

## Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 1 of 22

TOPDIODE MANUFACTURING COMPANY LIMITED

SHANGKENG INDUSTRIAL ROAD NO.3, SHANGKENG INDUSTRIAL PARK, CHANGPING TOWN,  
DONGGUAN, GUANGDONG PROVINCE, CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : V-CHIP ALUMINUM  
ELECTROLYTIC CAPACITORS

SGS Job No. : CP14-053104 - GZ  
Client Ref. Info. : Material lot No.: M82401, CA06-1386, 1514010540-0593, 20140103,  
YK-131230-45130, 140208A, 320309, 140222081  
Date of Sample Received : 14 Mar 2014  
Testing Period : 14 Mar 2014 - 25 Mar 2014  
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 selected part of submitted sample(s), the  
results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated  
biphenyls (PBB), Polybrominated diphenyl ethers (PBDE) comply with the limits  
in RoHS Directive 2011/65/EU Annex II; recasting 2002/95/EC.

Signed for and on behalf of  
SGS-CSTC Ltd.



Merry Lv  
Approved Signatory



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# Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 2 of 22

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	CAN14-163563.001	Silver-grey metal sheet(1#)(semi-product)
SN2	CAN14-163563.002	Silvery metal sheet(2#)(semi-product)
SN3	CAN14-163563.003	Beige paper(3#)(semi-product)
SN4	CAN14-163563.005	Lt-yellow transparent liquid(5#)(semi-product)
SN5	CAN14-163563.007	Silvery metal(7#)(semi-product)
SN6	CAN14-163563.009	Black soft material(9#)(semi-product)
SN7	CAN14-163563.012	Black ink(12#)(semi-product)
SN8	CAN14-163563.015	Black plastic(15#)(semi-product)
SN9	CAN14-163563.016	White particle(16#)(semi-product)
SN10	CAN14-163563.017	Silver-white metal pin(17#)(semi-product)

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 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	003	005	009
Cadmium (Cd)	100	mg/kg	2	ND	ND	ND
Lead (Pb)	1,000	mg/kg	2	ND	ND	18
Mercury (Hg)	1,000	mg/kg	2	ND	ND	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND	ND	ND
Sum of PBBs	1,000	mg/kg	-	ND	ND	ND
Monobromobiphenyl	-	mg/kg	5	ND	ND	ND
Dibromobiphenyl	-	mg/kg	5	ND	ND	ND
Tribromobiphenyl	-	mg/kg	5	ND	ND	ND



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## Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 3 of 22

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>	<u>005</u>	<u>009</u>
Tetrabromobiphenyl	-	mg/kg	5	ND	ND	ND
Pentabromobiphenyl	-	mg/kg	5	ND	ND	ND
Hexabromobiphenyl	-	mg/kg	5	ND	ND	ND
Heptabromobiphenyl	-	mg/kg	5	ND	ND	ND
Octabromobiphenyl	-	mg/kg	5	ND	ND	ND
Nonabromobiphenyl	-	mg/kg	5	ND	ND	ND
Decabromobiphenyl	-	mg/kg	5	ND	ND	ND
Sum of PBDEs	1,000	mg/kg	-	ND	ND	ND
Monobromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Dibromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Tribromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Octabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Decabromodiphenyl ether	-	mg/kg	5	ND	ND	ND

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>012</u>	<u>015</u>	<u>016</u>
Cadmium (Cd)	100	mg/kg	2	ND	ND	ND
Lead (Pb)	1,000	mg/kg	2	ND	ND	ND
Mercury (Hg)	1,000	mg/kg	2	ND	ND	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND	ND	ND
Sum of PBBs	1,000	mg/kg	-	ND	ND	ND
Monobromobiphenyl	-	mg/kg	5	ND	ND	ND
Dibromobiphenyl	-	mg/kg	5	ND	ND	ND
Tribromobiphenyl	-	mg/kg	5	ND	ND	ND
Tetrabromobiphenyl	-	mg/kg	5	ND	ND	ND
Pentabromobiphenyl	-	mg/kg	5	ND	ND	ND
Hexabromobiphenyl	-	mg/kg	5	ND	ND	ND
Heptabromobiphenyl	-	mg/kg	5	ND	ND	ND
Octabromobiphenyl	-	mg/kg	5	ND	ND	ND
Nonabromobiphenyl	-	mg/kg	5	ND	ND	ND
Decabromobiphenyl	-	mg/kg	5	ND	ND	ND
Sum of PBDEs	1,000	mg/kg	-	ND	ND	ND
Monobromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Dibromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Tribromodiphenyl ether	-	mg/kg	5	ND	ND	ND



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## Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 4 of 22

Test Item(s)	Limit	Unit	MDL	012	015	016
Tetrabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Octabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Decabromodiphenyl ether	-	mg/kg	5	ND	ND	ND

### Notes :

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

### 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	001	002	007
Cadmium (Cd)	100	mg/kg	2	ND	ND	ND
Lead (Pb)	1,000	mg/kg	2	ND	ND	ND
Mercury (Hg)	1,000	mg/kg	2	ND	ND	ND
Hexavalent Chromium (CrVI)	-	-	◇	Negative	Negative	Negative
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
Dibromodiphenyl ether	-	mg/kg	5			ND



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## Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 5 of 22

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>	<u>002</u>	<u>007</u>
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

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>017</u>
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)	-	-	◇	Negative

### 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 cm<sup>2</sup> 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.

### 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>003</u>	<u>005</u>	<u>007</u>
Fluorine (F)	mg/kg	50	ND	ND	ND
Chlorine (Cl)	mg/kg	50	ND	ND	ND
Bromine (Br)	mg/kg	50	ND	ND	ND
Iodine (I)	mg/kg	50	ND	ND	ND



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## Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 6 of 22

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>009</u>	<u>012</u>	<u>015</u>
Fluorine (F)	mg/kg	50	ND	ND	90
Chlorine (Cl)	mg/kg	50	ND	ND	ND
Bromine (Br)	mg/kg	50	ND	ND	ND
Iodine (I)	mg/kg	50	ND	ND	ND

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>016</u>
Fluorine (F)	mg/kg	50	ND
Chlorine (Cl)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

### Polynuclear Aromatic Hydrocarbons (PAHs)

Test Method : With reference to ZEK 01.4-08 of German ZLS and its amendments, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>	<u>005</u>	<u>007</u>
Naphthalene(NAP)	mg/kg	0.2	ND	ND	ND
Acenaphthylene(ANY)	mg/kg	0.2	ND	ND	ND
Acenaphthene(ANA)	mg/kg	0.2	ND	ND	ND
Fluorene(FLU)	mg/kg	0.2	ND	ND	ND
Phenanthrene(PHE)	mg/kg	0.2	ND	ND	ND
Anthracene(ANT)	mg/kg	0.2	ND	ND	ND
Fluoranthene(FLT)	mg/kg	0.2	ND	ND	ND
Pyrene(PYR)	mg/kg	0.2	ND	ND	ND
Benzo(a)anthracene(BaA)	mg/kg	0.2	ND	ND	ND
Chrysene(CHR)	mg/kg	0.2	ND	ND	ND
Benzo(b)fluoranthene(BbF) + Benzo(j)fluoranthene(BjF)	mg/kg	0.2	ND	ND	ND
Benzo(k)fluoranthene(BkF)	mg/kg	0.2	ND	ND	ND



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## Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 7 of 22

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>	<u>005</u>	<u>007</u>
Benzo(e)pyrene(BeP)	mg/kg	0.2	ND	ND	ND
Benzo(a)pyrene(BaP)	mg/kg	0.2	ND	ND	ND
Indeno(1,2,3-c,d)pyrene(IPY)	mg/kg	0.2	ND	ND	ND
Dibenzo(a,h)anthracene(DBA)	mg/kg	0.2	ND	ND	ND
Benzo(g,h,i)perylene(BPE)	mg/kg	0.2	ND	ND	ND
Sum of 18 PAHs	mg/kg	-	ND	ND	ND

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>015</u>	<u>016</u>
Naphthalene(NAP)	mg/kg	0.2	ND	ND
Acenaphthylene(ANY)	mg/kg	0.2	ND	ND
Acenaphthene(ANA)	mg/kg	0.2	ND	ND
Fluorene(FLU)	mg/kg	0.2	ND	ND
Phenanthrene(PHE)	mg/kg	0.2	ND	ND
Anthracene(ANT)	mg/kg	0.2	ND	ND
Fluoranthene(FLT)	mg/kg	0.2	ND	ND
Pyrene(PYR)	mg/kg	0.2	ND	ND
Benzo(a)anthracene(BaA)	mg/kg	0.2	ND	ND
Chrysene(CHR)	mg/kg	0.2	ND	ND
Benzo(b)fluoranthene(BbF) + Benzo(j)fluoranthene(BjF)	mg/kg	0.2	ND	ND
Benzo(k)fluoranthene(BkF)	mg/kg	0.2	ND	ND
Benzo(e)pyrene(BeP)	mg/kg	0.2	ND	ND
Benzo(a)pyrene(BaP)	mg/kg	0.2	ND	ND
Indeno(1,2,3-c,d)pyrene(IPY)	mg/kg	0.2	ND	ND



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## Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 8 of 22

Test Item(s)	Unit	MDL	015	016
Dibenzo(a,h)anthracene(DBA)	mg/kg	0.2	ND	ND
Benzo(g,h,i)perylene(BPE)	mg/kg	0.2	ND	ND
Sum of 18 PAHs	mg/kg	-	ND	ND

### ZEK 01.4-08: Restraining maximum values for products

Parameter	Category 1	Category 2	Category 3
	Material indented to be put in the mouth or material for toys with normal skin contact for children aged < 36 months	Materials those are not included in Category 1, with predictable contact with the skin longer than 30 s. (long-term skin contact).	Materials those are not included in Category 1 or 2, with predictable skin contact up to 30 s. (short-term skin contact).
Benzo(a)pyrene (mg/kg)	<0.2**	1	20
Sum of 18 PAH (mg/kg)*	<0.2**	10	200

#### Notes:

- \* = Only PAH substances >0.2 mg/kg are taken into account while calculating the sum of PAHs
- \*\* = In case that the maximum values exceed the limits of category 1, but are within the limits of category 2, one may confirm the suitability of the tested material which is indented to be put in the mouth by additional specific migration tests of PAH components based on DIN EN 1186ff and §64 LFGB 80.30-1. The conclusion of the migration test results must be made based on food law criteria.

### Tetrabromobisphenol A (TBBP-A)

Test Method : With reference to US EPA Method 3540C:1996, analysis was performed by GC-MS&HPLC-MS.

Test Item(s)	Unit	MDL	003	005	007
Tetrabromobisphenol A (TBBP-A)	mg/kg	10	ND	ND	ND

Test Item(s)	Unit	MDL	009	012	015
Tetrabromobisphenol A (TBBP-A)	mg/kg	10	ND	ND	ND

Test Item(s)	Unit	MDL	016
Tetrabromobisphenol A (TBBP-A)	mg/kg	10	ND

### Dimethyl Fumarate (DMF)



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## Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 9 of 22

Test Method : SGS In house method(GZTC CHEM-TOP-095), alalysis was performed by GC-MS

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>	<u>005</u>	<u>007</u>
Dimethyl fumarate(DMF)	0.1	mg/kg	0.1	ND	ND	ND
<b>Conclusion</b>				<b>PASS</b>	<b>PASS</b>	<b>PASS</b>
<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>009</u>	<u>012</u>	<u>015</u>
Dimethyl fumarate(DMF)	0.1	mg/kg	0.1	ND	ND	ND
<b>Conclusion</b>				<b>PASS</b>	<b>PASS</b>	<b>PASS</b>
<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>016</u>		
Dimethyl fumarate(DMF)	0.1	mg/kg	0.1	ND		
<b>Conclusion</b>				<b>PASS</b>		

Notes :

- (1) The maximum permissible limit is quoted from the document Commission Regulation (EU) No 412/2012 amending Annex XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Commission Decision 2012/48/EU)

### Hexabromocyclododecane (HBCDD)

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>	<u>005</u>	<u>007</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND	ND	ND
<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>009</u>	<u>012</u>	<u>015</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND	ND	ND
<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>016</u>		
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND		

### PFOS (Perfluorooctane Sulfonates)

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by HPLC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>003</u>
Perfluorooctane Sulfonates (PFOS) and related Acid,Metal Salt and Amide	mg/kg	10	ND



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# Test Report

No. CANEC1416356301

Date: 10 Oct 2014

Page 10 of 22

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
Perfluorooctane Sulfonates (PFOS) and related Acid, Metal Salt and Amide	mg/kg	10	ND

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>007</u>
Perfluorooctane Sulfonates (PFOS) and related Acid, Metal Salt and Amide	mg/kg	10	ND

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>009</u>
Perfluorooctane Sulfonates (PFOS) and related Acid, Metal Salt and Amide	mg/kg	10	ND

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>012</u>
Perfluorooctane Sulfonates (PFOS) and related Acid, Metal Salt and Amide	mg/kg	10	ND

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>015</u>
Perfluorooctane Sulfonates (PFOS) and related Acid, Metal Salt and Amide	mg/kg	10	ND

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>016</u>
Perfluorooctane Sulfonates (PFOS) and related Acid, Metal Salt and Amide	mg/kg	10	ND

**Notes :**

For reference: commission regulation (EU) No 757/2010 amending regulation (EC) No 850/2004:  
 (1) For the purposes of this entry, Article 4(1) (b) shall apply to concentrations of PFOS equal to or below 10 mg/kg (0,001 % by weight) when it occurs in substances or in preparations.  
 (2) For the purposes of this entry, Article 4(1) (b) shall apply to concentrations of PFOS in semi-finished products or articles, or parts thereof, if the concentration of PFOS is lower than 0,1 % by weight calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS or, for textiles or other coated materials, if the amount of PFOS is lower than 1µg /m2 of the coated material.

Remark1: The result(s) of specimen 005, 012 shown is/are of the total weight of wet sample.

Remark2: Results & photo(s) of this report refer to test report CANEC1403103813.



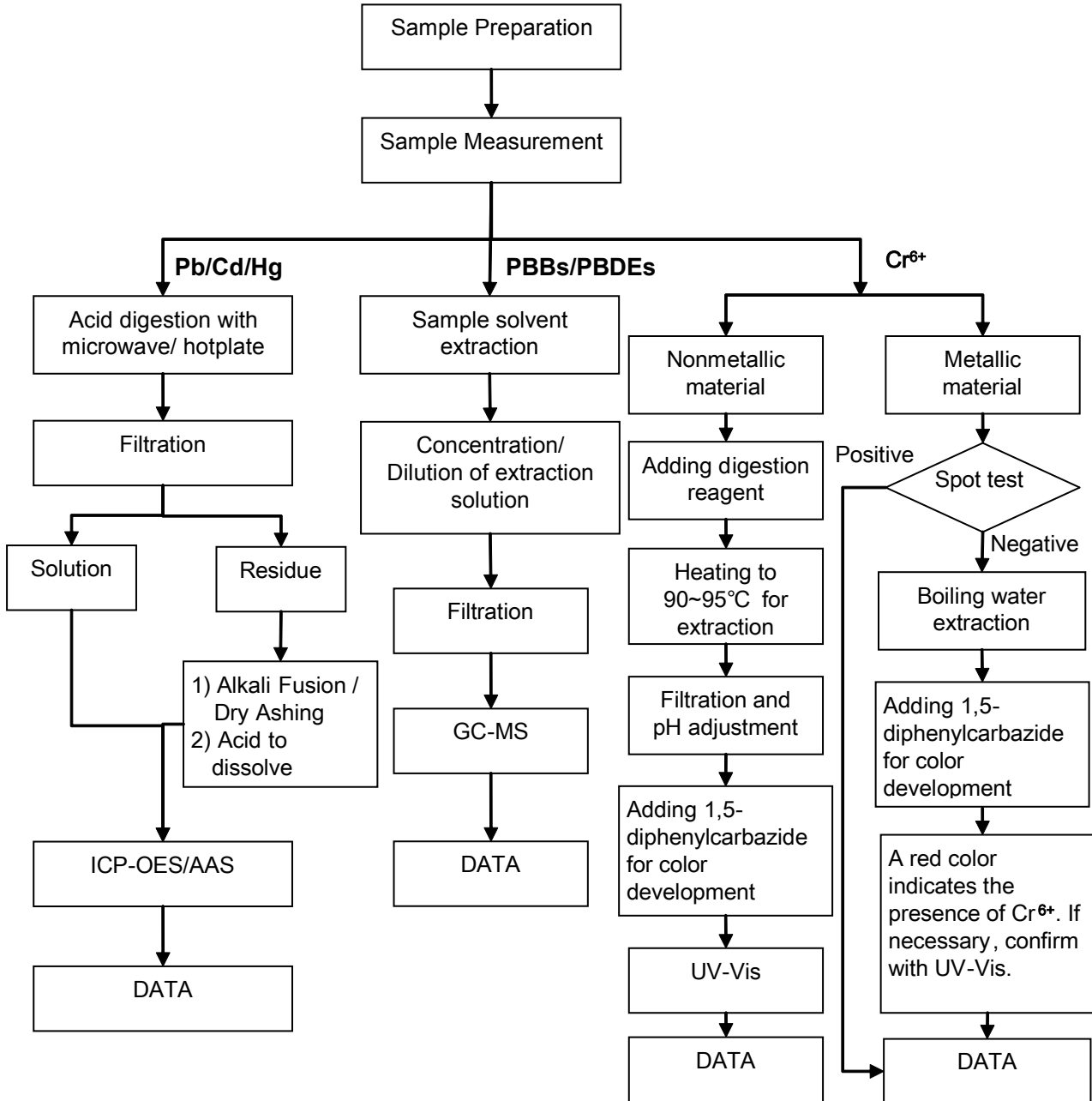
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RoHS Testing Flow Chart

- 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 (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded).



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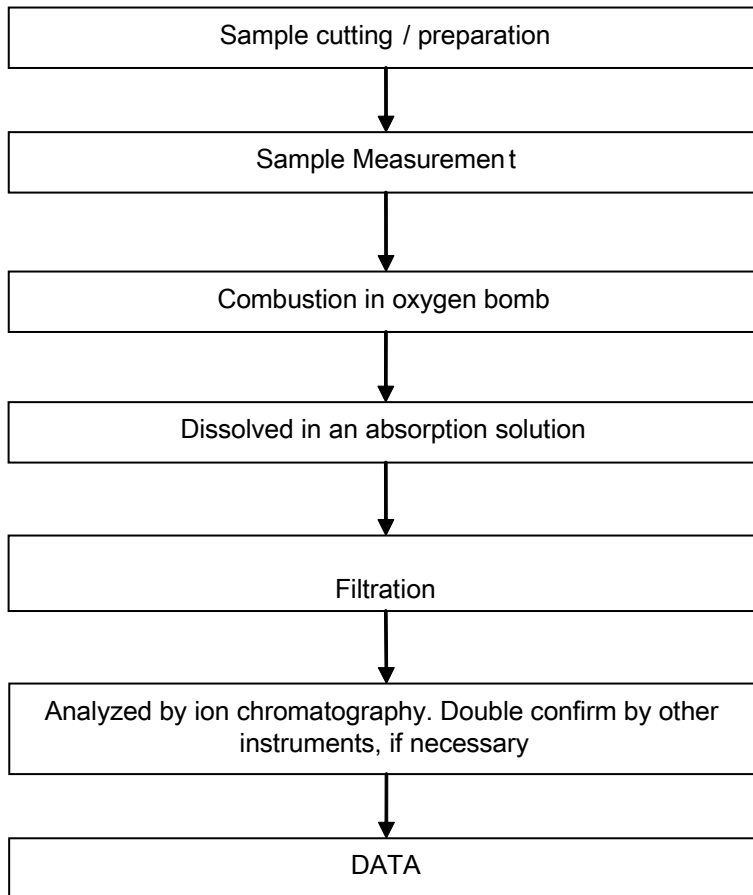
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Halogen Testing Flow Chart

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



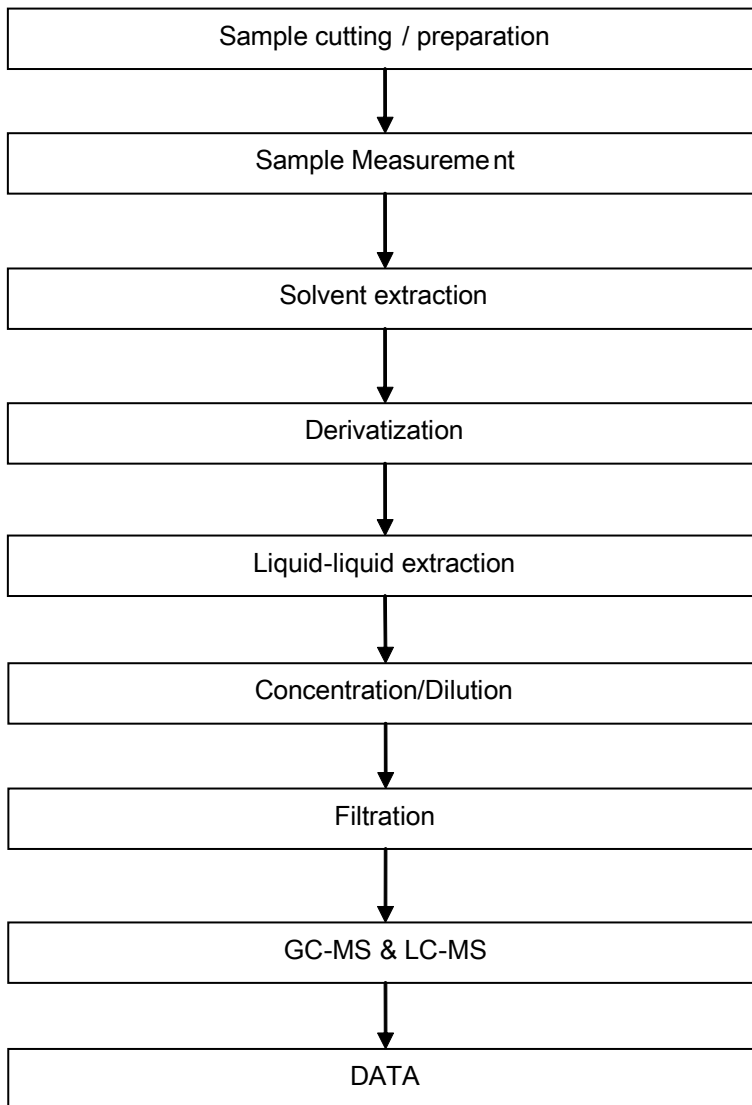
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TBBP-A Testing Flow Chart

- 1) Name of the person who made testing: Cutey Yu
- 2) Name of the person in charge of testing: Yolanda Wei



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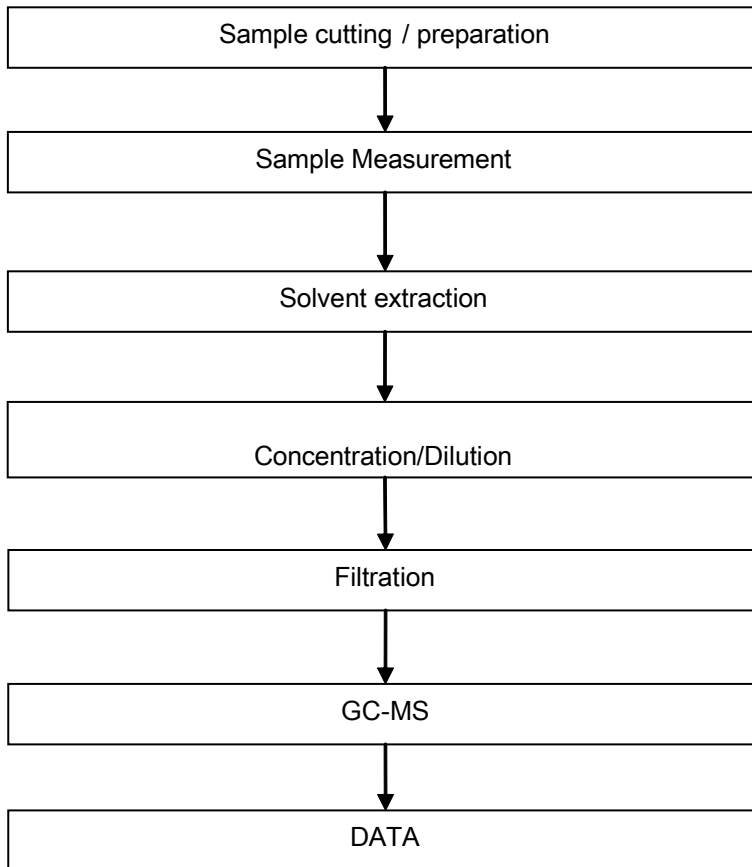
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HBCDD Testing Flow Chart

- 1) Name of the person who made testing: Cutey Yu
- 2) Name of the person in charge of testing: Yolanda Wei



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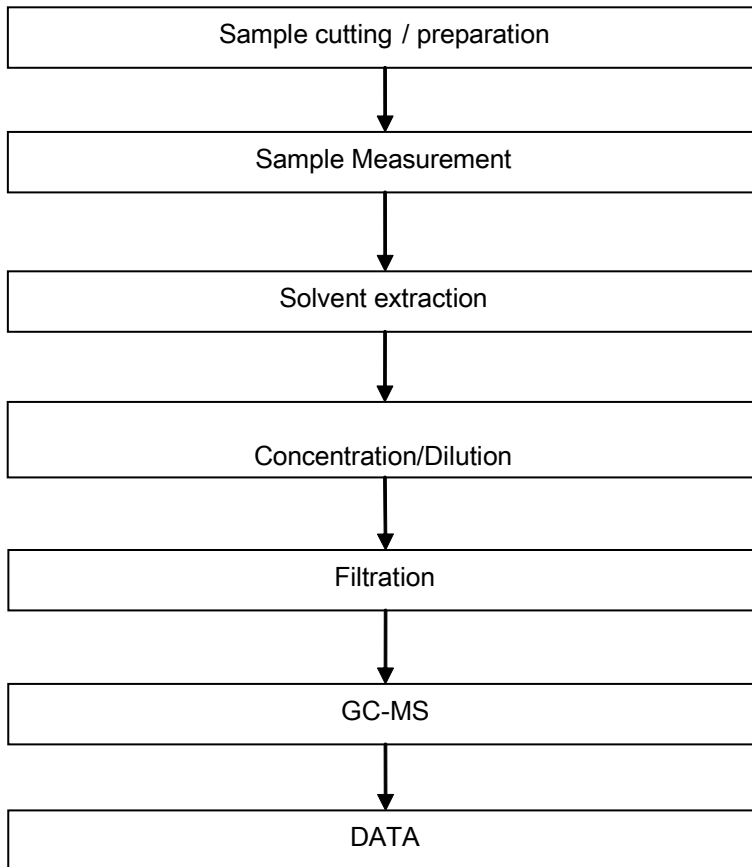
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### PAHs Testing Flow Chart

- 1) Name of the person who made testing: Cutey Yu
- 2) Name of the person in charge of testing: Yolanda Wei



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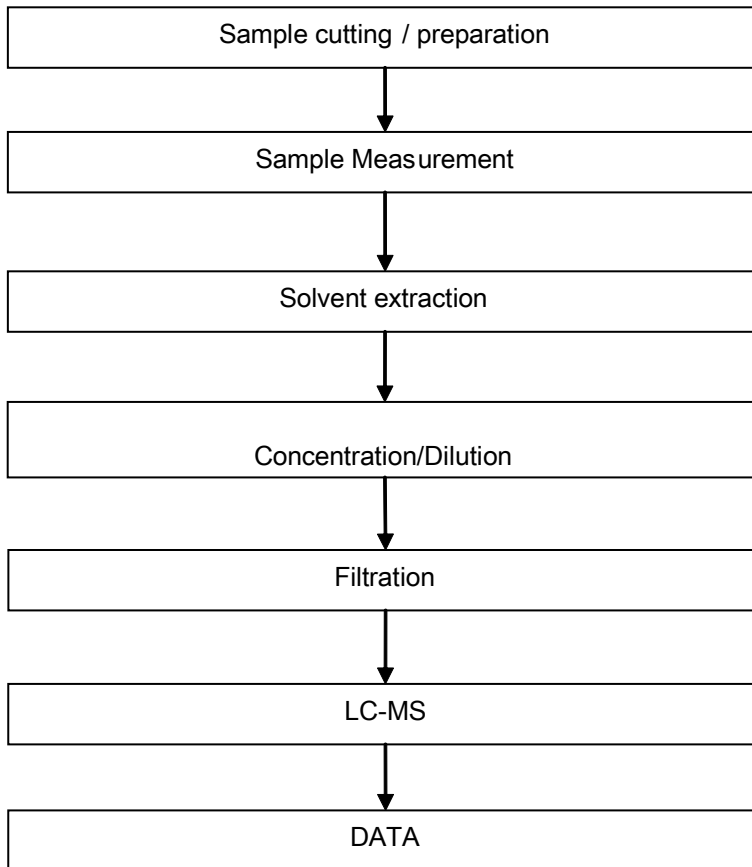
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PFOA / PFOS Testing Flow Chart

- 1) Name of the person who made testing: Tina Zhao
- 2) Name of the person in charge of testing: Yolanda Wei



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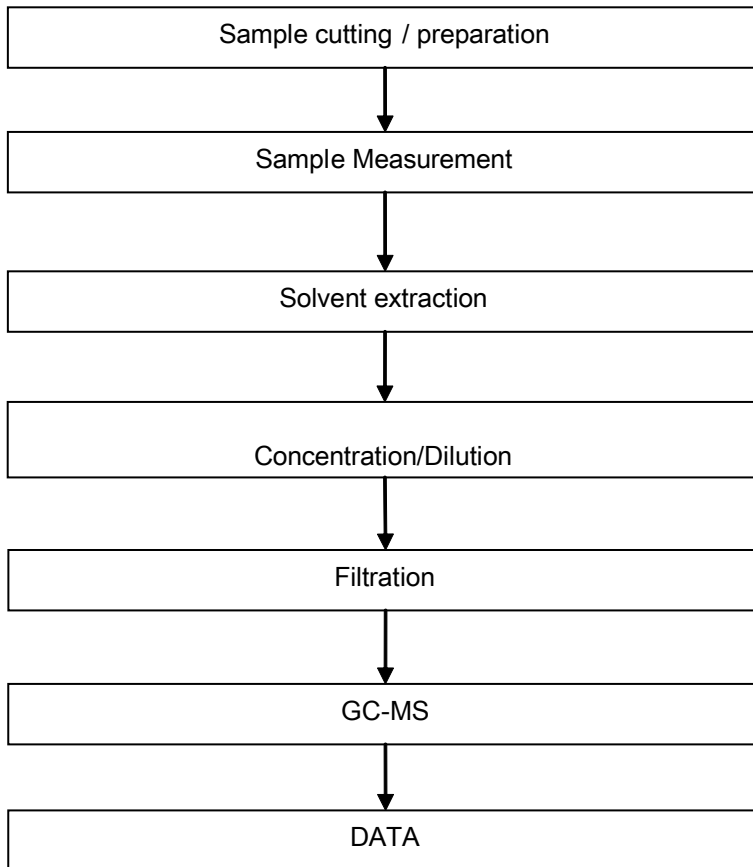
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Dimethyl Fumarate Testing Flow Chart

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- 2) Name of the person in charge of testing: Yolanda Wei

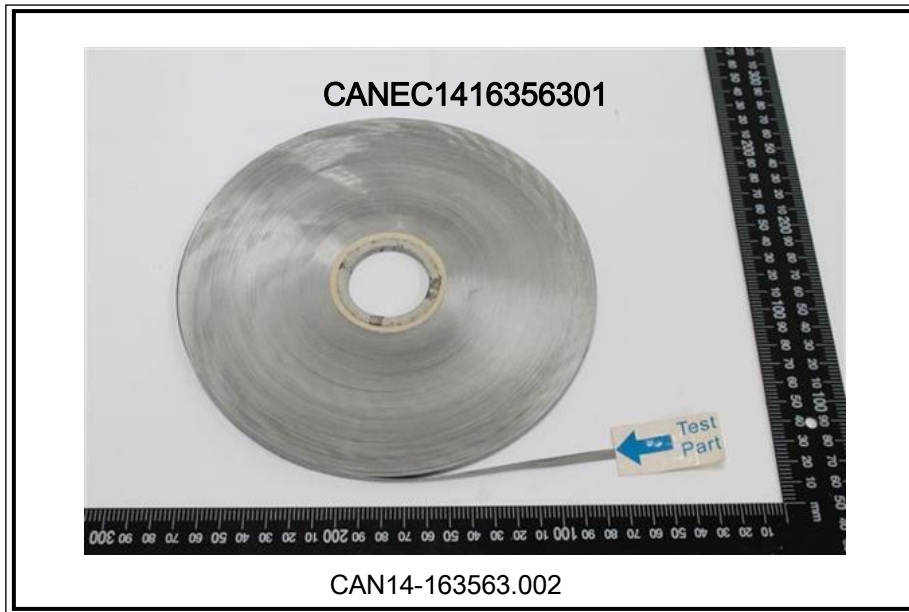
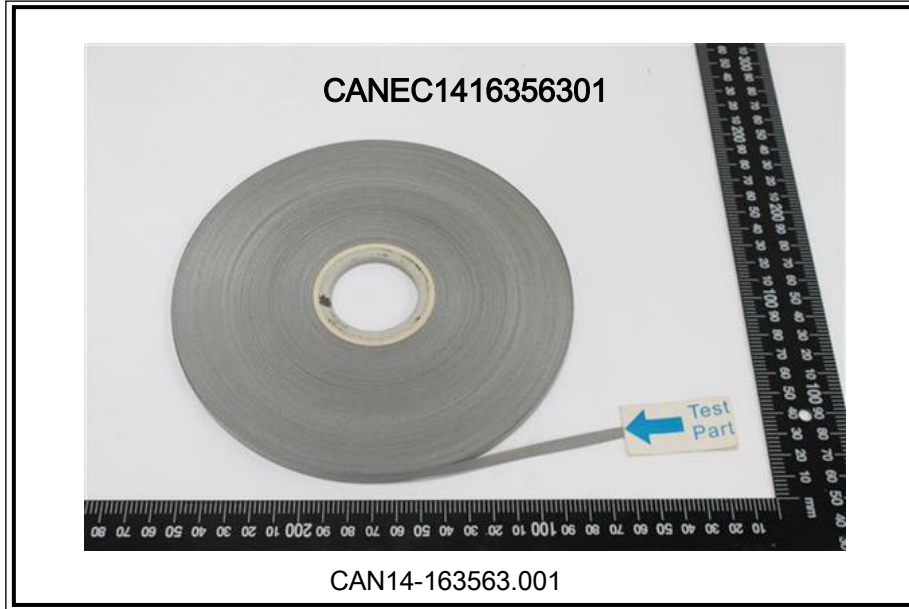


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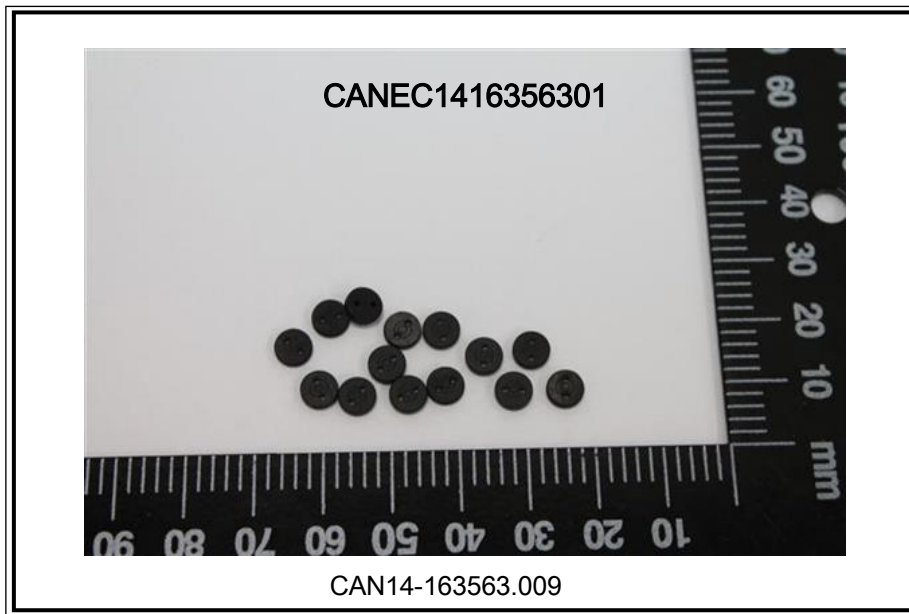
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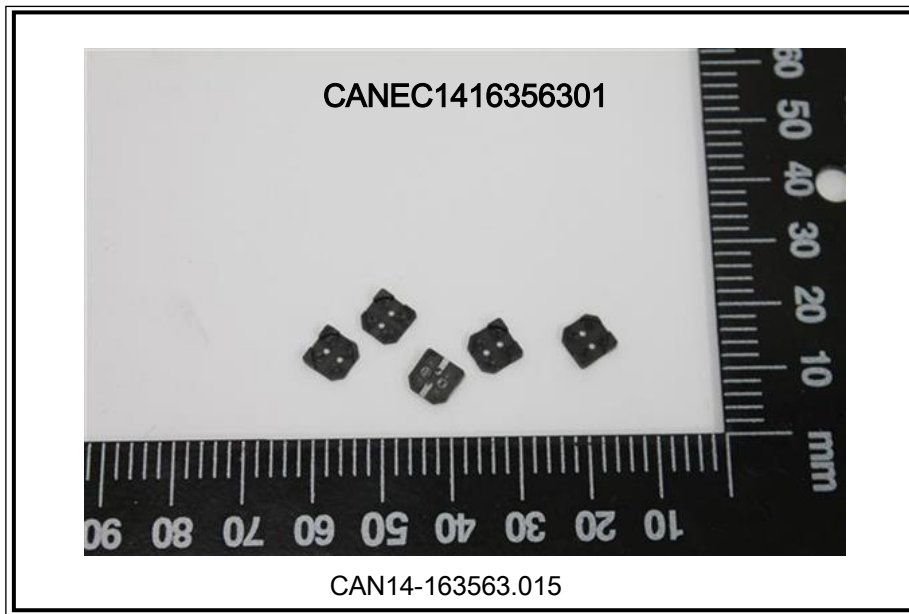
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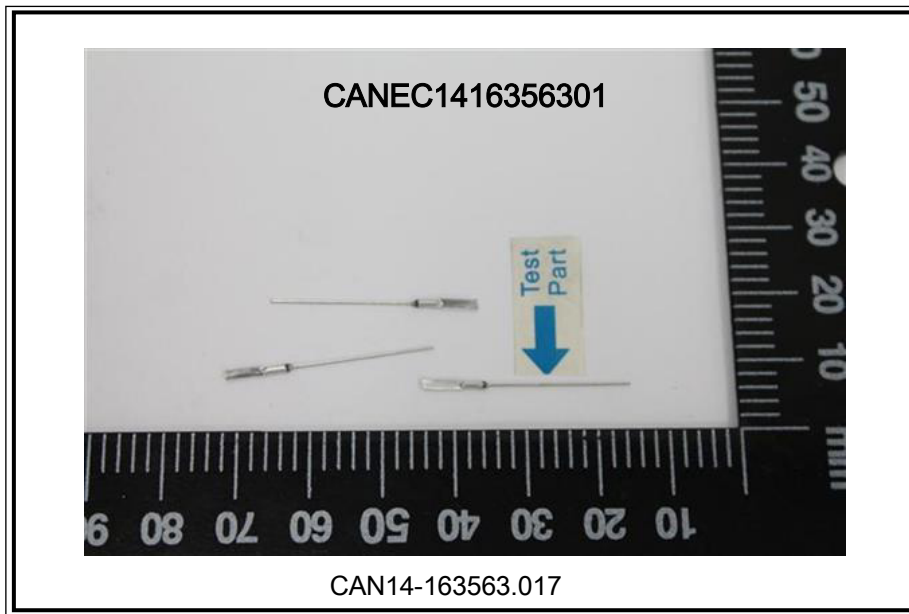
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