

# JACKCON *Electrolytic Capacitors*

## 105°C *LHK*SERIES

- 規格書

Item	Performance Characteristics													
Operating Temperature Range(°C)	-40+105°C 6.3 to 100VDC							-25+105°C 160 to 450VDC						
Capacitance Tolerance (%)	±20%													
Rated Voltage Range(v)	6.3	10	16	25	35	50	63	100	160	200	250	350	400	450
Dissipation Factor(tan δ %)max.	23	20	16	14	12	10	10	10	15	15	16	20	20	20
	For Capacitance > 1000uF, add 2% per another 1000uF (+20°C, at 120Hz)													
Leakage Current (LC.) (µA /after 1 min.)max.	I ≤ 0.01 CV or 3(µA) After 1 minute whichever is greater measured With rated working voltage applied							I ≤ 0.03 CV or 3(µA) After 1 minute With rated working voltage applied						
Life Test :	ΔC/C		Within ±20% of the initial value											
Load Life Test :	Tan δ		≤ 200% of the initial specified value											
Shelf Life Test :	LC.		≤ The initial specified value											
Detail specifications	Conform to IEC 60384-4													

### Spec. & RIPPLE CURRENT:

uF	WV	SIZE(DxL)	Maximum Ripple Current
470	63	13X21	640mA,rms,120Hz at 105°C

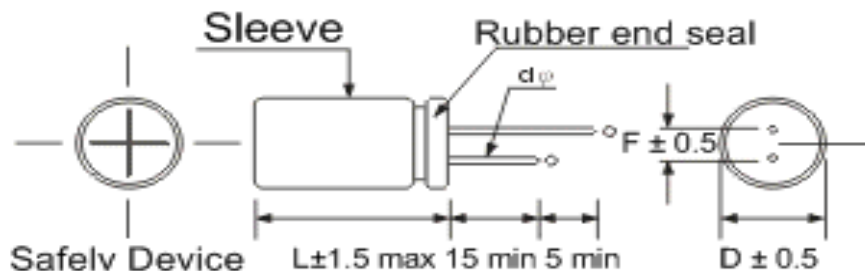
### Temperature Multipliers Dimensions Unit : mm

Temp(°C)	105	85	70	60	45	φ D	5	6.3	8	10	13	16	18	22	25
						F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10	12
Multiplier	1.00	1.40	1.65	1.90	2.10	φ d	0.5	0.5	0.5	0.6	0.6	0.8	0.8	0.8	1.0

### Multiplier for Ripple Current VS, Frequency

CAP(uF)Hz		50(60)	120	400	1K	10K	50K~100K
Multiplier	CAP ≤ 10	0.8	1	1.30	1.30	1.65	1.70
	10 < CAP ≤ 100	0.8	1	1.23	1.23	1.48	1.53
	100 < CAP ≤ 1000	0.8	1	1.16	1.16	1.35	1.38
	1000 < CAP	0.8	1	1.11	1.11	1.25	1.28

Unit : mm





# JACKCON *Electrolytic Capacitors*

## Endurance characteristic

NO.	Item	Condition	Specification	
5	High temperature load life test	<ol style="list-style-type: none"> <li>Capacitors shall be placed in oven with application of ripple current and rate voltage for <math>2000 \pm 12</math> hrs at <math>105^{\circ}\text{C}</math></li> <li>The capacitors should be use within specified permissible ripple current in each standard products table (the sum of DC working voltage and AC peak voltage shall be equal to the rated DC working voltage)</li> <li>The specified maximum permissible ripple current in defined at <math>105^{\circ}\text{C}</math> and 120 Hz</li> <li>Then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made.</li> </ol>	Capacitance change	Within $\pm 20\%$ of the initial value
			TAN $\delta$	Less then 200% of specified value
			Leakage Current	Within specified value
			Physical	no broken and undamaged
6.	High temperature shelf life test	After 500hrs test at $105^{\circ}\text{C}$ without rated working voltage. And then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made.	Capacitance change	Within $\pm 20\%$ of the initial value
			TAN $\delta$	Less then 200% of specified value
			Leakage Current	Within specified value
			Physical	no broken and undamaged
7.	Rotational temperature test	Capacitor is place in a oven whose temperature follow specific regulation to change. The specific regulations is “ $+25^{\circ}\text{C}$ (1 hr) $\rightarrow$ $+105^{\circ}\text{C}$ (2 hrs) $\rightarrow$ $+25^{\circ}\text{C}$ (0.5 hr) $\rightarrow$ $-40^{\circ}\text{C}$ (2 hrs) $\rightarrow$ $+25^{\circ}\text{C}$ (0.5 hr)”, and it called a cycle. The test totals 10 cycles. And then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made.	Capacitance change	Within $\pm 10\%$ of the initial value
			TAN $\delta$	Within specified value
			Leakage Current	Within specified value
			Physical	no broken and undamaged
8.	Humidity test	Capacitors shall be exposed for $500 \pm 8$ hrs in an atmosphere of 90~95%R.H at $40^{\circ}\text{C}$ . And then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made.	Capacitance change	Within $\pm 10\%$ of the initial value
			TAN $\delta$	Less then 120% of specified value
			Leakage Current	Within specified value
			Physical	no broken and undamaged

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9.	Low temperature test	Capacitor are place at $-40 \pm 3^{\circ}\text{C}$ for $72 \pm 4$ hrs. And then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made.	Capacitance change	Within $\pm 10\%$ of the initial value																		
			TAN $\delta$	Within specified value																		
			Leakage Current	Within specified value																		
			Physical	no broken and undamaged																		
10.	Vibration test	<ol style="list-style-type: none"> <li>Fix it at the point 4mm or less form body. For ones of 12.5mm or 25mm or more length, use separate fixture.</li> <li>Direction and during of vibration:3 orthogonal direction each for 2hrs total 6hrs.</li> <li>Mutually frequency: 10 to55Hz reciprocation for 1 min.</li> <li>Total amplitude:1.5mm</li> </ol>	Capacitance change	Within $\pm 10\%$ of the initial value																		
			TAN $\delta$	Within specified value																		
			Leakage Current	Within specified value																		
			Physical	no broken and undamaged																		
11.	Reflow test	<ol style="list-style-type: none"> <li>IR Reflow           <div style="text-align: center;"> </div> <table border="1" style="margin-top: 10px;"> <tr> <td rowspan="2">Preheat</td> <td>Temp (T1~T2)</td> <td>100~150°C</td> </tr> <tr> <td>Time (t1) max</td> <td>40 sec</td> </tr> <tr> <td rowspan="2">Duration</td> <td>Temp(T3)</td> <td>260°C</td> </tr> <tr> <td>Time (t2) max</td> <td>10 sec</td> </tr> <tr> <td rowspan="2">Peck</td> <td>Temp(T4)</td> <td>270°C</td> </tr> <tr> <td>Time (t3) max</td> <td>5 sec</td> </tr> <tr> <td>Reflow cycle</td> <td colspan="2">Twice or less</td> </tr> </table> </li> <li>Solder bath method: Solder temperature:<math>260 \pm 3^{\circ}\text{C}</math> Immersion time:<math>5+1/-0</math> sec Thickness of heat shunt (Printed wiring board):1.6mm</li> <li>Soldering iron method: Bit temperature: <math>350 \pm 10^{\circ}\text{C}</math> Application time of soldering Iron:<math>3+1/-0</math> sec</li> </ol>	Preheat	Temp (T1~T2)	100~150°C	Time (t1) max	40 sec	Duration	Temp(T3)	260°C	Time (t2) max	10 sec	Peck	Temp(T4)	270°C	Time (t3) max	5 sec	Reflow cycle	Twice or less		Capacitance change	Within $\pm 10\%$ of the initial value
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Reflow cycle	Twice or less																					
TAN $\delta$	Within specified value																					
Leakage Current	Within specified value																					
Physical	no broken and undamaged																					

# JACKCON *Electrolytic Capacitors*

12.	Solderability test	After the lead wire fully immersed in the solder for $2 \pm 0.1$ sec at a temperature of $245 \pm 2^\circ\text{C}$ , the solder coating must be more than 95%																
13.	Mechanical	<p>1. The test is about lead tabs strength.</p> <p>2. Tension test: The lead tabs shall not be broken or any malformed condition after fixing capacitor vertically and pressing the following weight on the lead tabs of capacitor for <math>10 \pm 1</math> sec.</p> <table border="1" data-bbox="603 629 1238 759"> <thead> <tr> <th>Lead tabs diameter(mm)</th> <th>Weight(Kg)</th> </tr> </thead> <tbody> <tr> <td><math>\leq 0.5</math></td> <td>0.5</td> </tr> <tr> <td>0.6~0.8</td> <td>1.0</td> </tr> <tr> <td>&gt;0.8</td> <td>2.5</td> </tr> </tbody> </table> <p>3. Bending test: The capacitor is held in vertical position. Attach a weight to the lead tabs, slowly rotate the capacitor <math>90^\circ</math> to a same way in the opposite direction. Repeat it again (5 secs per cycle). The lead tabs shall not be broken or cracked.</p> <table border="1" data-bbox="603 1010 1238 1140"> <thead> <tr> <th>Lead tabs diameter(mm)</th> <th>Weight(Kg)</th> </tr> </thead> <tbody> <tr> <td><math>\leq 0.5</math></td> <td>0.5</td> </tr> <tr> <td>0.6~0.8</td> <td>1.0</td> </tr> <tr> <td>&gt;0.8</td> <td>2.5</td> </tr> </tbody> </table>	Lead tabs diameter(mm)	Weight(Kg)	$\leq 0.5$	0.5	0.6~0.8	1.0	>0.8	2.5	Lead tabs diameter(mm)	Weight(Kg)	$\leq 0.5$	0.5	0.6~0.8	1.0	>0.8	2.5
Lead tabs diameter(mm)	Weight(Kg)																	
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$\leq 0.5$	0.5																	
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>0.8	2.5																	
14.	Safety vent	<p><b>Condition:</b> Apply a reverse voltage with current 1 amp.(DC reverse voltage test)</p> <p><b>Criteria:</b> When the pressure relief vent operated, the capacitor shall not flame although gas generation or expulsion of a part of the inside element is allowable. If the vent does not operate with the voltage applied for 30 minutes, the test is Considered to be passed.</p>																
15.	Standards	Satisfies Characteristic W of IEC-60384-4,18																

# JACKCON *Electrolytic Capacitors*

## CODE CONSTRUCTION

LHK	471	M	63	V	13	21	----
<u>Series</u> (1)	<u>Capacitance</u> (2)	<u>Tol.</u> (3)	<u>Voltage</u> (4)	<u>Sleeve</u> (5)	<u>Dia.</u> (6)	<u>Length</u> (7)	<u>Forming</u> (8)

### (1) Series:

LGK	LHK	LMK	LSM	LEK	LPS	LKP	LNP	LLK	LBP
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

### (2) Capacitance (uF):

$\mu$ F	0.1	1	10	100	1000	10000	1.5
Code	0R1	010	100	101	102	103	1R5
$\mu$ F	0.22	2.2	22	220	2200	22000	15
Code	R22	2R2	220	221	222	223	150
$\mu$ F	0.33	3.3	33	330	3300	33000	150
Code	R33	3R3	330	331	332	333	151
$\mu$ F	0.47	4.7	47	470	4700	47000	1500
Code	R47	4R7	470	471	472	473	152

### (3) Tolerance:

Code	J	K	M
Tolerance	$\pm 5\%$	$\pm 10\%$	$\pm 20\%$

### (4) Working Voltage (V):

6.3	10	16	25	35	50	63
100	160	200	250	350	400	450

### (5) Sleeve:

Code	V	E
Sleeve	PVC	PET

### (6) Diameter (mm):

4	5	6	8	10	13	16	18
22	25	30	35	51	64	77	90

### (7) Length (mm):

5	7	9	11	12	14	16	20	21	25
26	31	33	36	40	42	45	50	53	65
75	83	96	100	115	121	130	140	144	157

### (8) Forming (optional):

Taping + pitch (mm)	Cutting + length (mm)	Kink + pitch (mm)
TB2	C3.3	K5
TB2.5	C3.5	
TB3.5	C5	
TB5	C7	

# **JACKCON** *Electrolytic Capacitors*

## L A B E L

### FRONT

<b>JACKCON</b>	<b>Electrolytic Capacitor</b>	
Capacitance Range:	<b>470</b>	<b>uF</b>
Voltage Range:	<b>63</b>	<b>V</b>
Quantity:	<u><b>250</b></u>	<b>pcs</b>
Remark: <b>13*21</b>	<b>105°C</b>	<b>RoHS</b>
<b>MADE IN TAIWAN</b>		<b>COMPLIANT</b>

**Lot No : 8 070313-000314**

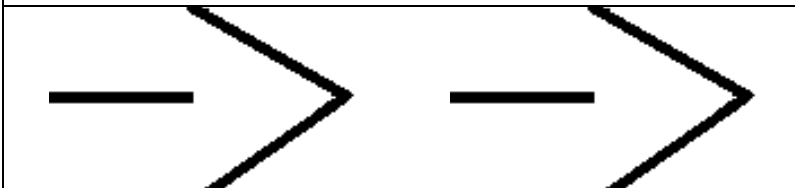
**DATE LOT NO.**

# **JACKCON** *Electrolytic Capacitors*

## Marking

### FRONT

**JACKCON**  
**470uF63V**  
**-40+105°C**



### BACK

**02** (PRODUCTION LINE)

**10D** (DATE CODE)

**LHK**



## Test Report

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5F., NO. 90, SHING DE ROAD, SAN CHUNG CITY, TAIPEI HSIEN,  
TAIWAN



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

Sample Description : JACKCON ELECTROLYTIC CAPACITOR  
Style/Item No. : AL. ELECTROLYTIC CAPACITORS FULL RANGE  
Sample Receiving Date : 2009/12/03  
Testing Period : 2009/12/03 TO 2009/12/10

=====  
**Test Requested** : In accordance with the RoHS Directive 2002/95/EC, and its amendment directives.

**Test Method** : With reference to IEC 62321: 2008  
Procedures for the Determination of Levels of Regulated Substances in  
Electrotechnical Products.  
(1) Determination of Cadmium by ICP-AES.  
(2) Determination of Lead by ICP-AES.  
(3) Determination of Mercury by ICP-AES.  
(4) Determination of Hexavalent Chromium by UV/Vis Spectrometry.  
(5) Determination of PBB and PBDE by GC/MS.

**Test Result(s)** : Please refer to next page(s).

**Chenyu Kung / Operation Manager**  
**Signed for and on behalf of**  
**SGS TAIWAN LTD.**  
**Chemical Laboratory – Taipei**

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TAIWAN



Test results by chemical method (Unit: mg/kg)

Test Item (s):	Method (Refer to)	Result	MDL
		No.1	
Cadmium (Cd)	(1)	n.d.	2
Lead (Pb)	(2)	n.d.	2
Mercury (Hg)	(3)	n.d.	2
Hexavalent Chromium Cr(VI) by alkaline extraction	(4)	n.d.	2
<b>Sum of PBBs</b>	(5)	n.d.	-
Monobromobiphenyl		n.d.	5
Dibromobiphenyl		n.d.	5
Tribromobiphenyl		n.d.	5
Tetrabromobiphenyl		n.d.	5
Pentabromobiphenyl		n.d.	5
Hexabromobiphenyl		n.d.	5
Heptabromobiphenyl		n.d.	5
Octabromobiphenyl		n.d.	5
Nonabromobiphenyl		n.d.	5
Decabromobiphenyl		n.d.	5
<b>Sum of PBDEs</b>		n.d.	-
Monobromodiphenyl ether		n.d.	5
Dibromodiphenyl ether		n.d.	5
Tribromodiphenyl ether		n.d.	5
Tetrabromodiphenyl ether		n.d.	5
Pentabromodiphenyl ether		n.d.	5
Hexabromodiphenyl ether		n.d.	5
Heptabromodiphenyl ether		n.d.	5
Octabromodiphenyl ether		n.d.	5
Nonabromodiphenyl ether		n.d.	5
Decabromodiphenyl ether	n.d.	5	

## TEST PART DESCRIPTION:

NO.1 : MIXED ALL PARTS

Note : 1. mg/kg = ppm; 0.1wt% = 1000ppm

2. n.d. = Not Detected

3. MDL = Method Detection Limit

4. "-" = Not Regulated

5. The sample(s) was/were analyzed on behalf of the applicant as mixing sample in one testing.

The above result(s) was/were only given as the informality value.

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# Test Report

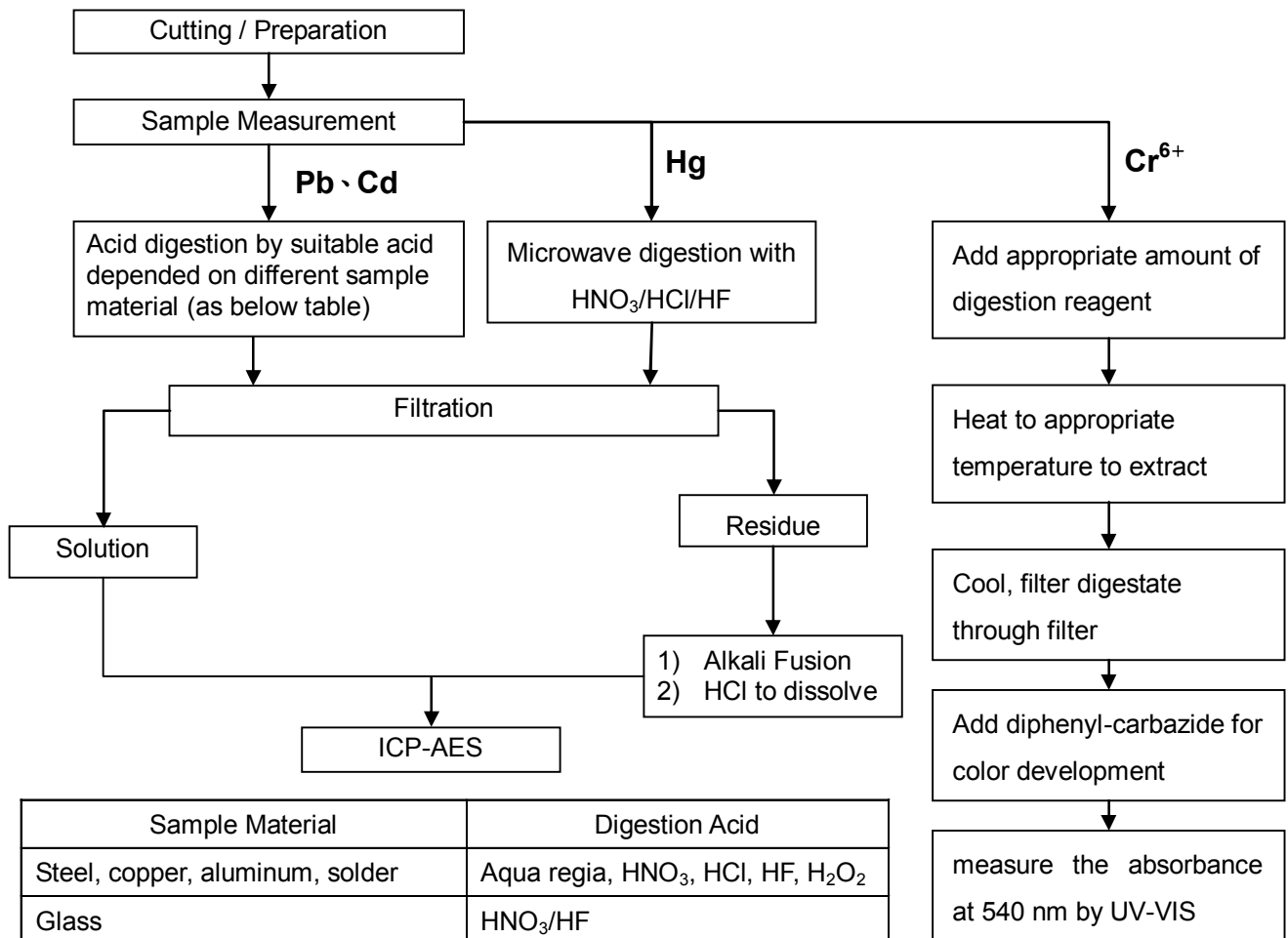
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TAIWAN



- 1) These samples were dissolved totally by pre-conditioning method according to below flow chart.  
(Cr<sup>6+</sup> test method excluded)
- 2) Name of the person who made measurement: Climbgreat Yang
- 3) Name of the person in charge of measurement: Troy Chang



Sample Material	Digestion Acid
Steel, copper, aluminum, solder	Aqua regia, HNO <sub>3</sub> , HCl, HF, H <sub>2</sub> O <sub>2</sub>
Glass	HNO <sub>3</sub> /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO <sub>3</sub>
Plastic	H <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O <sub>2</sub> , HNO <sub>3</sub> , HCl
Others	Any acid to total digestion

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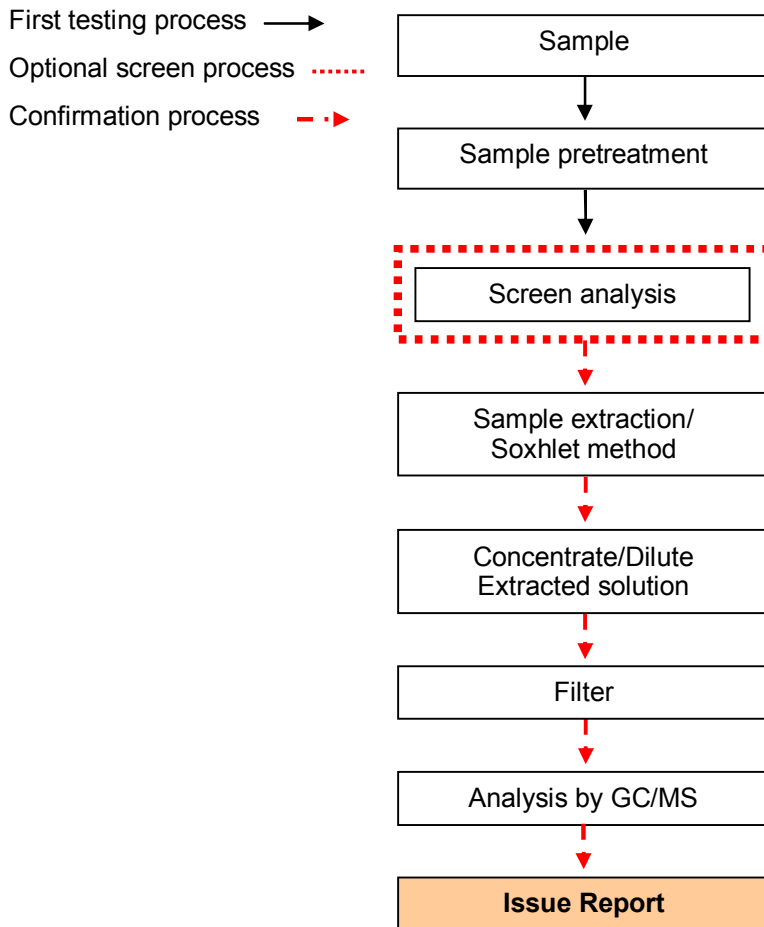
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TAIWAN



### PBB/PBDE analytical FLOW CHART

- 1) Name of the person who made measurement: Roman Wong
- 2) Name of the person in charge of measurement: Shinjyh Chen



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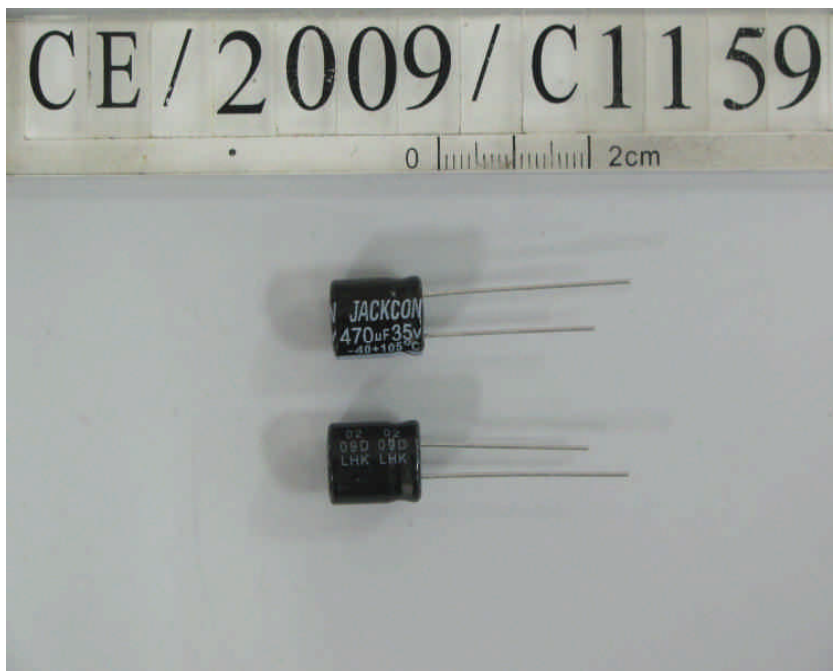
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