

**NO.: JSB221122013**

**TO: Ozdisan**

**APPROVAL SHEET No. : B-7536A**

**Series .No.: KLG**

**Specification No.:**

# Halogen-Free RoHS2.0

## APPROVAL SHEET FOR AL. ELECTROLYTIC CAPACITORS

| No. | Customer No. | Koshin Part No.   | Description | ΦD x L |
|-----|--------------|-------------------|-------------|--------|
| 1   |              | PKLG-400V680MK250 | 400V68μF    | 18X25  |

**APPROVED BY:**

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**PLEASE SIGN RETURN US ONE COPY OF THE APPROUAL SHEET**

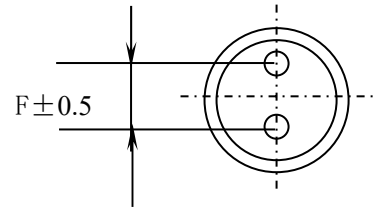
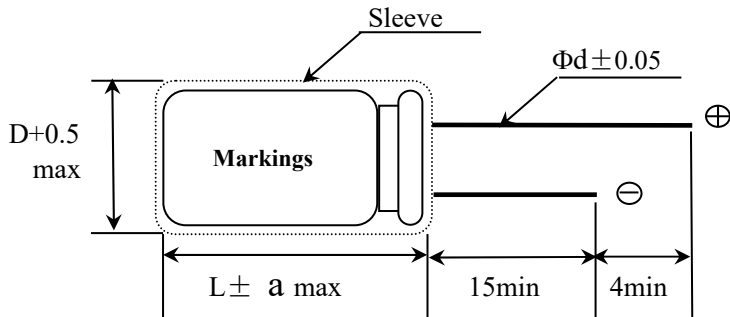
**DESIGNED BY: LUOLI      CHECKEDBY: CAOGUIHUA      APPROVED BY: SHENZHIHONG**

**DATE: 2022-11-22**

**KOSHIN**

**DJS-DS-0013**

Standard Size map:



Unit: mm

|          |     |
|----------|-----|
| $\Phi D$ | 18  |
| F        | 7.5 |
| $\Phi d$ | 0.8 |
| L        | 25  |
| a        | 2.0 |

Coefficient of Frequency for Ripple Current

|                |         |      |      |      |
|----------------|---------|------|------|------|
| Frequency (Hz) | 50 • 60 | 1K   | 10K  | 100K |
| Coefficient    | 0.50    | 0.80 | 0.85 | 1.00 |

Coefficient of Temperature for Ripple Current

|                  |            |      |      |
|------------------|------------|------|------|
| Temperature (°C) | 60 or less | 85   | 105  |
| Coefficient      | 2.00       | 1.40 | 1.00 |



# KOSHIN INTERNATIONAL LIMITED

ELECTROLYTIC CAPACITORS

TEL: 86-755-89501998

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## TEST REPORT OF ELECTROLYTIC CAPACITORS SAMPLE

|                  |                  |                      |                          |     |
|------------------|------------------|----------------------|--------------------------|-----|
| DATE :           | 2022/11/22       | Quantity :           | 5                        | PCS |
| Customer:        | Ozdisan          | Customer'S part No.: |                          |     |
| Ratings :        | 400V68 $\mu$ F   | Part No.:            | PKLG-400V680MK250        |     |
| Series :         | PKLG             | Case Size:           | D18XL25( $\pm$ 2.0max mm |     |
| Lead space:      | 7.5 $\pm$ 0.5 mm | Lead Dia.:           | 0.8 $\pm$ 0.05           | mm  |
| Terminal Length: | +19min-15min mm  | Load Life:           | 10000                    | hrs |
| Sleeve Color:    | Black (PET)      | Marking Color:       | White                    |     |

| Capacitance Tolerance at 120Hz/20°C | Max.TAN $\delta$ at 120 Hz 20°C | Max.Leakage Current( $\mu$ A) Afte 2 min. | Max.ESR ( $\Omega$ ) At 100KHz/20°C | Max. Ripple Current(mArms) At100KHz/105°C | WORKING TEMP (°C) | SURGE VOLT. (V) |
|-------------------------------------|---------------------------------|---|-------------------------------------|---|-------------------|-----------------|
| $\pm$ 20%                           | 0.15                            | 816                                       | /                                   | 1400                                      | -40+105           | 440             |

| NO.  | CAPACITANCE ( $\mu$ F) | TAN $\delta$ | Leakage Current ( $\mu$ A) | ESR ( $\Omega$ ) | Remarks |
|------|------------------------|--------------|----------------------------|------------------|---------|
| 1    | 61.31                  | 0.047        | 13.38                      |                  |         |
| 2    | 61.28                  | 0.049        | 14.71                      |                  |         |
| 3    | 61.33                  | 0.046        | 15.02                      |                  |         |
| 4    | 61.34                  | 0.048        | 13.94                      |                  |         |
| 5    | 61.29                  | 0.047        | 12.87                      |                  |         |
| 6    |                        |              |                            |                  |         |
| 7    |                        |              |                            |                  |         |
| 8    |                        |              |                            |                  |         |
| 9    |                        |              |                            |                  |         |
| 10   |                        |              |                            |                  |         |
| AVE. | 61.310                 | 0.0474       | 13.984                     |                  |         |
| MAX. | 61.34                  | 0.049        | 15.02                      |                  |         |
| MIN. | 61.28                  | 0.046        | 12.87                      |                  |         |

TESTED BY:Dengxiujuan

CHECKED BY: LuoLi

APPROVED BY:Shenzhihong



## Series KLG Capacitor

1. Our part No. : For example

|             |               |             |           |                  |
|-------------|---------------|-------------|-----------|------------------|
| <u>PKLG</u> | <u>400V</u>   | <u>680</u>  | <u>M</u>  | <u>K250</u>      |
| Series code | rated voltage | capacitance | tolerance | case size symbol |
| PKLG        | 400 v         | 68μF        | ±20%      | Φ18X25           |

2. Your part No.:

3. Marking:

Include company's brand "Koshin", series code, rated voltage, capacitance, rated temperature range, polarity and tolerance of capacitance.

4. Specifications :

4.1 Temperature range : -40~+105°C

4.2 Electrical characteristics

4.2.1 Capacitance tolerance : ±20%

4.2.2 Tangent of loss angle (tan δ) :

|                  |      |      |      |      |      |      |      |
|------------------|------|------|------|------|------|------|------|
| Rated voltage(V) | 160  | 200  | 250  | 350  | 400  | 450  | 500  |
| tan δ (max.)     | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |

Note: 0.02 is added to each 1000 μF increase over 1000 μF

4.2.3 Leakage current (μA) :


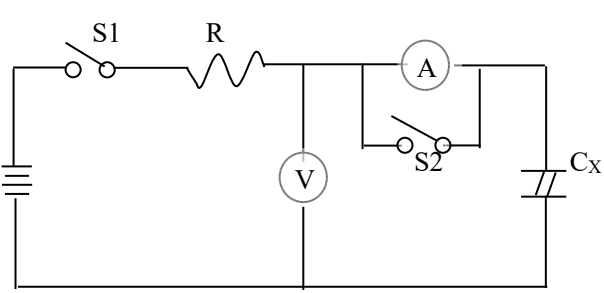
|                      |  |
|----------------------|--|
| Rated voltage (V)    | 160 ~ 500  |
| Leakage Current (μA) | Less than 0.03CV or 3 whichever is large (after 2 minutes) |

Note: I : Leakage current (μA) , C : Capacitance (μF) , V : Rated DC working voltage (V)

**1. Scope:**

This specification applies to aluminium electrolytic capacitor ,used in electronic equipment.

**2. Electrical characteristics:**

| NO.   | ITEM                        | TEST METHOD  | SPECIFICATION  |              |  |
|---|-----------------------------|--|--|--------------|--|
| 2.1   | Rated voltage               |  | Voltage range、capacitance range ,see specification of this series      |              |  |
| 2.2   | Capacitance                 | 1.Measuring frequency:120Hz±12Hz   |  |              |  |
| 2.3   | Dissipation factor          | 2.Measuring voltage: ≤0.5Vrms+0.5VDC~2.0VDC<br>3.Measuring circuit: (  )  |  |              |  |
| 2.4   | Leakage current             | DC leakage current shall be measured after 1~2minutes application of the DC rated working voltage through the 1000 Ω resistor at 20℃<br><br><div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: left;"> <p>R: 1000 Ω 100 Ω</p> <p>A: DC current meter</p> <p>V: DC voltage meter</p> </div> <div style="text-align: left;"> <p>S1:Switch</p> <p>S2:Switch for protect of current meter</p> <p>C<sub>x</sub>: Testing capacitor</p> </div> </div> | Dissipation factor, leakage current, see specification of this series. |              |  |
| 2.5   | Temperature characteristics | STEP   | TEMPERATURE  | STORAGE TIME | Step2.<br>Low temperature impedance stability<br>Less than specified value.<br><br>Step4.<br>Capacitance change:<br>within ± 10% of the initial measured value.<br><br>Dissipation factor:<br>Less than specified value. |
|   |                             | 1  | 20℃ ± 2℃   | 30minutes    |  |
|   |                             | 2  | -40℃ ± 3℃  | 2hours       |  |
|   |                             | 3  | 20℃ ± 2℃   | 4hours       |  |
|   |                             | 4  | 105℃ ± 2℃  | 2hours       |  |
| Step1.Measure the impedance.<br>(  Z  , 20℃, 120Hz±2HZ)<br>Step2. Measure the impedance at thermal balance after 2 hours.<br>(  Z  , -40℃ 120Hz±2HZ)<br>Step4.Measure the leakage current at thermal balance after 2 hours. |                             |  |  |              |  |

| NO  | ITEM       | TEST METHOD  | SPECIFICATION   |
|-----|------------|--|---|
| 2.6 | Surge test | Rated surge voltage shall be applied (switch on)for 30±5 second and then shall be applied (switch off) with discharge for 5.5min at room temperature. This cycle shall be repeated for 1000 cycles. Duration of one cycle is 6±0.5 minutes | <p>Capacitance change:<br/>within±15% of the initial specified value.</p> <p>Dissipation factor:<br/>Less than specified value.</p> <p>Leakage current:<br/>Within initial specified value.</p> |

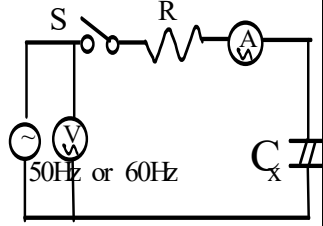
**3.Mechanical characteristics:**

| NO       | ITEM          | TEST METHOD   | SPECIFICATION |      |           |            |          |     |     |     |       |      |           |            |          |     |     |     |  |
|----------|---------------|---|---------------|------|-----------|------------|----------|-----|-----|-----|-------|------|-----------|------------|----------|-----|-----|-----|--|
| 3.1      | Lead strength | <p>(A)Tensile strength:<br/>wire lead terminal:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <tr> <td style="text-align: center;">d(mm)</td> <td style="text-align: center;">≤0.5</td> <td style="text-align: center;">0.5&lt;d≤0.8</td> <td style="text-align: center;">0.8&lt;d≤1.25</td> </tr> <tr> <td style="text-align: center;">load(kg)</td> <td style="text-align: center;">0.5</td> <td style="text-align: center;">1.0</td> <td style="text-align: center;">2.0</td> </tr> </table> <p>The capacitor shall withstand the constant tensile force specified between the body and each lead for 10seconds without damage either mechanical or electrical.</p> <p>(B) Bending strength:<br/>wire lead terminal:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <tr> <td style="text-align: center;">d(mm)</td> <td style="text-align: center;">≤0.5</td> <td style="text-align: center;">0.5&lt;d≤0.8</td> <td style="text-align: center;">0.8&lt;d≤1.25</td> </tr> <tr> <td style="text-align: center;">load(kg)</td> <td style="text-align: center;">0.5</td> <td style="text-align: center;">0.5</td> <td style="text-align: center;">1.0</td> </tr> </table> <p>with the capacitor in a vertical position apply the load specified axially to each lead. The capacitor shall be rotated slowly from the vertical to the horizontal position, back to the vertical position. The 90° in the opposite direction and back the original position. Performance of capacitor shall not have change and leads shall be undamaged.</p> | d(mm)         | ≤0.5 | 0.5<d≤0.8 | 0.8<d≤1.25 | load(kg) | 0.5 | 1.0 | 2.0 | d(mm) | ≤0.5 | 0.5<d≤0.8 | 0.8<d≤1.25 | load(kg) | 0.5 | 0.5 | 1.0 | <p>When the capacitance is measured, there shall be no intermittent contacts, or open-or short-circuiting.</p> <p>There shall be no such mechanical damage as terminal damage etc.<br/>Capacitance change:<br/>within±5% of the initial specified value.</p> |
| d(mm)    | ≤0.5          | 0.5<d≤0.8   | 0.8<d≤1.25    |      |           |            |          |     |     |     |       |      |           |            |          |     |     |     |  |
| load(kg) | 0.5           | 1.0   | 2.0           |      |           |            |          |     |     |     |       |      |           |            |          |     |     |     |  |
| d(mm)    | ≤0.5          | 0.5<d≤0.8   | 0.8<d≤1.25    |      |           |            |          |     |     |     |       |      |           |            |          |     |     |     |  |
| load(kg) | 0.5           | 0.5   | 1.0           |      |           |            |          |     |     |     |       |      |           |            |          |     |     |     |  |

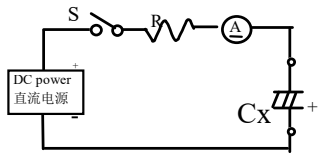
| NO. | ITEM                 | TEST METHOD  | SPECIFICATION   |
|-----|----------------------|--|---|
| 3.2 | Vibration resistance | The frequency of the vibration shall vary uniformly within the range 10 to 55 Hz with the amplitude of 0.75mm, completing the cycle in the internal of one minute.<br>The capacitor shall be securely mounted by its leads with hold the body of capacitor.<br>The capacitor shall be vibrated in three mutually perpendicular directions for a period of 2 hours in each direction. | Appearance : no abnormal.<br>Capacitance change:<br>within $\pm 5\%$ of initial measured value. |
| 3.3 | Solder ability       | The leads are dipped in the solder bath of Sn at $245^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for $2 \pm 0.5$ seconds. The dipping depth should be set at 1.5~2.0 mm.   | The solder alloy shall cover the 95% or more of dipped lead's area.                             |

#### 4. Reliability:

| NO. | ITEM                      | TEST METHOD   | SPECIFICATION   |
|-----|---------------------------|---|---|
| 4.1 | Soldering heat resistance | The leads immerse in the solder bath of Sn at $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for $10 \pm 1$ seconds until a distance of 1.5~2.0mm from the case. | No visible damage or leakage of electrolyte.<br>Capacitance change:<br>Within $\pm 5\%$ of the initial measured value<br>Tan $\delta$ :<br>Less than specified value.<br>Leakage current:<br>Less than specified value      |
| 4.2 | Damp head ( steady state) | Subject the capacitor to $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 90% to 95% relative humidity for 504 hours.   | Capacitance change:<br>Within $\pm 20\%$ of the initial measured value<br>Tan $\delta$ :<br>Less than 1.2 specified value.<br>Leakage current:<br>Less than specified value<br>Impedance:<br>Less than 1.2 specified value. |

| NO.   | ITEM                       | TEST METHOD   | SPECIFICATION   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
|---|----------------------------|---|---|-----------------|--------------------|---------------|---------------------------------------|--------------|---|-------------|---|------------|---|--------------|------------------------|---|--|
| 4.3   | Load life                  | After 10000 hours continuous application of max allowable ripple current and DC rated voltage at $105^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .<br>Measurements shall be performed after 16 hours exposed at room temperature.   | Capacitance change:<br>Within $\pm 20\%$ of the initial value.<br><br>Tan $\delta$ :less than 200% specified value  |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| 4.4   | Shelf life                 | After storage for 1000 hours at $105^{\circ}\text{C} \pm 2^{\circ}\text{C}$ without voltage application .Measurements shall be performed after exposed for 16 hrs at room temperature after application of Testing  | Leakage current:<br>Less than initial specified value.<br><br>Appearance :no Abnormal   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| 4.5   | Storage at low temperature | The capacitor shall be stored at temperature of $-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 16 hours, during which time be subjected to standard atmospheric conditions for 16 hours or more. After which measurements shall be made.   | Capacitance change:<br>Within $\pm 10\%$ of the initial value.<br><br>Tan $\delta$ :less than specified value<br><br>Leakage current:<br>Less than specified value.<br><br>Appearance :no Abnormal.   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| 4.6   | Pressure relief            | AC test:<br>Applied voltage : AC voltage not exceeding 0.7 times of the rated direct voltage or 250V AC whichever is the lower.<br><br>Frequency : 50Hz or 60Hz.<br>Series resistor :refer to the table below   | AC test circuit<br><br><br>⊖ : AC power<br>S : Switch<br>Ⓧ : AC voltage meter<br>Ⓐ : AC current meter<br>R : protection resistor<br>C <sub>x</sub> : testing capacitor |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
|   |                            | <table border="1" data-bbox="389 1532 1121 1910"> <thead> <tr> <th>Capacitance(C)</th> <th>Series resistor</th> </tr> </thead> <tbody> <tr> <td><math>C &lt; 1\mu\text{F}</math></td> <td>1000 <math>\Omega</math></td> </tr> <tr> <td><math>1\mu\text{F} &lt; C \leq 10\mu\text{F}</math></td> <td>100 <math>\Omega</math></td> </tr> <tr> <td><math>10\mu\text{F} &lt; C \leq 100\mu\text{F}</math></td> <td>10 <math>\Omega</math></td> </tr> <tr> <td><math>100\mu\text{F} &lt; C \leq 1000\mu\text{F}</math></td> <td>1 <math>\Omega</math></td> </tr> <tr> <td><math>1000\mu\text{F} &lt; C \leq 10000\mu\text{F}</math></td> <td>0.1 <math>\Omega</math></td> </tr> <tr> <td><math>10000\mu\text{F} &lt; C</math></td> <td>*</td> </tr> </tbody> </table> <p>* Resistance is equivalent to a half impedance by test frequency.</p> | Capacitance(C)  | Series resistor | $C < 1\mu\text{F}$ | 1000 $\Omega$ | $1\mu\text{F} < C \leq 10\mu\text{F}$ | 100 $\Omega$ | $10\mu\text{F} < C \leq 100\mu\text{F}$ | 10 $\Omega$ | $100\mu\text{F} < C \leq 1000\mu\text{F}$ | 1 $\Omega$ | $1000\mu\text{F} < C \leq 10000\mu\text{F}$ | 0.1 $\Omega$ | $10000\mu\text{F} < C$ | * |  |
| Capacitance(C)                              | Series resistor            |   |   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| $C < 1\mu\text{F}$                          | 1000 $\Omega$              |   |   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| $1\mu\text{F} < C \leq 10\mu\text{F}$       | 100 $\Omega$               |   |   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| $10\mu\text{F} < C \leq 100\mu\text{F}$     | 10 $\Omega$                |   |   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| $100\mu\text{F} < C \leq 1000\mu\text{F}$   | 1 $\Omega$                 |   |   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| $1000\mu\text{F} < C \leq 10000\mu\text{F}$ | 0.1 $\Omega$               |   |   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |
| $10000\mu\text{F} < C$                      | *                          |   |   |                 |                    |               |                                       |              |   |             |   |            |   |              |                        |   |  |



| NO. | ITEM            | TEST METHOD   | SPECIFICATION  |
|-----|-----------------|---|--|
| 4.6 | Pressure relief | <p>DC test</p> <p>Send the following electricity while applying the inverse voltage.</p> <p>Where case size<br/> <math>D \leq 22.4\text{mm}</math>: 1 A d.c.max<br/> <math>D &gt; 22.4\text{mm}</math>: 10 A d.c.max</p> <p>Note :1.This requirement applies to capacitors with a diameter of 6 mm or more.<br/>           2.When the pressure relief device does not open even 30 minutes after commencement of test, the test may be ended.</p>   | <p>DC test circuit</p>  <p>S : Switch<br/> <math>\text{A}</math> : DC current meter<br/>           C x: testing capacitor</p> <p>The pressure relief device shall open in such a way as to avoid any damage of fire or explosion of capacitor elements (terminal and metal foil etc.) or cover.</p> |
| 4.7 | Temp cycle      | <p>LSL temperature(<math>^{\circ}\text{C}</math>): <math>-40 \pm 3</math> time(H): 0.5H/timeX5 times<br/>           USL temperature(<math>^{\circ}\text{C}</math>): <math>105 \pm 2</math> time(H): 0.5H/timeX5 times<br/>           Judgement: CAP: <math>\Delta C/C \leq \pm 10\%</math>, Appearance no Abnormal.<br/>           No electrolyte leakage.</p>  |  |
| 4.8 | Thermal shock   | <p>dry heat temperature (<math>^{\circ}\text{C}</math>): <math>105 \pm 2</math> time(H): 16 moist heat temperature(<math>^{\circ}\text{C}</math>): 55 time(H): 24/<br/>           cold temperature(<math>^{\circ}\text{C}</math>): <math>-40 \pm 2</math> time(H): 2/ moist heat temperature(<math>^{\circ}\text{C}</math>): 55 time(H): 24 :<br/>           Judgement: CAP, <math>\Delta C/C \leq \pm 10\%</math>, Tan <math>\delta</math> :Less than 1.2 specified value, Leakage current: Less than specified value. Appearance no Abnormal. No electrolyte leakage.</p> |  |

## 5. Marking

### 5.1. Marking on capacitors includes:

a. Manufacture's name or trade mark

Koshin

b. Rated voltage and capacity

--V --uF

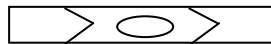
c. Sleeve material-Series

Ⓢ KLG

d. Capacitance tolerance code-Rated temperature

(M)105 $^{\circ}\text{C}$

e. Polarity of the terminals



### 5.2 Marking color:

Sleeve color: Black PET

Marking color: White

Detergent needing attention

Hydrogen carbide liquid and halogen liquid can cause Aluminium Electrolytic Capacitor to corrode. Some of Safe and Unsafe detergent are as follows

| <b>Safe</b>     | <b>Unsafe</b>                              |
|-----------------|--|
| Dimethylbenzene | 1,1,2-trichloroethane                      |
| Ethanol         | 1,2,2- trichloroethane                     |
| Butanol         | Tetrachloroethylene                        |
| Methanol        | Chloroform(colorless volatilizable liquid) |
| Propanol        | Dichloromethane                            |
| Detergent       | Trichloroethylene                          |

## Aluminum Electrolytic Capacitor Specification

|                 |  |                  |   |                   |
|-----------------|--|------------------|---|-------------------|
| Series          | PKLG   | 400 V 68 $\mu$ F | Part No.  | PKLG-400V680MK250 |
| Customer No.    | /  |                  | Case size   | $\Phi$ D18 X L 25 |
| Specification   | Items  |                  | Standard  |                   |
|                 | Operating temperature range  |                  | - 40 ~ + 105 $^{\circ}$ C                                 |                   |
|                 | Capacitance tolerance  |                  | $\pm$ 20% ( 20 $^{\circ}$ C , 120Hz )                     |                   |
|                 | Dissipation factor (MAX)   |                  | ( Less than ) 0.15 ( 20 $^{\circ}$ C , 120Hz )            |                   |
|                 | Leakage current (MAX)  |                  | ( Less than ) 816 $\mu$ A ( 20 $^{\circ}$ C 400 V 2 min ) |                   |
|                 | Ripple current (MAX)   |                  | <b>1400mArms ( 100KHz , 105<math>^{\circ}</math>C )</b>   |                   |
|                 | Impedance (MAX)  |                  | /   |                   |
|                 | Load life  |                  | 10000 hrs   |                   |
| Outline         | Sleeve color   |                  | Black PET   |                   |
|                 | Marking color  |                  | White   |                   |
|                 | ( Dimensions )   |                  |   |                   |
|                 | <p>The drawing shows a side view and a top view of the capacitor. The side view labels include: Vent (top left), Sleeve (top center), Copper clad steel wire(tinned) (top right), Markings (center), <math>\Phi 0.8 \pm 0.05</math> (wire diameter), <math>18 \pm 0.5</math> max (height), <math>25 \pm 2.0</math> max (body length), 15min (lead length), and 4min (lead length). The top view labels include: Lead space <math>7.5 \pm 0.5</math> (distance between leads) and Unit:mm (bottom right).</p> |                  |   |                   |
| Recorder        | (The first edition) : 2022-11-22   |                  |   |                   |
| Wrote by: LUOLI | Checked by: DINGCHANGHUA   |                  | Approved by: SHENZHIHONG                                  |                   |