

Test Report

No. CRSSA/16345-1/18
CRS Ref. CRSSA/18/3074

Date : 09/01/2019

Page: 1 of 5

Mold Compound

The following merchandise was (were) submitted and identified by the client as:

Sample Description	:	Epoxy Molding Compound
Sample Name	:	
Sample Receiving Date	:	22/11/2018
Testing Period	:	22/11/2018 to 20/12/2018
Date Completed	:	20/12/2018
Reporting Date	:	09/01/2019

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).
Analysts	:	Tan Mei Ann & Gan Wan Han

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SECTION HEAD
IKM No. M/3983/6401/12/14

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Test Report

No. CRSSA/16345-1/18

Date : 09/01/2019

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Test results:

Test Part Description :

Sample Description : Epoxy Molding Compound
Sample Name :

RoHS Directive 2011/65/EU Annex II

Test Item(s):	Unit	Test Method	Results	MDL	Limit
Cadmium (Cd)	ppm	With reference to IEC 62321-5:2013 (Determination of Cd by ICP-OES)	N.D.	2	100
Lead (Pb)	ppm	With reference to IEC 62321-5:2013 (Determination of Pb by ICP-OES)	N.D.	2	1000
Mercury (Hg)	ppm	With reference to IEC 62321-4:2013/AMD 1:2017 (Determination of Hg by ICP-OES)	N.D.	2	1000
Hexavalent Chromium (CrVI)	ppm	With reference to IEC 62321-7-2:2017 (Determination of CrVI by UV-Vis)	N.D.	8	1000
Sum of PBBs	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	-	1000
Monobromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Dibromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Tribromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Tetrabromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Pentabromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Hexabromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Heptabromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Octabromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Nonabromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-
Decabromobiphenyl	ppm	With reference to IEC 62321-6:2015 (Determination of PBB by GC-MS)	N.D.	5	-

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Sum of PBDEs	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	-	1000
Monobromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Dibromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Tribromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Tetrabromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Pentabromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Hexabromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Heptabromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Octabromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Nonabromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-
Decabromodiphenyl ether	ppm	With reference to IEC 62321-6:2015 (Determination of PBDE by GC-MS)	N.D.	5	-

Note : (a) mg/kg = ppm ; (0.1wt% = 1000ppm)
 (b) N.D. = Not Detected
 (c) MDL = Method Detection Limit
 (d) - = not regulated

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Test Part Description :

Sample Description : Epoxy Molding Compound
Sample Name :



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1. DETERMINATION OF CADMIUM CONTENT BY IEC 62321-5 2013 Sample Receiving and Registration ↓ Cut sample in small pieces ↓ Weight sample (0.2-0.5g) into digestion vessel ↓ Acid digestion (Microwave) ↓ "Totally Dissolved" ↓ Filtration ↓ Analyses by ICP	2. DETERMINATION OF LEAD CONTENT BY IEC 62321-5 2013 Sample Receiving and Registration ↓ Cut sample in small pieces ↓ Weight sample (0.2-0.5g) into digestion vessel ↓ Acid digestion (Microwave) ↓ "Totally Dissolved" ↓ Filtration ↓ Analyses by ICP
3. DETERMINATION OF MERCURY CONTENT BY IEC 62321-4 2013/AMD 1 2017 Sample Receiving and Registration ↓ Cut sample in small pieces ↓ Weight sample (0.1-0.5g) into digestion vessel ↓ Acid digestion (Microwave) ↓ "Totally Dissolved" ↓ Filtration ↓ Analyses by ICP	4a. DETERMINATION OF HEXAVALENT CHROMIUM BY IEC 62321-7-2 2017 (Other Materials) Sample Preparation ↓ Digestion at 150~160 °C ↓ Separating To Obtain Aqueous Phase ↓ pH Adjustment ↓ Add Diphenyl-Carbazide for Color Development ↓ Analyses by UV- Spectrophotometer (540 nm)
4b. DETERMINATION OF HEXAVALENT CHROMIUM BY IEC 62321-7-2 2017 (Soluble Polymers) Sample Preparation ↓ Add Digestion Solution ↓ Ultrasonicate Sample ↓ pH Adjustment ↓ Add Diphenyl-Carbazide for Color Development ↓ Analyses by UV- Spectrophotometer (540 nm)	5. DETERMINATION OF PBB/PBDE WITH GC-MS BY IEC 62321-6 2015 Cut sample in small pieces ↓ Weight sample (0.5-4.0g) into extraction thimble ↓ Soxhlet Extraction with Toluene ↓ Filter through 0.45 µm membrane filter ↓ Analyses by GC-MS (with appropriate dilution)

**** End of Report ****

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Test Report

No. CRSSA/16345-2/18

Date : 09/01/2019

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Mold Compound

The following merchandise was (were) submitted and identified by the client as:

Sample Description	:	Epoxy Molding Compound
Sample Name	:	
Sample Receiving Date	:	22/11/2018
Testing Period	:	22/11/2018 to 20/12/2018
Date Completed	:	20/12/2018
Reporting Date	:	09/01/2019

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).
Analyst	:	Gan Wan Han

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Test result:

Test Part Description :

Sample Description : Epoxy Molding Compound
Sample Name :

Optional: RoHS Directive 2011/65/EU, priority substances

Test Item (s):	Unit	Method	Result	MDL
Hexabromocyclododecane (HBCDD) (Cas#25637-99-4 & 3194-55-6)	mg/kg	In-house method with reference to IEC 62321-6: 2015. Analysis was performed by GC-MS	N.D.	5

Note:

- Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.
- = not regulated
- N.D = Not Detected

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Test result:

Test Part Description :

Sample Description : Epoxy Molding Compound
Sample Name :

RoHS Directive 2011/65/EU Annex II (amended by Directive (EU) 2015/863)

Test Item(s):	Unit	Test Method	Results	MDL	Limit
Bis (2-ethylhexyl) phthalate (DEHP) (CAS No. 117-81-7)	mg/kg	With reference to IEC 62321-8:2017. Analysis was performed by GC/MS.	N.D.	50	1000
Butyl benzyl phthalate (BBP) (CAS No. 85-68-7)	mg/kg	With reference to IEC 62321-8:2017. Analysis was performed by GC/MS.	N.D.	50	1000
Dibutyl phthalate (DBP) (CAS No. 84-74-2)	mg/kg	With reference to IEC 62321-8:2017. Analysis was performed by GC/MS.	N.D.	50	1000
Diisobutyl phthalate (DIBP) (CAS No. 84-69-5)	mg/kg	With reference to IEC 62321-8:2017. Analysis was performed by GC/MS.	N.D.	50	1000

Note : (a) mg/kg = ppm ; (0.1wt% = 1000ppm)

(b) N.D. = Not Detected

(c) MDL = Method Detection Limit

(d) - = Not regulated

(e) On 4 June 2015, [Commission Directive \(EU\) 2015/863](#) was published in the Official Journal of the European Union (OJEU) to include the phthalates BBP, DBP, DEHP and DIBP into ANNEX II of the Rohs Recast Directive. The new law restricts each phthalate to no more than 0.1% in each homogeneous material of an electrical product.

(f) The restriction of DEHP, BBP, DBP and DIBP shall apply to medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021.

(g) The restriction of DEHP, BBP, DBP and DIBP shall not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 22 July 2019, and of medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, placed on the market before 22 July 2021.

(h) The restriction of DEHP, BBP and DBP shall not apply to toys which are already subject to the restriction of DEHP, BBP and DBP through entry 51 of Annex XVII to Regulation (EC) No 1907/2006.

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Test Part Description :

Sample Description : Epoxy Molding Compound
Sample Name :



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DETERMINATION OF HBCDD CONTENT

Cut sample in small pieces
↓
Weight sample (0.5-4.0g) into extraction thimble
↓
Soxhlet Extraction with Toluene
↓
Filter through 0.45 um membrane filter
↓
Analyses by GC-MS (with appropriate dilution)

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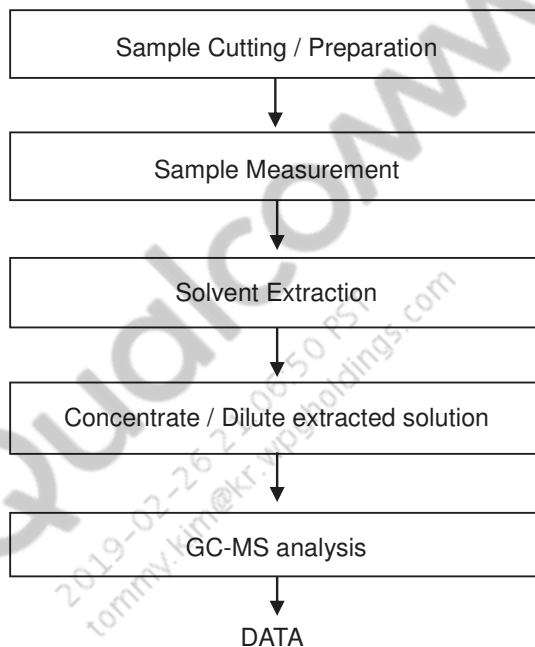

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Flowchart for Phthalates Measurement

Method: IEC62321



****End of Report****

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Mold Compound

The following merchandise was (were) submitted and identified by the client as:

Sample Description	:	Epoxy Molding Compound
Sample Name	:	
Sample Receiving Date	:	22/11/2018
Testing Period	:	22/11/2018 to 20/12/2018
Date Completed	:	20/12/2018
Reporting Date	:	09/01/2019

Test Results : Please refer to next page.

Analyst : Su Lian Zye

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Test results by chemical method:

Test Item (s) :	Unit	Method	Results	MDL
Halogen	---	---	---	---
Halogen-Fluorine (F)	mg/kg	With reference to BS EN 14582:2016. Analysis was performed by IC method for Fluorine content.	N.D.	50
Halogen-Chlorine (Cl)	mg/kg	With reference to BS EN 14582:2016. Analysis was performed by IC method for Chlorine content.	N.D.	50
Halogen-Bromine (Br)	mg/kg	With reference to BS EN 14582:2016. Analysis was performed by IC method for Bromine content.	N.D.	50
Halogen-Iodine (I)	mg/kg	With reference to BS EN 14582:2016. Analysis was performed by IC method for Iodine content.	N.D.	50

Test Part Description:

Sample Description : Epoxy Molding Compound
Sample Name : CEL-9220HF 10 Series

- Note :
- (a) mg/kg = ppm
 - (b) N.D. = Not Detected
 - (c) MDL = Method Detection Limit
 - (d) --- = Not Conducted
 - (e) Upon Customer's request, this report has been issued in more than one original. Only the first original is a legally binding document and may be used for any legal purpose, including payment. (Original 1-2)

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Test Report

No. CRSSA/16345-5/18

Date : 09/01/2019

Page 3 of 4

Test Part Description :

Sample Description : Epoxy Molding Compound
Sample Name :



SGS authenticate the photo on original report only

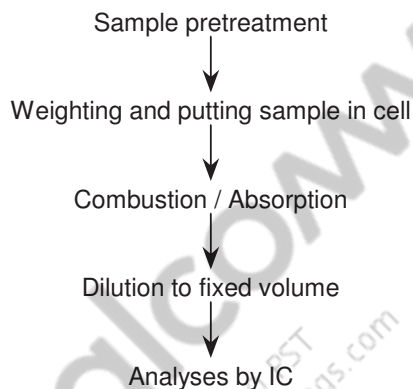
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IKM No. M/3983/6401/12/14

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DETERMINATION OF HALOGEN CONTENT BY EN 14582 2016



**** End of Report ****

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Test Report

REPORT NO. : CRSSA/16345-3/18
CRS REF. : CRSSA/18/3074
DATE REPORTED : 09th Jan., 2019
PAGE : 1 of 4

Mold Compound

The following merchandise was (were) submitted and identified by the client as:

Sample Description : Epoxy Molding Compound
Sample Name :
Sample Receiving Date : 22/11/2018
Testing Period : 22/11/2018 to 20/12/2018
Date Completed : 20/12/2018
Reporting Date : 09/01/2019

Test Result : Please see the next page

Analyst : Tan Mei Ann

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Test Report

REPORT NO. : CRSSA/16345-3/18
 CRS REF. : CRSSA/18/3074
 DATE REPORTED : 09th Jan., 2019
 PAGE : 2 of 4

Test Result

Sample Description : Epoxy Molding Compound
 Sample Name :

Test Item (s) :	Unit	Method	Results	MDL
Antimony (Sb)	mg/kg	ICP-OES as per US EPA 3052 (acid digestion method)	N.D.	2

Note : (a) mg/kg = ppm
 (b) N.D. = Not Detected
 (c) MDL = Method Detection Limit

Analyst: Tan Mei Ann

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Test Report

REPORT NO. : CRSSA/16345-3/18
 CRS REF. : CRSSA/18/3074
 DATE REPORTED : 09th Jan., 2019
 PAGE : 3 of 4

Test Result

Sample Description : Epoxy Molding Compound
 Sample Name :



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Test Report

REPORT NO. : CRSSA/16345-3/18
 CRS REF. : CRSSA/18/3074
 DATE REPORTED : 09th Jan., 2019
 PAGE : 4 of 4

**MICROWAVE ASSISTED ACID DIGESTION OF
 SILICEOUS AND ORGANICALLY BASED METRICES
 (US EPA 3052)**

Cut sample in small pieces
 ↓
 Weight sample (0.2-0.5g) into digestion vessel
 ↓
 Acid digestion (HF and HNO₃) – Microwave
 ↓
 "Totally Dissolved"
 ↓
 Filtration
 ↓
 Analyses by ICP

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Test Report

REPORT NO. : CRSSA/16345-4/18
CRS REF. : CRSSA/18/3074
DATE REPORTED : 09th Jan., 2019
PAGE : 1 of 4

Mold Compound

The following merchandise was (were) submitted and identified by the client as:

Sample Description : Epoxy Molding Compound
Sample Name :
Sample Receiving Date : 22/11/2018
Testing Period : 22/11/2018 to 20/12/2018
Date Completed : 20/12/2018
Reporting Date : 09/01/2019

Test Result : Please see the next page

Analyst : Tan Mei Ann

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Test Report

REPORT NO. : CRSSA/16345-4/18
 CRS REF. : CRSSA/18/3074
 DATE REPORTED : 09th Jan., 2019
 PAGE : 2 of 4

Test Result

Sample Description : Epoxy Molding Compound
 Sample Name :

Test Item (s) :	Unit	Method	Results	MDL
Beryllium (Be)	mg/kg	ICP-OES as per US EPA 3052 (acid digestion method)	N.D.	2

Note : (a) mg/kg = ppm
 (b) N.D. = Not Detected
 (c) MDL = Method Detection Limit

Analyst: Tan Mei Ann

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Test Report

REPORT NO. : CRSSA/16345-4/18
CRS REF. : CRSSA/18/3074
DATE REPORTED : 09th Jan., 2019
PAGE : 3 of 4

Test Result

Sample Description : Epoxy Molding Compound
Sample Name :



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Test Report

REPORT NO. : CRSSA/16345-4/18
 CRS REF. : CRSSA/18/3074
 DATE REPORTED : 09th Jan., 2019
 PAGE : 4 of 4

**MICROWAVE ASSISTED ACID DIGESTION OF
 SILICEOUS AND ORGANICALLY BASED METRICES
 (US EPA 3052)**

Cut sample in smaller pieces
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 Weight sample (0.2-0.5g) into digestion vessel
 ↓
 Acid digestion (HF and HNO₃) – Microwave
 ↓
 "Totally Dissolved"
 ↓
 Filtration
 ↓
 Analyses by ICP

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