for Cd/Pb Contents

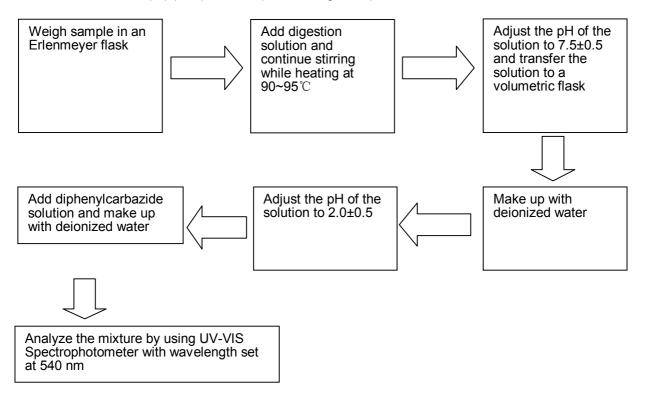




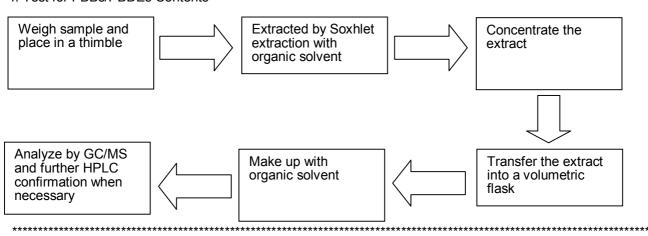


Tests Conducted

3. Test for Chromium (VI) (Cr⁶⁺) Content (Alkaline Digestion)



4. Test for PBBs/PBDEs Contents





Tests Conducted

2 **Halogen Content**

(I) Test Result Summary:

Testing Item	Result (mg/kg)
Fluorine (F) Content	ND
Chlorine (CI) Content	ND
Bromine (Br) Content	ND
Iodine (I) Content	ND

mg/kg = milligram per kilogram = ppm ND = Not detected

(II) Test Method:

Testing Item	Testing Method	Reporting Limit
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

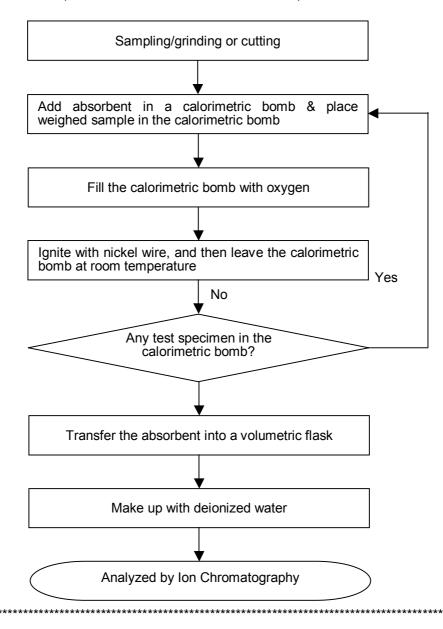
Date sample received : Jun 07, 2013 Testing period : Jun 07, 2013 to Jun 17, 2013



Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)



End of report

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Date:

Jun 18, 2013

LITTELFUSE, INC Applicant:

8755 WEST HIGGINS ROAD SUITE

500CHICAGO IL 60631 USA

KRISTEEN BACILA/ARSENIO CESISTA JR. Attn:

Sample Description:

One (1) submitted sample said to be dull grey core (DV Black Disc).



Tests conducted:

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

Conclusion:

Tested Samples

Standard Submitted sample

Restriction of the use of certain hazardous substance

in electrical and electronic equipment (RoHS

Directive 2011/65/EU)

Test Item

Halogen (F, Cl, Br, I) Content

conducted

Result

See test

See test conducted

Authorized by: For Intertek Testing Services

Shenzhen Ltd.

Ben N.L. Lin General Manager



Tests Conducted

1 RoHS Chemical Test

(A) Test Result Summary:

Testing Item	Result
Cadmium (Cd) Content (mg/kg)	ND(<2)
Lead (Pb) Content (mg/kg)	ND(<2)
Mercury (Hg) Content (mg/kg)	ND(<2)
Chromium (VI)(Cr ⁶⁺) Content (mg/kg)	ND(<1)
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND(<5)
Dibromobiphenyl (DiBB)	ND(<5)
Tribromobiphenyl (TriBB)	ND(<5)
Tetrabromobiphenyl (TetraBB)	ND(<5)
Pentabromobiphenyl (PentaBB)	ND(<5)
Hexabromobiphenyl (HexaBB)	ND(<5)
Heptabromobiphenyl (HeptaBB)	ND(<5)
Octabromobiphenyl (OctaBB)	ND(<5)
Nonabromobiphenyl (NonaBB)	ND(<5)
Decabromobiphenyl (DecaBB)	ND(<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND(<5)
Dibromodiphenyl Ether (DiBDE)	ND(<5)
Tribromodiphenyl Ether (TriBDE)	ND(<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND(<5)
Pentabromodiphenyl Ether (PentaBDE)	ND(<5)
Hexabromodiphenyl Ether (HexaBDE)	ND(<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND(<5)
Octabromodiphenyl Ether (OctaBDE)	ND(<5)
Nonabromodiphenyl Ether (NonaBDE)	ND(<5)
Decabromodiphenyl Ether (DecaBDE)	ND(<5)

ND = Not detected



Tests Conducted

(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 2011/65/EU for homogeneous material.

(C) Test Method:

Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr ⁶⁺) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

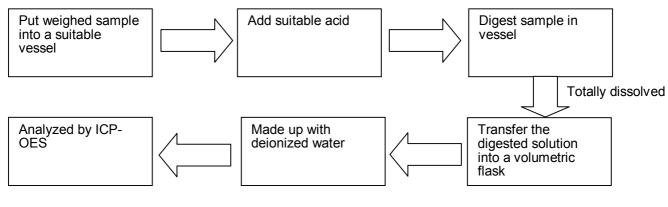
Date sample received: Jun 07, 2013 Testing period: Jun 07, 2013 to Jun 15, 2013

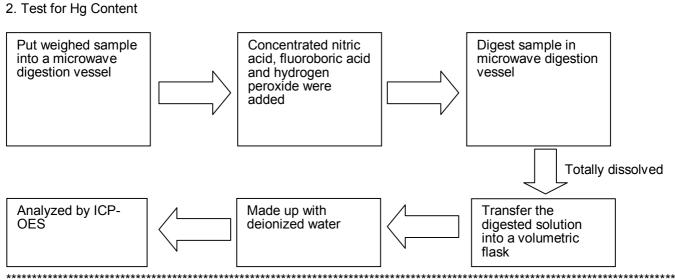


Tests Conducted

(D) Measurement Flowchart:

1. Test for Cd/Pb Contents

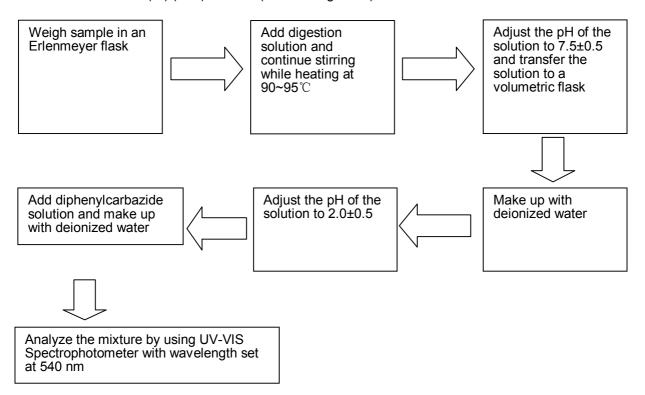




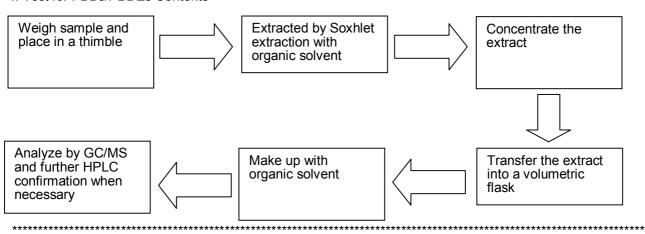


Tests Conducted

3. Test for Chromium (VI) (Cr⁶⁺) Content (Alkaline Digestion)



4. Test for PBBs/PBDEs Contents





Tests Conducted

2 **Halogen Content**

(I) Test Result Summary:

Testing Item	Result (mg/kg)
Fluorine (F) Content	ND
Chlorine (CI) Content	ND
Bromine (Br) Content	ND
Iodine (I) Content	ND

mg/kg = milligram per kilogram = ppm ND = Not detected

(II) Test Method:

Testing Item	Testing Method	Reporting Limit
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

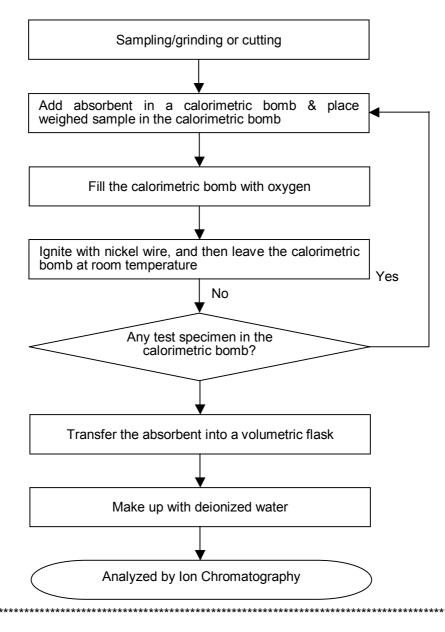
Date sample received : Jun 07, 2013 Testing period : Jun 07, 2013 to Jun 17, 2013



Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)



End of report

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No. SHAEC1220155601

Date: 20 Nov 2012

Page 1 of 6

HERAEUS MATERIALS TECHNOLOGY SHANGHAI LTD 1 GUANGZHONG ROAD, ZHUANQIAO TOWN, MINHANG DISTRICT, SHANGHAI 201108, R.P.CHINA

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

SGS Job No.:

SP12-033347 - SH

Model No.:

DT1766

Date of Sample Received:

16 Nov 2012

Testing Period:

16 Nov 2012 - 20 Nov 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.

JJ Fan

Approved Signatory

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No. SHAEC1220155601

Date: 20 Nov 2012

Page 2 of 6

Test Results:

Test Part Description:

Specimen No.

SGS Sample ID

Description

1

SHA12-201556.001

Grey mud

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	<u>Unit</u>	MDL	<u>001</u>
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	2	ND
Sum of PBBs	1000	mg/kg	ϵ	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	(74)	mg/kg	5	ND
Heptabromobiphenyl	(177	mg/kg	5	ND
Octabromobiphenyl	1 4	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	2	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	270	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

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No. SHAEC1220155601		Date: 20 Nov 2012		Page 3 of 6
<u>Limit</u>	<u>Unit</u>	MDL	<u>001</u>	
*	mg/kg	5	ND	
-	mg/kg	5	ND	
-	mg/kg	5	ND	
(7)	mg/kg	5	ND	
**	mg/kg	5	ND	
-	mg/kg	5	ND	
_	mg/kg	5	ND	
*	mg/kg	5	ND	
9	mg/kg	5	ND	
	Limit	Limit Unit - mg/kg	Limit Unit MDL - mg/kg 5 - mg/kg 5	Limit Unit MDL 001 - mg/kg 5 ND - mg/kg 5 ND

Notes:

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

Halogen

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

Test Item(s)	<u>Unit</u>	MDL	<u>001</u>
Fluorine (F)	mg/kg	50	ND
Chlorine (CI)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
lodine (I)	mg/kg	50	ND

Remark: Result shown is of the total weight of wet sample.

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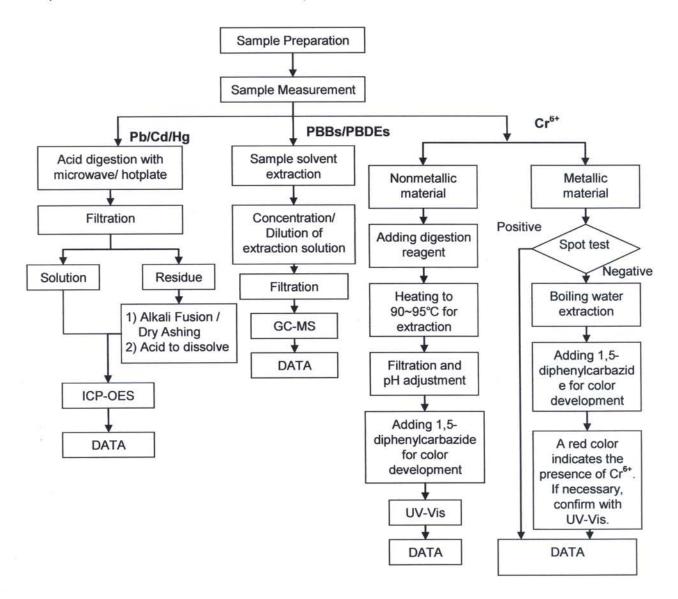
Date: 20 Nov 2012

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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.
 (Cr⁶⁺ and PBBs/PBDEs test method excluded)



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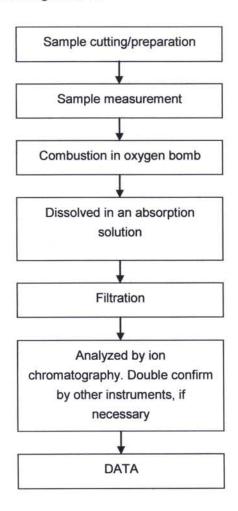
No. SHAEC1220155601

Date: 20 Nov 2012

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Halogen Testing Flow Chart

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



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Date: 20 Nov 2012

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Sample photo:



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Test Report No. CANEC1302942009 Date: 20 Mar 2013 Page 1 of 5

DONGGUAN CITY GUANGCHEN METAL PRODUCT CO.,LTD.

FIRST INDUSTRY AREA,LIU CHONG WEI,WANGJIANG DISTRICT,DONGGUAN CITY GUANGDONG PROVINCE
CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as: leed free solder bar

SGS Job No.: CP13-009612 - GZ

Model No. : SnAgCu

Date of Sample Received : 11 Mar 2013

Testing Period : 11 Mar 2013 - 19 Mar 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.

Trophy Zhang Approved Signatory

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No. CANEC1302942009

Date: 20 Mar 2013

Page 2 of 5

Test Results:

Test Part Description:

Specimen No. SGS Sample ID Description

1 CAN13-029420.002 Silvery metal bar

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)	Limit	Unit	MDL	002
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	37
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (CrVI)	÷	9	0	Negative
Sum of PBBs	1,000	mg/kg	1.9	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	_	mg/kg	5	ND
Tribromobiphenyl ,		mg/kg	5	ND
Tetrabromobiphenyl	1.2	mg/kg	5	ND
Pentabromobiphenyl	dia.	mg/kg	5	ND
Hexabromobiphenyl		mg/kg	5	ND
Heptabromobiphenyl	1.6	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. CANEC13029420	09	Date: 20	Mar 2013	Page 3 of 5
Test Item(s)	Limit	<u>Unit</u>	MDL	002	
Dibromodiphenyl ether	11.2	mg/kg	5	ND	
Tribromodiphenyl ether	14	mg/kg	5	ND	
Tetrabromodiphenyl ether	0.4	mg/kg	5	ND	
Pentabromodiphenyl ether		mg/kg	5	ND	
Hexabromodiphenyl ether		mg/kg	5	ND	
Heptabromodiphenyl ether		mg/kg	5	ND	
Octabromodiphenyl ether	4.	mg/kg	5	ND	
Nonabromodiphenyl ether	1.4	mg/kg	5	ND	
Decabromodiphenyl ether	1.6	mg/kg	5	ND	

Notes:

- (1) The maximum permissible limit is quoted from the directive 2011/65/EU, Annex II
- (2) 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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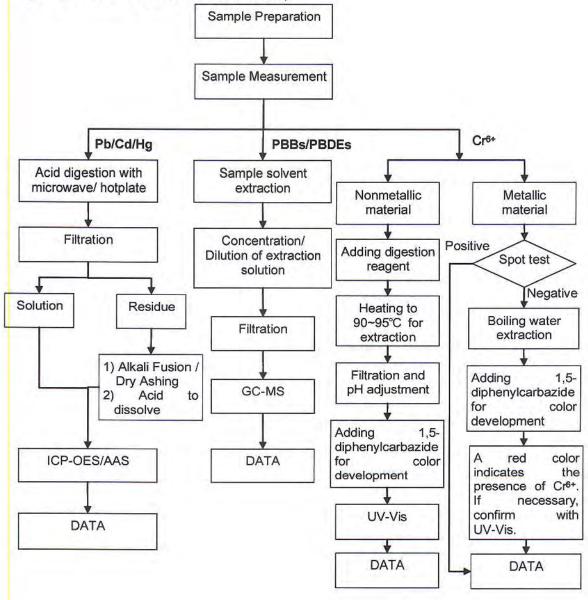
Date: 20 Mar 2013

Page 4 of 5

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
- 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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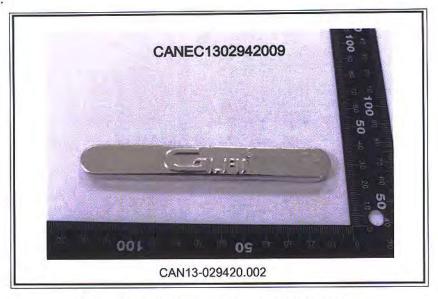


No. CANEC1302942009

Date: 20 Mar 2013

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Sample photo:



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No. TSNEC1200948802

Date: 24 Oct 2012

Page 1 of 5

The following sample(s) was/were submitted and identified on behalf of the clients as: TIN-COATED COPPER

WIRE

SGS Job No.:

TP12-009027 - TJ

Main Substance:

Date of Sample Received:

11 Oct 2012

Testing Period:

11 Oct 2012 - 16 Oct 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.

Reabeca Zhou Approved Signatory

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e sgs.china@sgs.com



No. TSNEC1200948802

Date: 24 Oct 2012

Page 2 of 5

Test Results:

Test Part Description:

Specimen No. SGS Sample ID Description 1 TSN12-009488.001 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

V (5-110

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>	Unit	MDL	001
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	-		\rightarrow	Negative
Sum of PBBs	1000	mg/kg	4	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	(+)	mg/kg	5	ND
Pentabromobiphenyl	O é o.	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	4	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

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Test Report	No. TSNEC120094880	02	Date: 24	Oct 2012	Page 3 of 5
Test Item(s)	Limit	<u>Unit</u>	MDL	001	
Dibromodiphenyl ether	-	mg/kg	5	ND	
Tribromodiphenyl ether	+	mg/kg	5	ND	
Tetrabromodiphenyl ether	1.0	mg/kg	5	ND	
Pentabromodiphenyl ether	(6)	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 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.

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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No. TSNEC1200948802

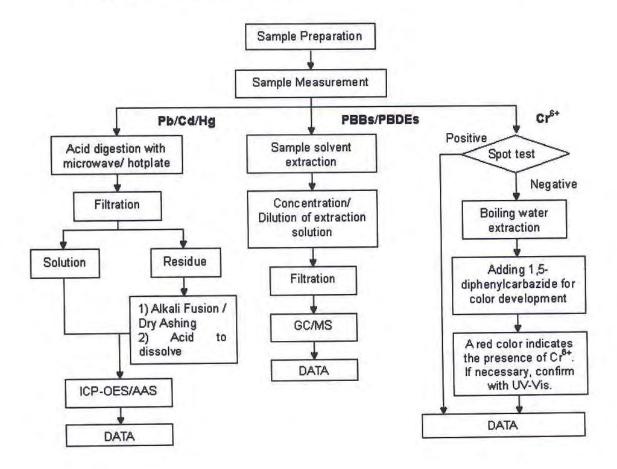
Date: 24 Oct 2012

Page 4 of 5

ATTACHMENTS

Cd/Pb/Hg/Cr⁸⁺/PBBs&PBDEs Testing Flow Chart

- 1) Name of the person who made testing: Aaron Wang/Jason Li/Angell Yao
- 2) Name of the person in charge of testing: Cindy Yin/Rex Zhu
- 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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No. TSNEC1200948802

Date: 24 Oct 2012

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Sample photo:



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Report No. RLSZF001581760007

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Applicant

DONGGUAN DAEJOO ELECTRONIC MATERIALS CO.,LTD.

Address

XIANCONG INDUSTRIAL ZONE WANJIANG DIATRICT DONGGUAN

GUANGDONG CHINA

The following sample(s) and sample information was/were submitted and identified by/on the behalf of the client

Sample Name

CP-930-1HF

Sample Received Date

Feb. 20, 2013

Testing Period

Feb. 20, 2013 to Feb. 23, 2013

Test Requested

As specified by client, to test Lead(Pb), Cadmium(Cd), Mercury(Hg),

Hexavalent Chromium(Cr(VI)), Polybrominated Biphenyls(PBBs), Polybrominated Diphenyl Ethers(PBDEs),

Hexabromocyclododecane(HBCDD), Phthalates, Fluorine(F), Chlorine(Cl),

Bromine(Br), Iodine(I) in the submitted sample(s).

Test Method

Please refer to the following page(s).

Test Result(s)

Please refer to the following page(s).

Reviewed by

Feb. 23, 2013

Danny Liu Technical Manager

No. 14983392

Centre Testing International (Shenzhen) Co., Ltd. Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China





Report No. RLSZF001581760007

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Test Method

Test Item(s)	Test Method	Measured Equipment(s)	MDL
Lead(Pb)	IEC 62321:2008 Ed.1 Sec.8	ICP-OES	2 mg/kg
Cadmium(Cd)	IEC 62321:2008 Ed.1 Sec.8	ICP-OES	2 mg/kg
Mercury(Hg)	IEC 62321:2008 Ed.1 Sec.7	ICP-OES	2 mg/kg
Hexavalent Chromium(Cr(VI))	IEC 62321:2008 Ed.1 Annex C	UV-Vis	2 mg/kg
Polybrominated Biphenyls(PBBs)	IEC 62321:2008 Ed.1 Annex A	GC-MS	5 mg/kg
Polybrominated Diphenyl Ethers(PBDEs)	IEC 62321:2008 Ed.1 Annex A	GC-MS	5 mg/kg
Fluorine(F)	Refer to BS EN 14582:2007	IC	10 mg/kg
Chlorine(Cl)	Refer to BS EN 14582:2007	IC	10 mg/kg
Bromine(Br)	Refer to BS EN 14582:2007	IC	10 mg/kg
Iodine(I)	Refer to BS EN 14582:2007	IC	10 mg/kg
Hexabromocyclododecane(HBCDD)	Refer to US EPA 3540C:1996	GC-MS	5 mg/kg
Phthalates	Refer to EN 14372:2004	GC-MS	50 mg/kg

Test Result(s)

Tested Item(s)	Result
Lead(Pb)	N.D.
Cadmium (Cd)	N.D.
Mercury(Hg)	N.D.
Hexavalent Chromium(Cr(VI))	N.D.

Tested Item(s)	Result	
Polybrominated Biphenyls(PBBs)		
Monobromobiphenyl	N.D.	
Dibromobiphenyl	N.D.	
Tribromobiphenyl	N.D.	
Tetrabromobiphenyl	N.D.	
Pentabromobiphenyl	N.D.	
Hexabromobiphenyl	N.D.	
Heptabromobiphenyl	N.D.	
Octabromobiphenyl	N.D.	
Nonabromobiphenyl	N.D.	
Decabromobiphenyl	N.D.	



Report No. RLSZF001581760007

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Tested Item(s)	Result
Polybrominated Diphenyl Ethers(PBDEs)	
Monobromodiphenyl ether	N.D.
Dibromodiphenyl ether	N.D.
Tribromodiphenyl ether	N.D.
Tetrabromodiphenyl ether	N.D.
Pentabromodiphenyl ether	N.D.
Hexabromodiphenyl ether	N.D.
Heptabromodiphenyl ether	N.D.
Octabromodiphenyl ether	N.D.
Nonabromodiphenyl ether	N.D.
Decabromodiphenyl ether	N.D.
Tested Item(s)	Result

Tested Item(s)	Result
Halogen(s)	
Fluorine (F)	N.D.
Chlorine (Cl)	233 mg/kg
Bromine (Br)	N.D.
Iodine (I)	N.D.

Tested Item(s)	Result	
Hexabromocyclododecane (HBCDD)	N.D.	

Tested Item(s)	CAS No.	EC No.	Result
Phthalates			
Dibutyl phthalate(DBP)	84-74-2	201-557-4	N.D.
Benzylbutyl phthalate(BBP)	85-68-7	201-622-7	N.D.
Di-2-ethylhexyl phthalate(DEHP)	117-81-7	204-211-0	N.D.

Tested Sample/Part Description Re

Red resin

Note:

The sample(s) had been dissolved totally tested for Lead, Cadmium, Mercury.

-MDL = Method Detection Limit

-N.D. = Not Detected (<MDL)

-mg/kg = ppm = parts per million



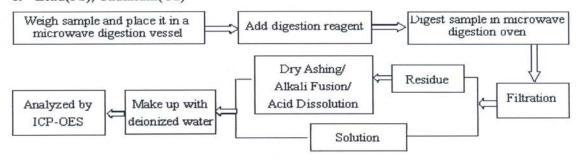


Report No. RLSZF001581760007

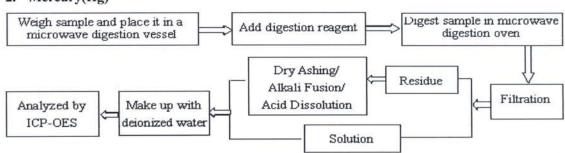
Page 4 of 6

Test Process

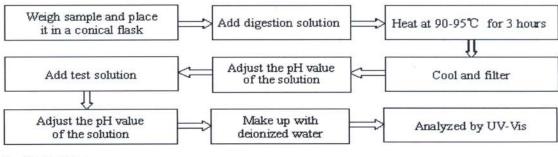
1. Lead(Pb), Cadmium(Cd)



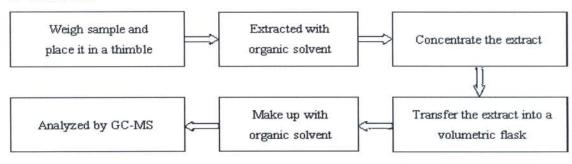
2. Mercury(Hg)



3. Hexavalent Chromium(Cr(VI))



4. Phthalates

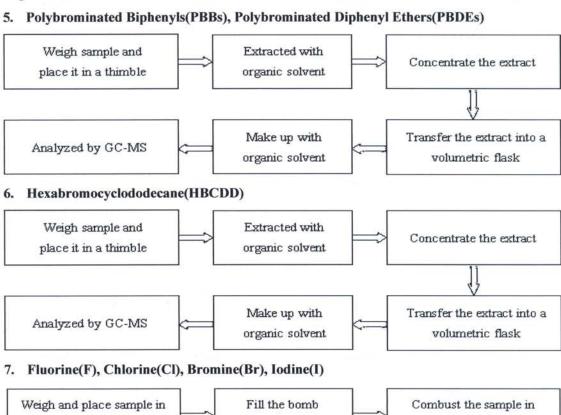


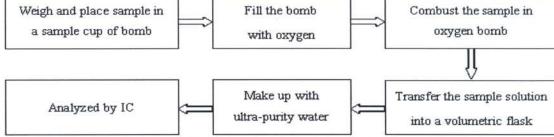




Report No. RLSZF001581760007

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Report No. RLSZF001581760007

Page 6 of 6

Photo(s) of the sample(s)



*** End of report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CTI, this report can't be reproduced except in full.



Date:

Jun 20, 2013

Applicant: LITTELFUSE, INC

8755 WEST HIGGINS ROAD SUITE

500CHICAGO IL 60631 USA

KRISTEEN BACILA/ARSENIO CESISTA JR. Attn:

Sample Description:

One (1) submitted sample said to be black powder (black epoxy resin PCE283).



Tests conducted:

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

To be continued

Authorized by: For Intertek Testing Services

Shenzhen Ltd.

Ben N.L. Lin General Manager



Conclusion:

Tested Samples Tested component of submitted sample

Standard

Restriction of the use of certain hazardous substance in electrical and electronic equipment (RoHS Directive 2011/65/EU)

Pass

Result

Phthalates content requirement in Annex XVII Items 51 & 52 of the REACH Regulation (EC) No. 1907/2006 & Amendment No. 552/2009 (formerly known as Directive 2005/84/EC) (DEHP, DBP & BBP)

Test Item

Halogen (F, Cl, Br, I) Content

See test conducted

See test conducted

Hexabromocyclododecane Content

See test conducted

Di-isobutyl phthalate(DIBP) Content

See test conducted

Total Antimony Content

See test conducted

Authorized by: For Intertek Testing Services Shenzhen Ltd.

Ben N.L. Lin General Manager

> Page 2 of 9



Tests Conducted

1 **RoHS Chemical Test**

(A) Test Result Summary:

Testing Item	Result
Cadmium (Cd) Content (mg/kg)	ND (<2)
Lead (Pb) Content (mg/kg)	ND (<2)
Mercury (Hg) Content (mg/kg)	ND (<2)
Chromium (VI)(Cr ⁶⁺) Content (mg/kg)	ND (<1)
Polybrominated Biphenyls (PBBs)(mg/kg)	
Monobromobiphenyl (MonoBB)	ND (<5)
Dibromobiphenyl (DiBB)	ND (<5)
Tribromobiphenyl (TriBB)	ND (<5)
Tetrabromobiphenyl (TetraBB)	ND (<5)
Pentabromobiphenyl (PentaBB)	ND (<5)
Hexabromobiphenyl (HexaBB)	ND (<5)
Heptabromobiphenyl (HeptaBB)	ND (<5)
Octabromobiphenyl (OctaBB)	ND (<5)
Nonabromobiphenyl (NonaBB)	ND (<5)
Decabromobiphenyl (DecaBB)	ND (<5)
Polybrominated Diphenyl Ethers (PBDEs)(mg/kg)	
Monobromodiphenyl Ether (MonoBDE)	ND (<5)
Dibromodiphenyl Ether (DiBDE)	ND (<5)
Tribromodiphenyl Ether (TriBDE)	ND (<5)
Tetrabromodiphenyl Ether (TetraBDE)	ND (<5)
Pentabromodiphenyl Ether (PentaBDE)	ND (<5)
Hexabromodiphenyl Ether (HexaBDE)	ND (<5)
Heptabromodiphenyl Ether (HeptaBDE)	ND (<5)
Octabromodiphenyl Ether (OctaBDE)	ND (<5)
Nonabromodiphenyl Ether (NonaBDE)	ND (<5)
Decabromodiphenyl Ether (DecaBDE)	ND (<5)

ND = Not detected

Tested component :Dark grey powder coating.



Tests Conducted

(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 2011/65/EU for homogeneous material.

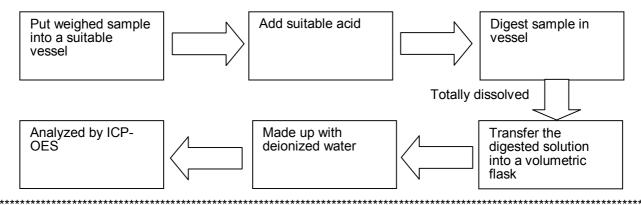
(C) Test Method:

Testing Item	Testing Method	Reporting Limit
Cadmium (Cd) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Lead (Pb) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Mercury (Hg) Content	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP - OES	2 mg/kg
Chromium (VI)(Cr ⁶⁺) Content	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1 mg/kg
Polybrominated Biphenyls (PBBs)& Polybrominated Diphenyl Ethers (PBDEs)	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS and further HPLC confirmation when necessary	5 mg/kg

Date sample received : Jun 07, 2013 Testing period : Jun 07, 2013 to Jun 17, 2013

(D) Measurement Flowchart:

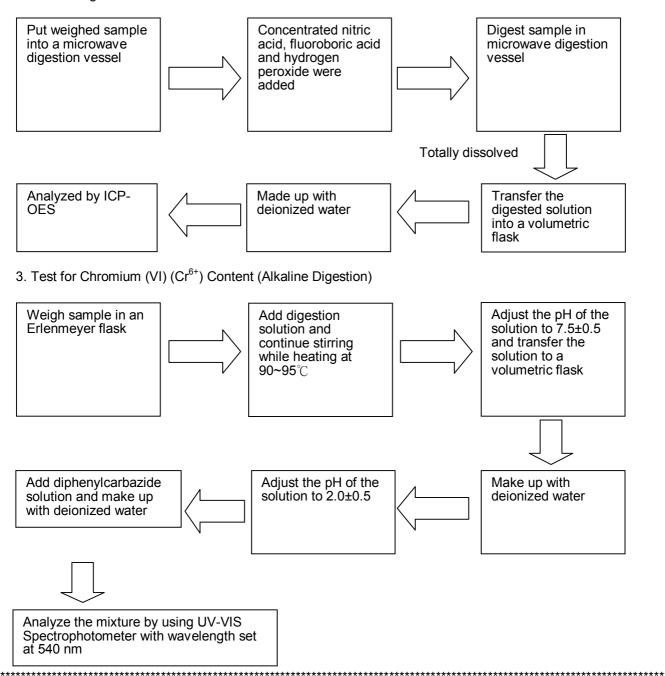
1. Test for Cd/Pb Contents





Tests Conducted

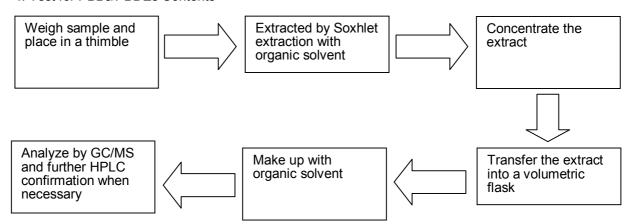
2. Test for Hg Content





Tests Conducted

4. Test for PBBs/PBDEs Contents



2 Phthalate Content

With reference to EN14372, by Gas chromatographic-Mass Spectrometric (GC-MS) analysis.

Dibutyl phthalate (DBP) Di-(2-ethyl hexyl) phthalate (DEHP) Benzyl butyl phthalate (BBP)	Result (%) <0.01 <0.01 <0.01
Sum of three phthalates	<0.01
Limit	0.1 %

The above limit was quoted according to Annex XVII Items 51 & 52 of the REACH Regulation (EC) No. 1907/2006 & Amendment No. 552/2009(formerly known as Directive 2005/84/EC) for phthalate content in toys and children articles.

As per client's request, only DBP, DEHP and BBP were tested for the submitted sample.

Tested component :Dark grey powder coating.

Date sample received : Jun 07, 2013

Testing period: Jun 07, 2013 to Jun 15, 2013





Tests Conducted

3 Halogen Content

(I) Test Result Summary:

Testing Item	Result (mg/kg)
Fluorine (F) Content	ND
Chlorine (CI) Content	155
Bromine (Br) Content	34381
Iodine (I) Content	ND

mg/kg= milligram per kilogram = ppm ND= Not detected

(II) Test Method:

Testing Item	Testing Method	Reporting Limit
Halogen (F, Cl, Br, I) Content	With reference to BS EN 14582:2007, by calorimetric bomb and determined by Ion Chromatography	50 mg/kg

Reporting limit = Quantitation limit of analyte in sample

Tested component :Dark grey powder coating.

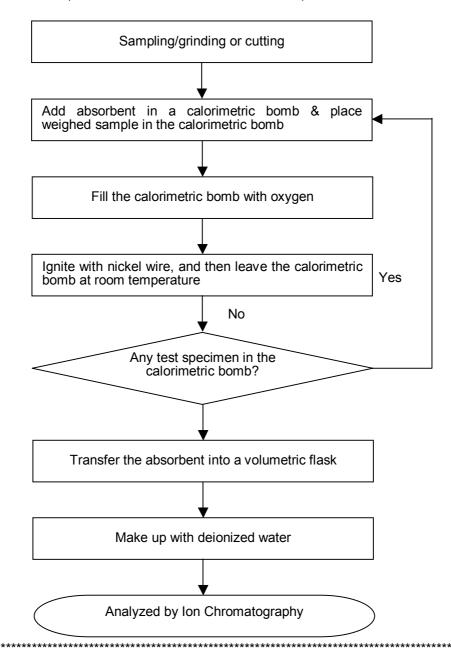
Date sample received : Jun 07, 2013 Testing period : Jun 07, 2013 to Jun 19, 2013



Tests Conducted

(III) Measurement Flowchart:

Test for Halogen Content (Reference Method: BS EN 14582:2007)





Tests Conducted

4 Hexabromocyclododecane (HBCDD) Content:

By solvent extraction followed by Gas Chromatographic - Mass Spectrometric (GC-MS) analysis.

Result: Less than 10mg/kg

mg/kg =milligram per kilogram

Tested component :Dark grey powder coating.

Date sample received: Jun 07, 2013

Testing period: Jun 07, 2013 to Jun 17, 2013

5 <u>Di-isobutyl phthalate (DIBP)Content</u>

By solvent extraction and Gas Chromatographic-Mass Spectrometric (GC-MS) analysis.

Result: Less than 0.01%

Tested component :Dark grey powder coating.

Date sample received: Jun 07, 2013

Testing period: Jun 07, 2013 to Jun 15, 2013

6 Total Antimony (Sb) Content

As per applicant's request, acid digestion method was used and total content was determined by Inductively Coupled Argon Plasma Spectrometry.

Result: 1060ppm

ppm = parts per million

Tested component :Dark grey powder coating.

Date sample received: Jun 07, 2013

Testing period: Jun 07, 2013 to Jun 17, 2013

End of report

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No. TSNEC1300137705

Date: 27 Feb 2013

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TIANJIN CITY KAIHUA INSULATION MATERIAL CO.,LTD. NO.27 YIJING ROAD, DONGLI DEVELOPMENT AREA TIANJIN 300300, CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as: HALOGEN-FREE **EPOXY SEALING POWDER**

SGS Job No.:

TP13-000644 - TJ

Main Substance:

EPOXY RESIN

Model No.:

EF-150

Date of Sample Received:

21 Feb 2013

Testing Period:

21 Feb 2013 - 27 Feb 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.

Summer Bai

Approved Signatory

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No. TSNEC1300137705

Date: 27 Feb 2013

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Test Results:

Test Part Description:

Specimen No.

SGS Sample ID

Description

1

TSN13-001377.005

blue powder

Remarks:

(1) 1 mg/kg = 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)	<u>Limit</u>	<u>Unit</u>	MDL	005
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	2	ND
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	1 -0	mg/kg	5	ND
Octabromobiphenyl	190	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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Test Report	No. TSNEC130013770	05	Date: 27	Feb 2013	Page 3 of 9
Test Item(s)	<u>Limit</u>	Unit	MDL	<u>005</u>	
Dibromodiphenyl ether	-	mg/kg	5	ND	
Tribromodiphenyl ether	G•11	mg/kg	5	ND	
Tetrabromodiphenyl ether	-	mg/kg	5	ND	
Pentabromodiphenyl ether	040	mg/kg	5	ND	
Hexabromodiphenyl ether	4	mg/kg	5	ND	
Heptabromodiphenyl ether	140	mg/kg	5	ND	
Octabromodiphenyl ether		mg/kg	5	ND	
Nonabromodiphenyl ether	19	mg/kg	5	ND	
Decabromodiphenyl ether	(4.	mg/kg	5	ND	

Notes:

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

Halogen

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

Test Item(s)	<u>Unit</u>	MDL	005
Fluorine (F)	mg/kg	50	ND
Chlorine (CI)	mg/kg	50	319
Bromine (Br)	mg/kg	50	68
lodine (I)	mg/kg	50	ND

Hexabromocyclododecane (HBCDD)

Test Method: With reference to IEC 62321:2008, analysis was performed by GC-MS.

Test Item(s)	<u>Unit</u>	MDL	<u>005</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

Notes:

(1) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD) is considered as a priority for risk evaluation and substance restriction.

Phthalates

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Test Method: With reference to EN14372: 2004, analysis was performed by GC-MS.

Test Item(s)	<u>Unit</u>	MDL	005
Dibutyl Phthalate (DBP)	% (w/w)	0.003	ND
Benzylbutyl Phthalate (BBP)	% (w/w)	0.003	ND
Bis-(2-ethylhexyl) Phthalate (DEHP)	% (w/w)	0.003	ND

Notes:

(1) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.

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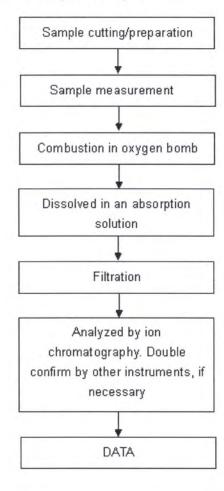
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Halogen Testing Flow Chart

- 1) Name of the person who made testing: Angell Yao
- 2) Name of the person in charge of testing: Rex Zhu



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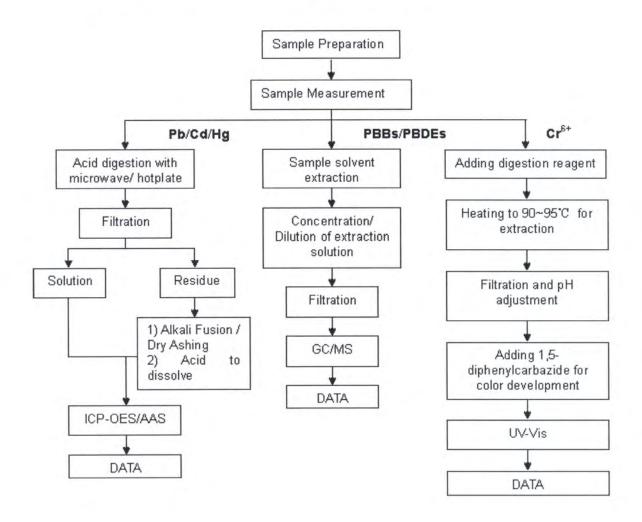
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Cd/Pb/Hg/Cr⁶⁺/PBBs&PBDEs Flow Chart

- 1) Name of the person who made testing: Aaron Wang/Jason Li /Angell Yao
- 2) Name of the person in charge of testing: Cindy Yin/Rex Zhu
- 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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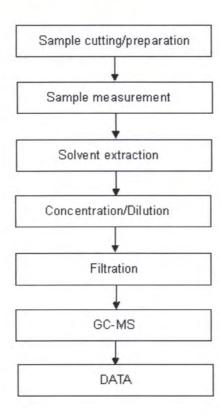
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HBCDD Testing Flow Chart

- 1) Name of the person who made testing: Marina Sun
- 2) Name of the person in charge of testing: Rex Zhu



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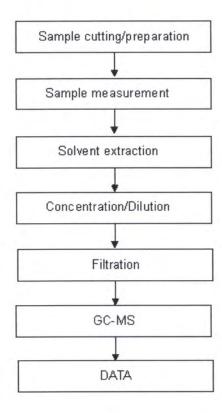
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Phthalate Testing Flow Chart

- 1) Name of the person who made testing: Marina Sun
- 2) Name of the person in charge of testing: Rex Zhu



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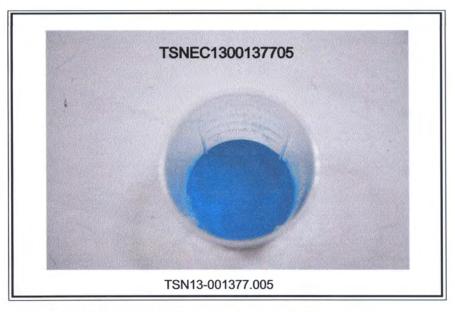


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Sample photo:



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