



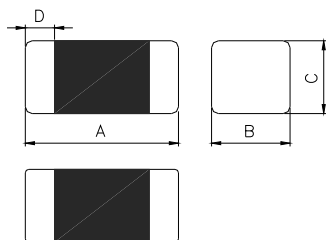
# High Current Ferrite Chip Bead(Lead Free) HCB2012KF-121T20



## 1.Features

1. Monolithic inorganic material construction.
2. Closed magnetic circuit avoids crosstalk.
3. Suitable for reflow soldering.
4. Shapes and dimensions follow E.I.A. spec.
5. Available in various sizes.
6. Excellent solder ability and heat resistance.
7. High reliability.
8. 100% Lead(Pb) & Halogen-Free and RoHS compliant.
9. Low DC resistance structure of electrode to prevent wasteful electric power consumption.
10. Operating Temperature: -55~+125°C (Including self-temperature rise)

## 2.Dimensions



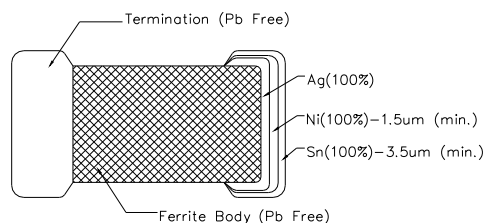
| Chip Size |           |
|-----------|-----------|
| A         | 2.00±0.20 |
| B         | 1.25±0.20 |
| C         | 0.85±0.20 |
| D         | 0.50±0.30 |

Units: mm

## 3.Part Numbering



- A: Series
- B: Dimension L x W
- C: Material Lead Free Material
- D: Impedance 121=120Ω
- E: Packaging T=Taping and Reel, B=Bulk(Bags)
- F: Rated Current 20=2000 mA

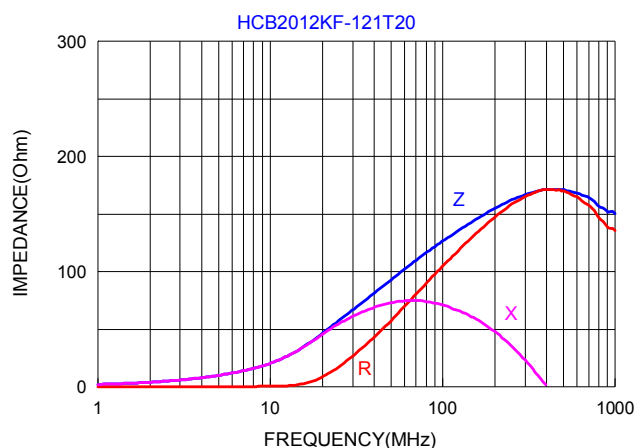


## 4.Specification

| Tai-Tech Part Number | Impedance (Ω) | Test Frequency (Hz) | DC Resistance (Ω) max. | Rated Current (mA) max. |
|----------------------|---------------|---------------------|------------------------|-------------------------|
| HCB2012KF-121T20     | 120±25%       | 60mV/100M           | 0.10                   | 2000                    |

- Rated current: based on temperature rise test
- In compliance with EIA 595

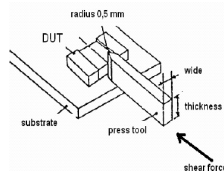
### ■ Impedance-Frequency Characteristics



## 5. Reliability and Test Condition

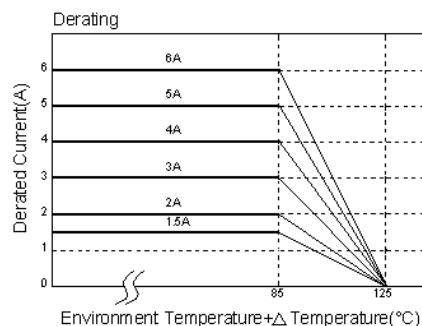
| Item                               | Performance  |                          |           |                            |     | Test Condition  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
|------------------------------------|--|--------------------------|-----------|----------------------------|-----|---|------|------------------|--------------------------|-----------|----------------------------|-----|----|----|-----------|------|------|----|----|-----------|------|
|                                    | FCB  | FCM                      | HCB       | GHB                        | FCA |   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Series No.                         | FCB  | FCM                      | HCB       | GHB                        | FCA | --  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Operating Temperature              | -55~+125℃<br>(Including self-temperature rise)   |                          |           |                            |     | --  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Transportation Storage Temperature | -55~+125℃<br>(on board)  |                          |           |                            |     | For long storage conditions, please see the Application Notice  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Impedance (Z)                      | Refer to standard electrical characteristics list  |                          |           |                            |     | Agilent4291<br>Agilent E4991<br>Agilent4287<br>Agilent16192   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| DC Resistance                      |  |                          |           |                            |     | Agilent 4338  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Rated Current                      |  |                          |           |                            |     | DC Power Supply<br>Over Rated Current requirements, there will be some risk   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Temperature Rise Test              | Rated Current < 1A ΔT 20℃Max<br>Rated Current ≧ 1A ΔT 40℃Max   |                          |           |                            |     | 1. Applied the allowed DC current.<br>2. Temperature measured by digital surface thermometer.   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Life test                          | Appearance: no damage.   |                          |           |                            |     | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Temperature: 125±2℃<br>Applied current: rated current.<br>Duration: 1000±12hrs.<br>Measured at room temperature after placing for 24±2 hrs.  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Load Humidity                      | Impedance: within±15%of initial value.<br>Inductance: within±10%of initial value.<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value                              |                          |           |                            |     | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Humidity: 85±2%R.H.<br>Temperature: 85±2℃.<br>Duration: 1000hrs Min. with 100% rated current.<br>Measured at room temperature after placing for 24±2 hrs.  |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Thermal shock                      | Appearance: no damage.<br>Impedance: within±15%of initial value.<br>Inductance: within±10%of initial value.<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value    |                          |           |                            |     | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Condition for 1 cycle<br>Step1: -55±2℃ 30±5 min.<br>Step2: 25±2℃ ≧0.5min<br>Step3: +125±2℃ 30±5min.<br>Number of cycles: 500<br>Measured at room temperature after placing for 24±2 hrs.   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Vibration                          | Appearance : No damage.<br>Impedance : within±15% of initial value<br>Inductance : within±10% of initial value<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value |                          |           |                            |     | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Oscillation Frequency: 10~2K~10Hz for 20 minutes<br>Equipment : Vibration checker<br>Total Amplitude:1.52mm±10%<br>Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations) °   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Bending                            | Appearance : No damage.<br>Impedance : within±10% of initial value<br>Inductance : within±10% of initial value<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value |                          |           |                            |     | Shall be mounted on a FR4 substrate of the following dimensions:<br>>=0805inch(2012mm):40x100x1.2mm<br><0805inch(2012mm):40x100x0.8mm<br>Bending depth:<br>>=0805inch(2012mm):1.2mm<br><0805inch(2012mm):0.8mm<br>Duration of 10 sec for a min.   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Shock                              | Appearance : No damage.<br>Impedance : within±10% of initial value<br>Inductance : within±10% of initial value<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value |                          |           |                            |     | Test condition:<br><table border="1"> <thead> <tr> <th>Type</th> <th>Peak Value (g's)</th> <th>Normal duration (D) (ms)</th> <th>Wave form</th> <th>Velocity change (V)/ft/sec</th> </tr> </thead> <tbody> <tr> <td>SMD</td> <td>50</td> <td>11</td> <td>Half-sine</td> <td>11.3</td> </tr> <tr> <td>Lead</td> <td>50</td> <td>11</td> <td>Half-sine</td> <td>11.3</td> </tr> </tbody> </table> | Type | Peak Value (g's) | Normal duration (D) (ms) | Wave form | Velocity change (V)/ft/sec | SMD | 50 | 11 | Half-sine | 11.3 | Lead | 50 | 11 | Half-sine | 11.3 |
| Type                               | Peak Value (g's)   | Normal duration (D) (ms) | Wave form | Velocity change (V)/ft/sec |     |   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| SMD                                | 50   | 11                       | Half-sine | 11.3                       |     |   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Lead                               | 50   | 11                       | Half-sine | 11.3                       |     |   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |
| Solderability                      | More than 95% of the terminal electrode should be covered with solder.   |                          |           |                            |     | Preheat: 150℃,60sec.<br>Solder: Sn96.5%-Ag3%-Cu0.5%<br>Solder temperature: 245±5℃<br>Flux for lead free: Rosin. 9.5%<br>Depth: completely cover the termination.<br>Dip time: 4±1sec.   |      |                  |                          |           |                            |     |    |    |           |      |      |    |    |           |      |

| Item                            | Performance  | Test Condition  |                  |          |  |                      |
|---------------------------------|--|---|------------------|----------|--|----------------------|
| Resistance to Soldering<br>Heat | Appearance : No damage.<br>Impedance : within±15% of initial value<br>Inductance : within±10% of initial value<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value | Number of heat cycles: 1  |                  |          |  |                      |
|                                 |  | <table border="1"> <tr> <th>Temperature (°C)</th> <th>Time (s)</th> <th>Temperature ramp/immersion and emersion rate</th> </tr> <tr> <td>260 ±5 (solder temp)</td> <td>10 ±1</td> <td>25mm/s ±6 mm/s</td> </tr> </table>  | Temperature (°C) | Time (s) | Temperature ramp/immersion and emersion rate | 260 ±5 (solder temp) |
| Temperature (°C)                | Time (s)   | Temperature ramp/immersion and emersion rate  |                  |          |  |                      |
| 260 ±5 (solder temp)            | 10 ±1  | 25mm/s ±6 mm/s  |                  |          |  |                      |
| Terminal strength               | Appearance : No damage.<br>Impedance : within±15% of initial value<br>Inductance : within±10% of initial value<br>Q : Shall not exceed the specification value.<br>RDC : within ±15% of initial value and shall not exceed the specification value | Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020D Classification Reflow Profiles)<br>Component mounted on a PCB apply a force >0805inch(2012mm):1kg <=0805inch(2012mm):0.5kg to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to shock the component being tested. |                  |          |  |                      |



**\*\*Derating Curve**

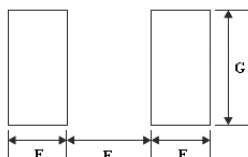
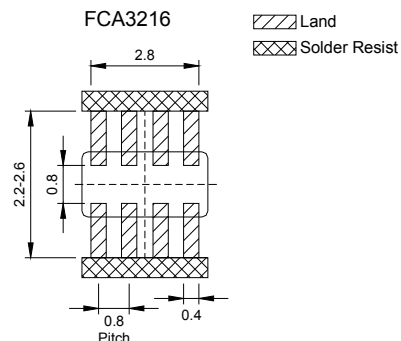
For the ferrite chip bead which withstanding current over 1.5A, as the operating temperature over 85°C, the derating current information is necessary to consider with. For the detail derating of current, please refer to the Derated Current vs. Operating Temperature curve.



**6.Soldering and Mounting**

**6-1. Recommended PC Board Pattern**

| Chip Size |      |          |           |           | Land Patterns For Reflow Soldering |       |       |       |
|-----------|------|----------|-----------|-----------|------------------------------------|-------|-------|-------|
| Series    | Type | A(mm)    | B(mm)     | C(mm)     | D(mm)                              | E(mm) | F(mm) | G(mm) |
| FCB       | 0603 | 0.6±0.03 | 0.30±0.03 | 0.30±0.03 | 0.15±0.05                          | 0.35  | 0.30  | 0.40  |
|           | 1005 | 1.0±0.10 | 0.50±0.10 | 0.50±0.10 | 0.25±0.10                          | 0.50  | 0.40  | 0.60  |
| FCM       | 1608 | 1.6±0.15 | 0.80±0.15 | 0.80±0.15 | 0.30±0.20                          | 0.80  | 0.85  | 0.95  |
| HCB       | 2012 | 2.0±0.20 | 1.25±0.20 | 0.85±0.20 | 0.50±0.30                          | 1.05  | 1.00  | 1.45  |
|           |      | 2.0±0.20 | 1.25±0.20 | 1.25±0.20 | 0.50±0.30                          |       |       |       |
| GHB       |      |          |           |           |                                    |       |       |       |
| FCI       | 3216 | 3.2±0.20 | 1.60±0.20 | 1.10±0.20 | 0.50±0.30                          | 1.05  | 2.20  | 1.80  |
| FHI       | 3225 | 3.2±0.20 | 2.50±0.20 | 1.30±0.20 | 0.50±0.30                          | 1.05  | 2.20  | 2.70  |
| FCH       |      |          |           |           |                                    |       |       |       |
| HCI       | 4516 | 4.5±0.20 | 1.60±0.20 | 1.60±0.20 | 0.50±0.30                          | 1.05  | 3.30  | 1.80  |
|           | 4532 | 4.5±0.20 | 3.20±0.20 | 1.50±0.20 | 0.50±0.30                          | 1.05  | 3.30  | 3.40  |



PC board should be designed so that products can prevent damage from mechanical stress when warping the board.

6-2. Soldering

Mildly activated rosin fluxes are preferred. The terminations are suitable for re-flow soldering systems. If hand soldering cannot be avoided, the preferred technique is the utilization of hot air soldering tools.

Note.

If wave soldering is used, there will be some risk.

Re-flow soldering temperatures below 240 degrees, there will be non-wetting risk

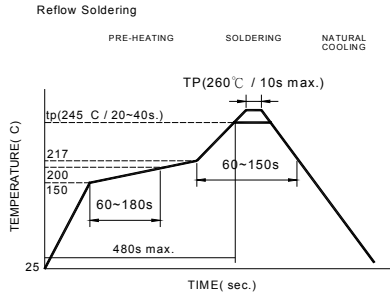
6-2.1 Lead Free Solder re-flow:

Recommended temperature profiles for lead free re-flow soldering in Figure 1. (Referred to J-STD-020C)

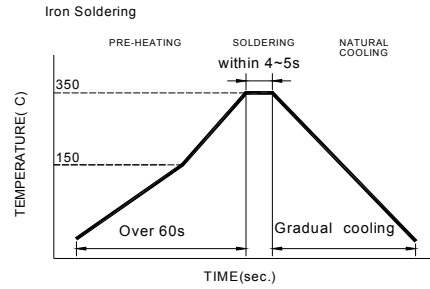
6-2.2 Soldering Iron:

Products attachment with a soldering iron is discouraged due to the inherent process control limitations. If a soldering iron must be employed the following precautions are recommended. for Iron Soldering in Figure 2.

- Preheat circuit and products to 150°C
- Never contact the ceramic with the iron tip
- Use a 20 watt soldering iron with tip diameter of 1.0mm
- 350°C tip temperature (max)
- 1.0mm tip diameter (max)
- Limit soldering time to 4~5sec.



Reflow times: 3 times max  
Fig.1

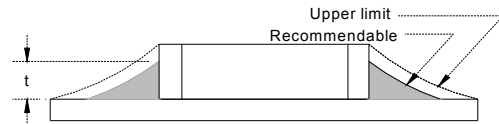


Iron Soldering times : 1 times max  
Fig.2

6-2.3 Solder Volume:

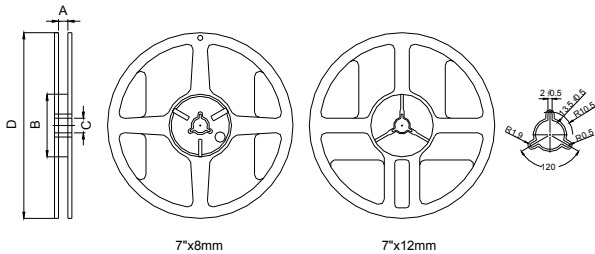
Accordingly increasing the solder volume, the mechanical stress to product is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance. Solder shall be used not to be exceed as shown in right side:

Minimum fillet height = soldering thickness + 25% product height



7. Packaging Information

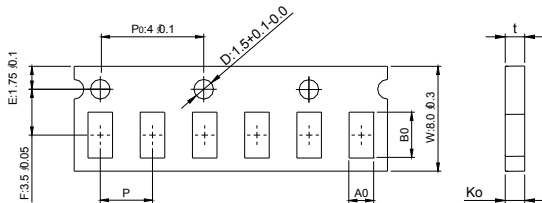
7-1. Reel Dimension



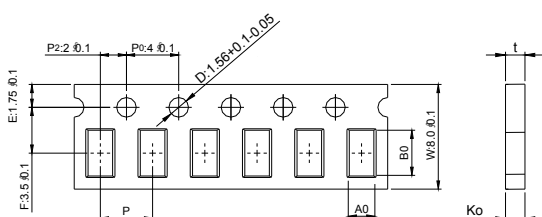
| Type    | A(mm)    | B(mm) | C(mm)    | D(mm) |
|---------|----------|-------|----------|-------|
| 7"x8mm  | 9.0±0.5  | 60±2  | 13.5±0.5 | 178±2 |
| 7"x12mm | 13.5±0.5 | 60±2  | 13.5±0.5 | 178±2 |

7-2.1 Tape Dimension / 8mm

Material of taping is paper

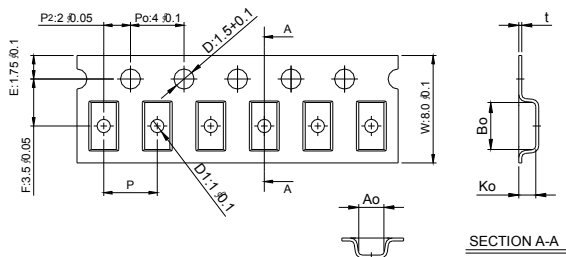


| Size   | Bo(mm)    | Ao(mm)    | Ko(mm)    | P(mm)    | t(mm)     |
|--------|-----------|-----------|-----------|----------|-----------|
| 060303 | 0.70±0.06 | 0.40±0.06 | 0.45max   | 2.0±0.05 | 0.45max   |
| 100505 | 1.12±0.03 | 0.62±0.03 | 0.60±0.03 | 2.0±0.05 | 0.60±0.03 |



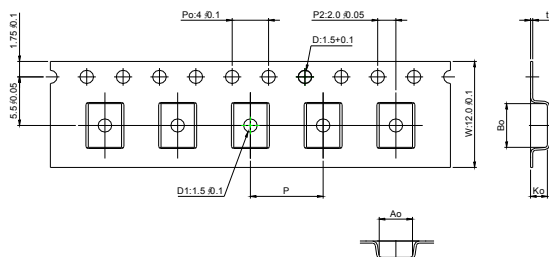
| Size   | Bo(mm)    | Ao(mm)          | Ko(mm)    | P(mm)    | t(mm)     |
|--------|-----------|-----------------|-----------|----------|-----------|
| 160808 | 1.80±0.05 | 0.96+0.05/-0.03 | 0.95±0.05 | 4.0±0.10 | 0.95±0.05 |
| 201209 | 2.10±0.05 | 1.30±0.05       | 0.95±0.05 | 4.0±0.10 | 0.95±0.05 |

Material of taping is plastic



| Size   | Bo(mm)    | Ao(mm)    | Ko(mm)    | P(mm)    | t(mm)     | D1(mm)   |
|--------|-----------|-----------|-----------|----------|-----------|----------|
| 201212 | 2.10±0.10 | 1.28±0.10 | 1.28±0.10 | 4.0±0.10 | 0.22±0.05 | 1.0±0.10 |
| 321611 | 3.35±0.10 | 1.75±0.10 | 1.25±0.10 | 4.0±0.10 | 0.23±0.05 | 1.0±0.10 |
| 322513 | 3.42±0.10 | 2.77±0.10 | 1.55±0.10 | 4.0±0.10 | 0.22±0.05 | 1.0±0.10 |
| 321609 | 3.40±0.10 | 1.77±0.10 | 1.04±0.10 | 4.0±0.10 | 0.22±0.05 | 1.0±0.10 |

7-2.2 Tape Dimension / 12mm

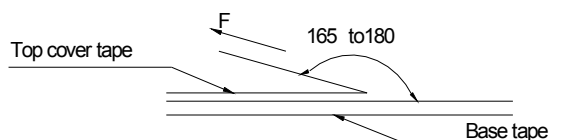


| Size   | Bo(mm)    | Ao(mm)    | Ko(mm)    | P(mm)    | t(mm)     | D1(mm)   |
|--------|-----------|-----------|-----------|----------|-----------|----------|
| 451616 | 4.70±0.10 | 1.75±0.10 | 1.75±0.10 | 4.0±0.10 | 0.24±0.05 | 1.5±0.10 |
| 453215 | 4.70±0.10 | 3.45±0.10 | 1.60±0.10 | 8.0±0.10 | 0.24±0.05 | 1.5±0.10 |

7-3. Packaging Quantity

| Chip Size   | 453215 | 451616 | 322513 | 321611 | 321609 | 201212 | 201209 | 160808 | 100505 | 060303 |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Chip / Reel | 1000   | 2000   | 2500   | 3000   | 3000   | 2000   | 4000   | 4000   | 10000  | 15000  |
| Inner box   | 4000   | 8000   | 12500  | 15000  | 15000  | 10000  | 20000  | 20000  | 50000  | 75000  |
| Middle box  | 20000  | 40000  | 62500  | 75000  | 75000  | 50000  | 100000 | 100000 | 250000 | 375000 |
| Carton      | 40000  | 80000  | 125000 | 150000 | 150000 | 100000 | 200000 | 200000 | 500000 | 750000 |

7-4. Tearing Off Force



The force for tearing off cover tape is 15 to 60 grams in the arrow direction under the following conditions.

| Room Temp. (°C) | Room Humidity (%) | Room atm (hPa) | Tearing Speed mm/min |
|-----------------|-------------------|----------------|----------------------|
| 5~35            | 45~85             | 860~1060       | 300                  |

Application Notice

- Storage Conditions(component level)
  - To maintain the solder ability of terminal electrodes:
    - TAI-TECH products meet IPC/JEDEC J-STD-020D standard-MSL, level 1.
    - Temperature and humidity conditions: Less than 40°C and 60% RH.
    - Recommended products should be used within 12 months from the time of delivery.
    - The packaging material should be kept where no chlorine or sulfur exists in the air.
- Transportation
  - Products should be handled with care to avoid damage or contamination from perspiration and skin oils.
  - The use of tweezers or vacuum pick up is strongly recommended for individual components.
  - Bulk handling should ensure that abrasion and mechanical shock are minimized.

## 測試報告 Test Report

號碼(No.) : CE/2018/C0389

日期(Date) : 2018/12/11

頁數(Page): 1 of 15

西北臺慶科技股份有限公司 / TAI-TECH ADVANCED ELECTRONICS CO., LTD.



(臺慶精密電子(昆山)有限公司 / TAI-TECH ADVANCED ELECTRONICS (KUN-SHAN) CO. LTD.)

(慶邦電子元器件(泗洪)有限公司 / TAIPAQ ELECTRONICS (SI-HONG) CO., LTD.)

桃園市楊梅區幼獅工業區幼四路1號 / NO. 1, YOU 4TH ROAD, YOUTH INDUSTRIAL DISTRICT, YANG-MEI, TAO-YUAN CITY, TAIWAN, R. O. C.)

(江蘇省昆山市蓬朗昆嘉高科技工業區郭澤路 / GUO-ZE ROAD, KUNJIA HI-TECH INDUSTRIAL PARK, KUN-SHAN, JIANG-SU, CHINA)

(中國, 江蘇省, 宿遷市, 泗洪縣, 經濟開發區杭州路南側, 建設北路東側 / THE SOUTH HANGZHOU ROAD AND THE EAST JIANSHE ROAD, ECONOMIC DEVELOPMENT ZONE, SIHONG COUNTY, SUQIANCITY, JIANGSU PROVINCE, P, R, CHINA)

以下測試樣品係由申請廠商所提供及確認 (The following sample(s) was/were submitted and identified by/on behalf of the applicant as):

|                             |   |  |
|-----------------------------|---|--|
| 樣品名稱(Sample Description)    | : | FERRITE CHIP BEAD、FERRITE CHIP INDUCTOR、ARRAY、MCF、MCM、YMW SERIES |
| 樣品型號(Style/Item No.)        | : | FERRITE CHIP BEAD、FERRITE CHIP INDUCTOR、ARRAY、MCF、MCM、YMW SERIES |
| 收件日期(Sample Receiving Date) | : | 2018/12/04   |
| 測試期間(Testing Period)        | : | 2018/12/04 to 2018/12/11   |

測試結果(Test Results) : 請參閱下一頁 (Please refer to following pages).

  
Troy Chang, Manager-Tech  
Signed for and on behalf of  
SGS TAIWAN LTD.  
Chemical Laboratory - Taipei



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# 測試報告

# Test Report

號碼(No.) : CE/2018/C0389

日期(Date) : 2018/12/11

頁數(Page): 2 of 15

西北臺慶科技股份有限公司 / TAI-TECH ADVANCED ELECTRONICS CO., LTD.



(臺慶精密電子(昆山)有限公司 / TAI-TECH ADVANCED ELECTRONICS (KUN-SHAN) CO. LTD.)

(慶邦電子元器件(泗洪)有限公司 / TAIPAQ ELECTRONICS (SI-HONG) CO., LTD.)

桃園市楊梅區幼獅工業區幼四路1號 / NO. 1, YOU 4TH ROAD, YOUTH INDUSTRIAL DISTRICT, YANG-MEI, TAO-YUAN CITY, TAIWAN, R. O. C.)

(江蘇省昆山市蓬朗昆嘉高科技工業區郭澤路 / GUO-ZE ROAD, KUNJIA HI-TECH INDUSTRIAL PARK, KUN-SHAN, JIANG-SU, CHINA)

(中國, 江蘇省, 宿遷市, 泗洪縣, 經濟開發區杭州路南側, 建設北路東側 / THE SOUTH HANGZHOU ROAD AND THE EAST JIANSHE ROAD, ECONOMIC DEVELOPMENT ZONE, SIHONG COUNTY, SUQIANCITY, JIANGSU PROVINCE, P, R, CHINA)

## 測試結果(Test Results)

測試部位(PART NAME)No. 1 : 整體混測 (MIXED ALL PARTS)

| 測試項目<br>(Test Items)   | 單位<br>(Unit) | 測試方法<br>(Method)   | 方法偵測<br>極限值<br>(MDL) | 結果<br>(Result) |
|--|--------------|--|----------------------|----------------|
|  |              |  |                      | No. 1          |
| 鎘 / Cadmium (Cd)   | mg/kg        | 參考IEC 62321-5 (2013), 以感應耦合電漿原子發射光譜儀檢測. / With reference to IEC 62321-5 (2013) and performed by ICP-AES.   | 2                    | n. d.          |
| 鉛 / Lead (Pb)  | mg/kg        |  | 2                    | n. d.          |
| 汞 / Mercury (Hg)   | mg/kg        | 參考IEC 62321-4 (2013), 以感應耦合電漿原子發射光譜儀檢測. / With reference to IEC 62321-4 (2013) and performed by ICP-AES.   | 2                    | n. d.          |
| 六價鉻 / Hexavalent Chromium Cr(VI)   | mg/kg        | 參考IEC 62321-7-2 (2017), 以UV-VIS 檢測. / With reference to IEC 62321-7-2 (2017) and performed by UV-VIS.      | 8                    | n. d.          |
| 六溴環十二烷及所有主要被辨別出的異構物 / Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified ( $\alpha$ -HBCDD, $\beta$ -HBCDD, $\gamma$ -HBCDD) (CAS No.: 25637-99-4 and 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8)) | mg/kg        | 參考IEC 62321 (2008), 以氣相層析儀 / 質譜儀檢測. / With reference to IEC 62321 (2008). Analysis was performed by GC/MS. | 5                    | n. d.          |

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| 測試項目<br>(Test Items)             | 單位<br>(Unit) | 測試方法<br>(Method)   | 方法偵測<br>極限值<br>(MDL) | 結果<br>(Result) |
|----------------------------------|--------------|--|----------------------|----------------|
|                                  |              |  |                      | No. 1          |
| 多溴聯苯總和 / Sum of PBBs             | mg/kg        | 參考IEC 62321-6 (2015), 以氣相層析儀/質譜儀檢測。 / With reference to IEC 62321-6 (2015) and performed by GC/MS. | -                    | n. d.          |
| 一溴聯苯 / Monobromobiphenyl         | mg/kg        |  | 5                    | n. d.          |
| 二溴聯苯 / Dibromobiphenyl           | mg/kg        |  | 5                    | n. d.          |
| 三溴聯苯 / Tribromobiphenyl          | mg/kg        |  | 5                    | n. d.          |
| 四溴聯苯 / Tetrabromobiphenyl        | mg/kg        |  | 5                    | n. d.          |
| 五溴聯苯 / Pentabromobiphenyl        | mg/kg        |  | 5                    | n. d.          |
| 六溴聯苯 / Hexabromobiphenyl         | mg/kg        |  | 5                    | n. d.          |
| 七溴聯苯 / Heptabromobiphenyl        | mg/kg        |  | 5                    | n. d.          |
| 八溴聯苯 / Octabromobiphenyl         | mg/kg        |  | 5                    | n. d.          |
| 九溴聯苯 / Nonabromobiphenyl         | mg/kg        |  | 5                    | n. d.          |
| 十溴聯苯 / Decabromobiphenyl         | mg/kg        |  | 5                    | n. d.          |
| 多溴聯苯醚總和 / Sum of PBDEs           | mg/kg        |  | -                    | n. d.          |
| 一溴聯苯醚 / Monobromodiphenyl ether  | mg/kg        |  | 5                    | n. d.          |
| 二溴聯苯醚 / Dibromodiphenyl ether    | mg/kg        |  | 5                    | n. d.          |
| 三溴聯苯醚 / Tribromodiphenyl ether   | mg/kg        |  | 5                    | n. d.          |
| 四溴聯苯醚 / Tetrabromodiphenyl ether | mg/kg        |  | 5                    | n. d.          |
| 五溴聯苯醚 / Pentabromodiphenyl ether | mg/kg        |  | 5                    | n. d.          |
| 六溴聯苯醚 / Hexabromodiphenyl ether  | mg/kg        |  | 5                    | n. d.          |
| 七溴聯苯醚 / Heptabromodiphenyl ether | mg/kg        |  | 5                    | n. d.          |
| 八溴聯苯醚 / Octabromodiphenyl ether  | mg/kg        |  | 5                    | n. d.          |
| 九溴聯苯醚 / Nonabromodiphenyl ether  | mg/kg        | 5  | n. d.                |                |
| 十溴聯苯醚 / Decabromodiphenyl ether  | mg/kg        | 5  | n. d.                |                |

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| 測試項目<br>(Test Items)  | 單位<br>(Unit) | 測試方法<br>(Method)  | 方法偵測<br>極限值<br>(MDL) | 結果<br>(Result) |
|---|--------------|---|----------------------|----------------|
|   |              |   |                      | No. 1          |
| 鄰苯二甲酸丁苯甲酯 / BBP (Butyl Benzyl phthalate) (CAS No. : 85-68-7)                | mg/kg        | 參考 IEC 62321-8 (2017), 以氣相層析儀/質譜儀檢測. / With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS. | 50                   | n. d.          |
| 鄰苯二甲酸二丁酯 / DBP (Dibutyl phthalate) (CAS No. : 84-74-2)                      | mg/kg        |   | 50                   | n. d.          |
| 鄰苯二甲酸二(2-乙基己基)酯 / DEHP (Di- (2-ethylhexyl) phthalate) (CAS No. : 117-81-7)  | mg/kg        |   | 50                   | n. d.          |
| 鄰苯二甲酸二異丁酯 / DIBP (Di-isobutyl phthalate) (CAS No. : 84-69-5)                | mg/kg        |   | 50                   | n. d.          |
| 鄰苯二甲酸二異癸酯 / DIDP (Di-isodecyl phthalate) (CAS No. : 26761-40-0; 68515-49-1) | mg/kg        |   | 50                   | n. d.          |
| 鄰苯二甲酸二異壬酯 / DINP (Di-isononyl phthalate) (CAS No. : 28553-12-0; 68515-48-0) | mg/kg        |   | 50                   | n. d.          |
| 鄰苯二甲酸二正辛酯 / DNOP (Di-n-octyl phthalate) (CAS No. : 117-84-0)                | mg/kg        |   | 50                   | n. d.          |
| 鄰苯二甲酸二正己酯 / DNHP (Di-n-hexyl phthalate) (CAS No. : 84-75-3)                 | mg/kg        |   | 50                   | n. d.          |
| 鄰苯二甲酸二戊酯 / DNPP (Di-n-pentyl phthalate) (CAS No. : 131-18-0)                | mg/kg        |   | 50                   | n. d.          |

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| 測試項目<br>(Test Items)   | 單位<br>(Unit) | 測試方法<br>(Method)   | 方法偵測<br>極限值<br>(MDL) | 結果<br>(Result) |
|--|--------------|--|----------------------|----------------|
|  |              |  |                      | No. 1          |
| <b>鹵素 / Halogen</b>  |              |  |                      |                |
| 鹵素(氟) / Halogen-Fluorine (F)<br>(CAS No.: 14762-94-8)              | mg/kg        | 參考BS EN 14582 (2016), 以離子層析儀分析. / With reference to BS EN 14582 (2016). Analysis was performed by IC.              | 50                   | n. d.          |
| 鹵素(氯) / Halogen-Chlorine (Cl)<br>(CAS No.: 22537-15-1)             | mg/kg        |  | 50                   | n. d.          |
| 鹵素(溴) / Halogen-Bromine (Br)<br>(CAS No.: 10097-32-2)              | mg/kg        |  | 50                   | n. d.          |
| 鹵素(碘) / Halogen-Iodine (I) (CAS No.: 14362-44-8)                   | mg/kg        |  | 50                   | n. d.          |
| 全氟辛烷磺酸 / Perfluorooctane sulfonates (PFOS-Acid, Metal Salt, Amide) | mg/kg        | 參考US EPA 3550C (2007), 以液相層析儀/質譜儀檢測. / With reference to US EPA 3550C (2007). Analysis was performed by LC/MS.     | 10                   | n. d.          |
| 全氟辛酸 / PFOA (CAS No.: 335-67-1)                                    | mg/kg        |  | 10                   | n. d.          |
| 聚氯乙烯 / PVC   | **           | 以紅外光譜分析及焰色法檢測. / Analysis was performed by FTIR and FLAME Test.  | -                    | Negative       |
| 銻 / Antimony (Sb)  | mg/kg        | 參考US EPA 3052 (1996), 以感應耦合電漿原子發射光譜儀檢測. / With reference to US EPA 3052 (1996). Analysis was performed by ICP-AES. | 2                    | n. d.          |
| 砷 / Arsenic (As)   | mg/kg        |  | 2                    | n. d.          |
| 鈹 / Beryllium (Be)   | mg/kg        |  | 2                    | n. d.          |

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### 備註(Note) :

1. mg/kg = ppm ; 0.1wt% = 1000ppm
2. n. d. = Not Detected (未檢出)
3. MDL = Method Detection Limit (方法偵測極限值)
4. "-" = Not Regulated (無規格值)
5. \*\*= Qualitative analysis (No Unit) 定性分析(無單位)
6. Negative = Undetectable 陰性(未偵測到); Positive = Detectable 陽性(已偵測到)
7. 樣品的測試是基於申請人要求混合測試, 報告中的混合測試結果不代表其中個別單一材質的含量. (The samples was/were analyzed on behalf of the applicant as mixing sample in one testing. The above results was/were only given as the informality value.)

PFOS濃度在物質或製備中不得超過0.001%(10ppm), 在半成品、成品或零部件中不得超過0.1%(1000ppm), 在紡織品或塗層材料中不得超過 $1\mu\text{g}/\text{m}^2$ 。

(Outlawing PFOS as substances or preparations in concentrations above 0.001% (10ppm), in semi-finished products or articles or parts at a level above 0.1%(1000ppm), in textiles or other coated materials above  $1\mu\text{g}/\text{m}^2$ .)

8. 樣品的測試是基於申請人要求混合測試, 報告中的混合測試結果不代表其中個別單一材質的含量. (The samples was/were analyzed on behalf of the applicant as mixing sample in one testing. The above results was/were only given as the informality value.)

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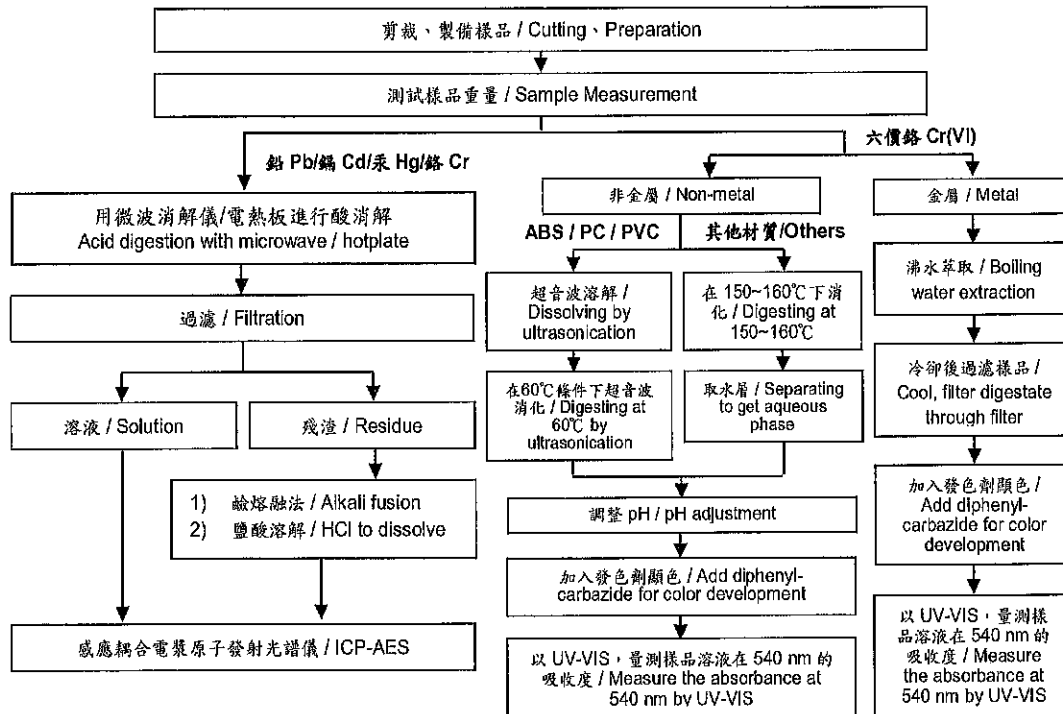
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### 重金屬流程圖 / Analytical flow chart of Heavy Metal

根據以下的流程圖之條件, 樣品已完全溶解。(六價鉻測試方法除外)

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

- 測試人員: 陳恩臻 / Technician: Rita Chen
- 測試負責人: 張啟興 / Supervisor: Troy Chang



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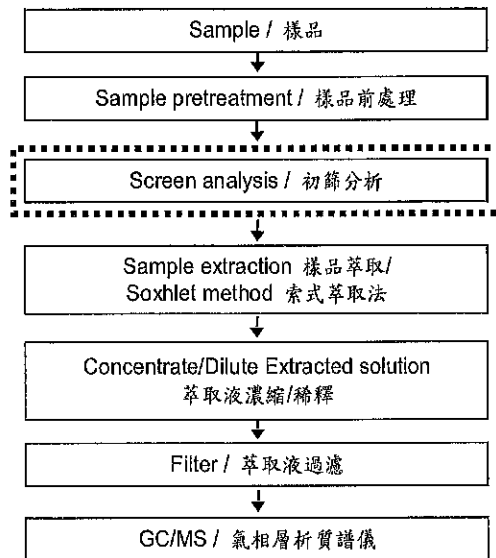
### 多溴聯苯/多溴聯苯醚分析流程圖 / Analytical flow chart - PBB/PBDE

- 測試人員: 涂雅苓 / Technician: Yaling Tu
- 測試負責人: 張啟興 / Supervisor: Troy Chang

初次測試程序 / First testing process —————>

選擇性篩檢程序 / Optional screen process .....>

確認程序 / Confirmation process - - - ->



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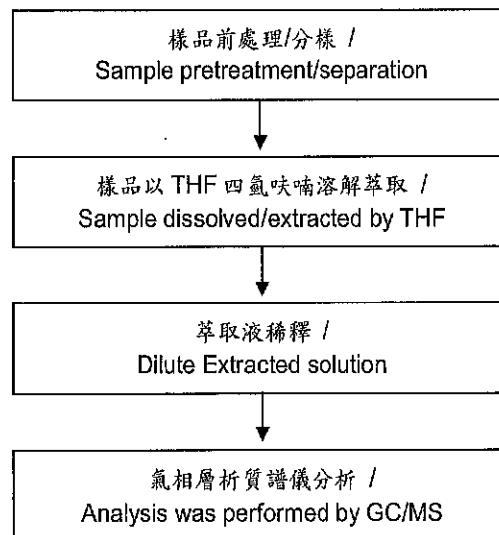
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### 可塑劑分析流程圖 / Analytical flow chart - Phthalate

- 測試人員: 涂雅琴 / Technician: Yaling Tu
- 測試負責人: 張啟興 / Supervisor: Troy Chang

**【測試方法/Test method: IEC 62321-8】**



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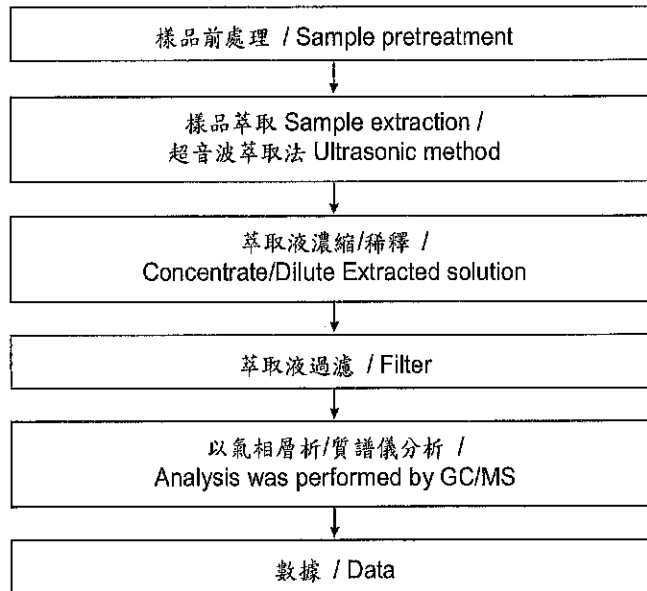
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### 六溴環十二烷分析流程圖 / Analytical flow chart - HBCDD

- 測試人員: 涂雅琴 / Technician: Yaling Tu
- 測試負責人: 張啟興 / Supervisor: Troy Chang



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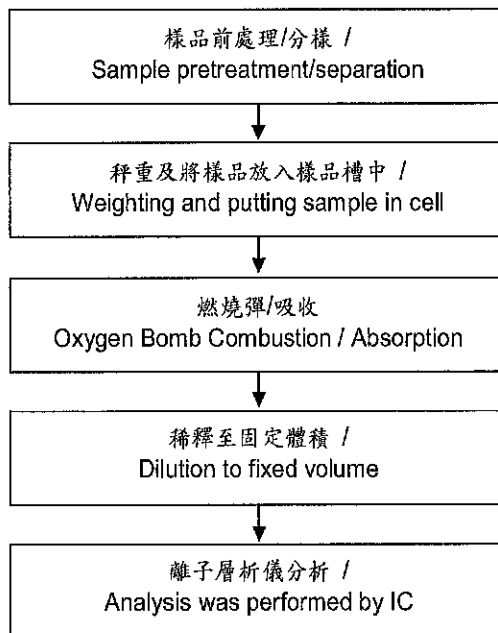
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### 鹵素分析流程圖 / Analytical flow chart - Halogen

- 測試人員: 陳思臻 / Technician: Rita Chen
- 測試負責人: 張啟興 / Supervisor: Troy Chang



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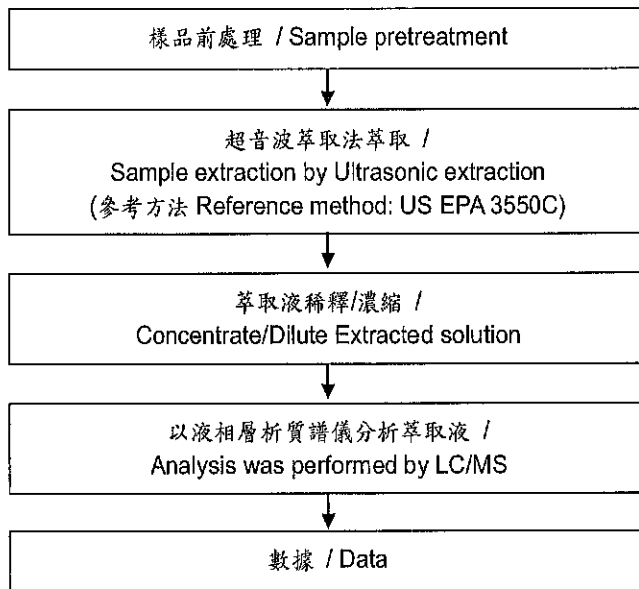
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### 全氟辛酸/全氟辛烷磺酸分析流程圖 / Analytical flow chart - PFOA/PFOS

- 測試人員：涂雅苓 / Technician: Yaling Tu
- 測試負責人：張啟興 / Supervisor: Troy Chang



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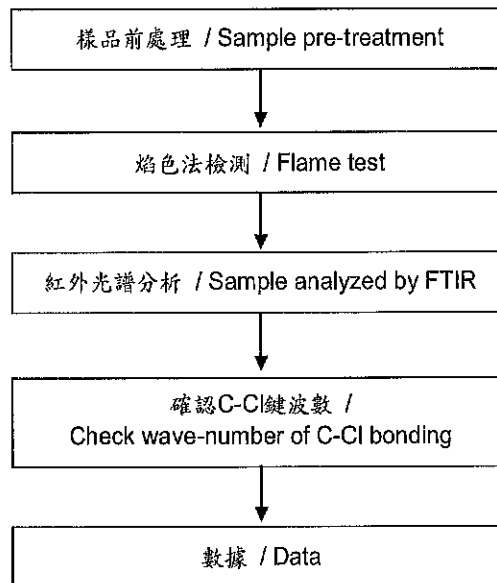
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### 聚氯乙烷物質判定分析流程圖 / Analysis flow chart - PVC

- 測試人員：涂雅琴 / Technician: Yaling Tu
- 測試負責人：張啟興 / Supervisor: Troy Chang



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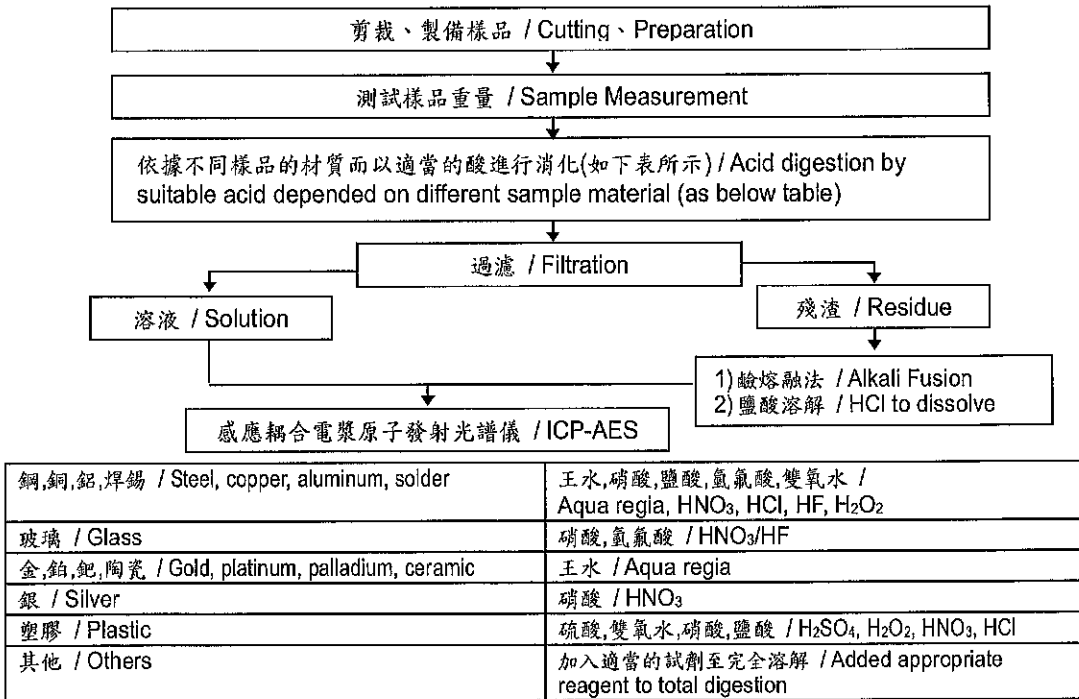
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根據以下的流程圖之條件, 樣品已完全溶解。 / These samples were dissolved totally by pre-conditioning method according to below flow chart.

- 測試人員: 陳思臻 / Technician: Rita Chen
- 測試負責人: 張啟興 / Supervisor: Troy Chang

元素以 ICP-AES 分析的消化流程圖  
(Flow Chart of digestion for the elements analysis performed by ICP-AES)



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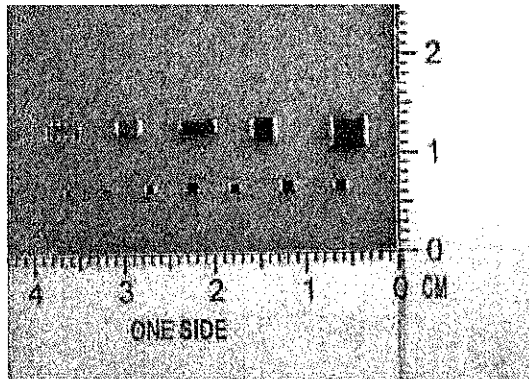
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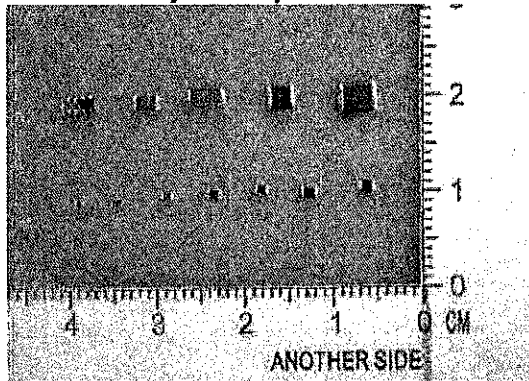
\* 照片中如有箭頭標示, 則表示為實際檢測之樣品/部位. \*

(The tested sample / part is marked by an arrow if it's shown on the photo.)

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