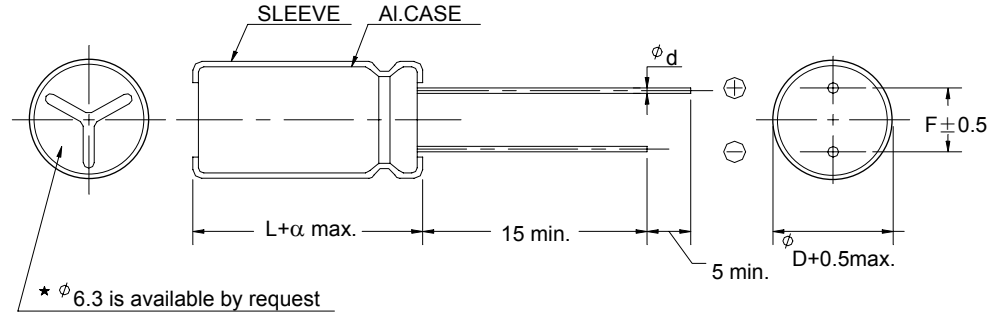


Customer	立創電子	Series	LF	Date	2018-11-15
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外形圖 Dimensions (mm)



引線間距和引線直徑(Lead Spacing and Wire Diameter)

ΦD	5	6.3	8	10	12.5	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	7.5
Φd	0.5	0.5	0.5	0.6	0.6	0.8	0.8	0.8
α	2.0							

TABLE-1

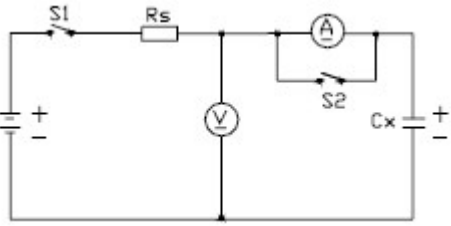
No.	Customer Part No.	TOPAZCON Part No.	Capacitance (μF)	Tolerance on Rated Capacitance (%)	Rated Voltage (Vdc)	Surge Voltage (Vdc)	Operating Temp. Range ($^{\circ}C$)	$\tan\delta$ (120Hz) (Max)	Max Leakage Current (μA)(2min.)	Max Ripple Current (mA) at 105 $^{\circ}C$ 100KHz	Endurance at 105 $^{\circ}C$ (Hours)	Dimensions (mm)			Appearance Drawing No.
												ΦD	L	F	
1		ELF2W220M132000I	22	± 20	450	495	-25~105	0.20	198	218	3000	13	20	5.0	

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<p>1、概述 SCOPE</p> <p>本承認書規定了LF系列焊針引出式鋁電解電容器的技術規範。 This specification covers “LF Series” general purpose with snap-in aluminum electrolytic capacitors.</p> <p>2、參考標準 APPLICABLE SPECIFICATION</p> <p>本承認書參考 JIS-C-5101-1 和 JIS-C-5101-4 制定。 The specification consulted the institute of JIS-C-5101-1 and JIS-C-5101-4.</p> <p>3、工作溫度範圍 OPERATING TEMPERATURE RANGE</p> <p>工作溫度範圍是電容器在施加額定工作電壓條件下，可以長期可靠工作的環境溫度範圍。 -25℃~+105℃(160V.DC~450V.DC)</p> <p>Operating temperature range is the range of ambient temperature at which the capacitor can be operated continuously at rated voltage. -25℃~+105℃(160V.DC~450V.DC)</p> <p>4、測試環境 CONDITION OF TEST</p> <p>如果沒有其他規定，標準的測試,檢驗環境條件如下所示： 環境溫度：15℃至 35℃ 相對濕度：45%至 75% 大氣壓力：85kpa 至 105kpa 如果對測試結果有異議，可以在以下條件測試： 環境溫度：25±1℃ 相對濕度：60%至 67% 大氣壓力：86kpa 至 106kpa Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests are as follows. Ambient temperature : 15℃ to 35℃ Relative humidity : 45% to 75% Air pressure : 85kpa to 105kpa If there may be doubt on the results, measurements shall be made within the following limits Ambient temperature : 25±1℃ Relative humidity : 60% to 67% Air pressure : 86kpa to 106kpa</p>		
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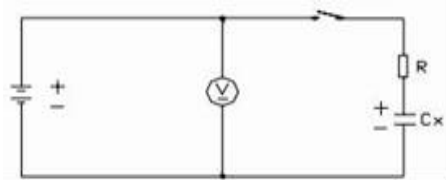
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5、 產品特性 PRODUCT CHARACTERISTICS

5.1 電氣特性 ELECTRICAL CHARACTERISTICS

序號 No.	項目 Item	測試方法 Test method	性能 Performance
5.1.1	額定工作電壓 Rated voltage		160V.DC~450V.DC
5.1.2	電容量 Capacitance	測試頻率：120Hz(±20%) 測試電路：串聯等效 測試電壓：0.5Vrms 以下+1.5~ 2.0VDC Measuring frequency: 120Hz±20% Measuring circuit: Series equivalent circuit Measuring voltage: 0.5Vrms or less +1.5 to 2.0 VDC	容量範圍： 0. 47uF ~220uF 容量偏差：±20% Range of Capacitance: 0. 47uF ~220uF Capacitance tolerance: ±20%
5.1.3	損失角正切值 Dissipation Factor	測試條件與 5.1.2 電容量測試相同 Testing condition are the same as 5.1.2 for capacitance	DF 見表 1 DF: See Table 1.
5.1.4	漏電流 Leakage current	在電容器兩端施加額定工作電壓，並串聯 1000 ±100Ω 電阻，在施加電壓2分鐘後，測量漏電流。 測試電路如下圖： The rated voltage shall be applied across the capacitor and its protective resistor which shall be 1000±100Ω. The leakage current shall then be measured after an electrification period of 2 min.. Measurement circuit  Rs: Protective resistor(1000±100Ω) A DC ammeter B DC voltmeter S ₁ : Switch S ₂ : Protective switch for an ammeter	施加電壓 2分鐘後，測試漏電流不大於 $I \leq 0.02CV$ or $10(\mu A)$ I：漏電流 (μA) C：容量 (μF) V：額定工作電壓 (V) The rated voltage shall be applied across the capacitor after 2 min. The leakage current not more than $I \leq 0.02CV$ or $10(\mu A)$ I: Leakage current (μA) C: Capacitance (μF) V: Rated voltage (V)

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序號 No.	項目 Item	測試方法 Test method	性能 Performance															
5.1.5	溫度特性 Temperature Characteristic	<table border="1"> <thead> <tr> <th>階段</th> <th>溫度</th> <th>時間</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20±2°C</td> <td>--</td> </tr> <tr> <td>2</td> <td>-25, -40₋₃⁺⁰°C</td> <td>2h</td> </tr> <tr> <td>3</td> <td>20±2°C</td> <td>15min</td> </tr> <tr> <td>4</td> <td>105₋₀⁺³°C</td> <td>2h</td> </tr> </tbody> </table> <p>階段 1：測量容量和阻抗 (z 20°C 120Hz±20%) 階段 2：電容器恒溫貯存2小時，在熱平衡狀態測阻抗 (z -25, -40°C 120Hz±20%) *450WV 除外 階段 4：電容器恒溫貯存2小時，在熱平衡狀態測電容量 Step 1:Capacitance and impedance shall be measured. (z 20°C 120Hz±20%) Step 2:After the capacitor being stored for 2 hours, impedance shall be made at thermal stability. (z -25, -40°C 120Hz±20%) * Except 450WV Step 4:After the capacitor being stored for 2 hours, capacitance shall be measured. The measurement shall be made at thermal stability</p>	階段	溫度	時間	1	20±2°C	--	2	-25, -40 ₋₃ ⁺⁰ °C	2h	3	20±2°C	15min	4	105 ₋₀ ⁺³ °C	2h	阻抗值與階段1阻抗值相比，不大於表2要求。 階段 4： 容量變化應在初值的±20%範圍內 Step 2: Impedance ratio to the value at step 1 shall be not more than the value given table-2 Step 4: Variation of capacitance Within±20% of the initial value
階段	溫度	時間																
1	20±2°C	--																
2	-25, -40 ₋₃ ⁺⁰ °C	2h																
3	20±2°C	15min																
4	105 ₋₀ ⁺³ °C	2h																
5.1.6	耐浪湧電壓 Surge Test	施加表1所列浪湧電壓，充電 30±5 秒，放電 5.5±0.5 分鐘作為一個週期，共進行1000次。 測試溫度：15°C-35°C 然後在標準大氣條件下放置達到熱穩定，測試各參數 Application of DC surge Voltage stated at table-1, 1000 times of charging for 30±5 sec., discharging with a period of 5.5±0.5 min.. Test temperature: 15°C-35°C And the capacitor shall be stored under standard atmospheric conditions to obtain thermal stability, after which measurements shall be made.	容量變化：在初始值的±20%以內。 損耗角正切值：不大於200%的表1規定值。 漏電流：達到 5.1.4 要求 Capacitance change: With±20% of the initial value. Dissipation factor: Not more than 200% of the specified value in Table-1. Leakage current: To satisfy No.5.1.4															
		Test circuit:  <p>Note: This requirement is applicable only to instantaneous over voltage which may be applied to terminals of capacitor, therefore, not applicable to such over voltages as often applied.</p>																
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5.2 機械特性 MECHANICAL PERFORMANCE

序號 No.	項目 Item	測試方法 Test method	性能 Performance																								
5.2.1	端子強度 Terminal strength	<p>端子抗拉強度： 沿電容器端子引線方向施加拉力(如下表)，10±1 秒。</p> <table border="1"> <tr> <td>引線直徑 Φ</td> <td>0.45</td> <td>0.5</td> <td>0.6</td> <td>0.8</td> <td>1.0</td> </tr> <tr> <td>拉力 (N)</td> <td colspan="2">5</td> <td colspan="2">10</td> <td>20</td> </tr> </table> <p>端子抗彎強度： 在電容器引線施加固定重力(如下表)，然後，將電容器彎折 90°後回到原位，再向相反方向彎折 90°後回到原位。 上述過程在 5 秒內完成。</p> <table border="1"> <tr> <td>引線直徑 Φ</td> <td>0.45</td> <td>0.5</td> <td>0.6</td> <td>0.8</td> <td>1.0</td> </tr> <tr> <td>拉力 (N)</td> <td colspan="2">2.5</td> <td colspan="2">5</td> <td>10</td> </tr> </table> <p>Tensile strength of termination: A static load (stated in the table below) shall be applied to the terminal in the axial direction and acting in a direction away from the body for 10±1 sec..</p> <p>Bending strength of termination: Hang the specified dead weight (stated in the table below), then bent the body through 90°, return to the original position. Next bent it in opposite direction through 90° with the same speed, again return to the original position. Carry out this operation in about 5 sec.</p>	引線直徑 Φ	0.45	0.5	0.6	0.8	1.0	拉力 (N)	5		10		20	引線直徑 Φ	0.45	0.5	0.6	0.8	1.0	拉力 (N)	2.5		5		10	<p>測量電容器應無接觸不良、開路或短路，無可見機械損傷</p> <p>When the capacitors is measured, there shall be no intermittent contacts, or open or short-circuiting. There shall be no such mechanical damage</p>
引線直徑 Φ	0.45	0.5	0.6	0.8	1.0																						
拉力 (N)	5		10		20																						
引線直徑 Φ	0.45	0.5	0.6	0.8	1.0																						
拉力 (N)	2.5		5		10																						
5.2.2	振動試驗 Resistance to Vibration	<p>依據 JIS C 5101-1-4.17 試驗。 在3個互相垂直的方向分別施加2小時振動,共6小時 頻率：10~55Hz 振幅：1.5mm 振速：1分鐘內振速 10~55~10Hz To comply with JIS C 5101-1-4.17 Direction and duration of vibration: 3 orthogonal directions mutually each for 2h, Total 6h. Vibration Frequency Range:10~55Hz Peak to peak amplitude:1.5mm Sweep rate:10to55to10Hz in about 1 min</p>	<p>測量電容器應無接觸不良開路或短路，無可見機械損傷。</p> <p>When the capacitors is measured there shall be no intermittent contacts, or open or short-circuiting There shall be no such mechanical damage.</p>																								
5.2.3	可焊性 Solderability	<p>JIS C 5101-1-4.15 進行試驗 焊錫溫度：235±5°C 浸入時間：3±0.5 秒 To comply with JIS C 5101-1-4.15 Temperature or solder: 235±5°C Dipping time: 3±0.5sec. This specification shall be met after the capacitors are stored under standard atmospheric conditions for 6 months.</p>	<p>浸入焊錫的引線表面積約90%以上應附著新錫</p> <p>At least 90% of circumferential surface of the dipping portion of termination shall be covered with new solder</p>																								
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5.3 耐久性測試 ENDURANCE PERFORMANCE

序號 No.	項目 Item	測試方法 Test method	性能 Performance
5.3.1	耐焊接熱 Resistance to soldering heat	焊槽法： 焊錫溫度：260±5℃ 浸入時間：10±1 秒 浸入深度：至引線根部1.5~2.0mm Solder bath method: Solder bath temperature : 260±5℃ Immersion time : 10±1sec. Depth of immersion : up to 1.5~2.0mm from the root of the lead wire covered with thermal screen.	容量變化：在初始值±10%範圍內 損失角正切值：滿足表1要求 漏電流：滿足5.1.4要求 外觀：無異狀 Variation of capacitance: Within ±10% of the initial value . Dissipation factor: To satisfy Table 1. Leakage current: To satisfy No.5.1.4 Appearance: No remarkable abnormality
5.3.2	穩態濕熱 Resistance to damp heat (Steady state)	依據JIS C 5101-1-4.22 進行試驗 試驗溫度：40±2℃ 試驗時間：500±8h 相對濕度：90~95% 試驗後，電容器在標準大氣條件下1~2小時，然後測試參數 To comply with JIS C 5101-1-4.22 Test temperature : 40±2℃ Test time : 500±8h Relative humidity: 90~95% After completion of test, the capacitor shall be d to standard atmospheric conditions for 1 to 2 hours, after which measurements shall be made.	容量變化：在初始值±15%範圍內 損失角正切值：滿足表1要求 漏電流：滿足5.1.4要求 外觀：無異狀 Variation of capacitance: Within ±15% of the initial value Dissipation factor: To satisfy Table 1. Leakage current: To satisfy No.5.1.4 Appearance: No remarkable abnormality.
5.3.3	高溫負荷試驗 Load life test	試驗溫度：105±2℃，施加額定電壓和額定紋波電流 試驗時間:3000 ⁺⁷² ₀ h Application of the rated voltage and the rated ripple current, Test temperature:105±2℃ Test time:3000 ⁺⁷² ₀ h	容量變化：在初始值±20%範圍內 損失角正切值：不超過表1所列規定值的200% 漏電流：滿足5.1.4需求 外觀：無異狀 Variation of capacitance: Within ±20% of the initial value. Dissipation factor: Not more than 200% of the specified value in Table 1. Leakage current: To satisfy No.5.1.4 Appearance: No remarkable abnormality.
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5.3.4	高溫貯存試驗 Shelf life test	<p>在105±2℃環境下無負荷貯存1000⁺⁴⁸₋₀ h, 至少恢復16小時後。</p> <p>The capacitors are then stored with no voltage applied perature of 105±2℃ for 1000⁺⁴⁸₋₀ h and then resumed 16 hours.</p>	<p>容量變化：初始值±20%範圍內。 損失角正切值：不超過表 1 所列規定值的150%。 漏電流：小於 5.1.4 中初始標準值的2 倍。 外觀：無異狀</p> <p>Variation of capacitance: Within ±20% of the value before test. Not more than 150% of the specified value in Table 1. Leakage current: Not more than 200% specified value in 5.14 Appearance: No remarkable abnormality.</p>
5.3.5	防爆試驗 Safety vent	<p>在電容器兩極施加反向工作電壓，其中通過的電流為 1 A(ΦD≤22.4mm)，10A(ΦD>22.4mm)在測試時防爆裝置應能在30分鐘內動作。</p> <p>Application test The capacitor shall be subjected to a reverse D.C. voltage equal to the rated D.C. voltage. The current flowing through the capacitor shall be 1A (ΦD≤22.4mm)，10A(ΦD>22.4mm) If the vent does not operate with the voltage applied for 30 minutes, the test is considered to be passed.</p>	<p>上述過程中應無引線、鋁箔等散射，無火花產生。</p> <p>The vent device is actuated under the test conditions, thereby preventing terminals, metal pieces, etc, of the capacitor from scattering due to burst, the case from separating from the seal packing, or the capacitor from producing flame.</p>

※ 表 2 (TABLE 2)

電容器的阻抗特性滿足下表要求。

Impedance ratio of the -25℃ or -40℃ value to the 25℃ value shall not exceed the value below. (at 120Hz)

Rated Voltage (V)	160	200	250	350	400	450
Z (-25℃) / Z (+20℃)	3	5				6
Z (-40℃) / Z (+20℃)	4	7				-


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6 標記 MARKING

6.1 在電容器體上應注明如下內容：

- (1) 生產廠商商標 *TOPAZCON*
- (2) 負極標誌 
- (3) 工作電壓 450V
- (4) 標稱容量 22uF
- (5) 系列 LF

The following items shall be marked indelibly on the capacitor.

- (1) Brand *TOPAZCON*
- (2) Polarity 
- (3) Rated voltage 450V
- (4) Nominal capacitance 22uF
- (5) Series LF

6.2 標記顏色 Marking color

套管顏色：綠色

標記顏色：白色

Sleeve color: Green

Marking color: White

7 紋波電流頻率因數 RIPPLE CURRENT FREQUENCY COEFFICIENT

Freq. (Hz) WV(Vdc)	120	1K	10K	100K
CAP < 18	0.59	0.85	0.97	1.00
18 ≤ Cap. < 100	0.62	0.89	0.97	1.00
Cap ≥ 100	0.72	0.90	0.98	1.00

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