

Aluminum Capacitors Power Eurodin Screw Terminals

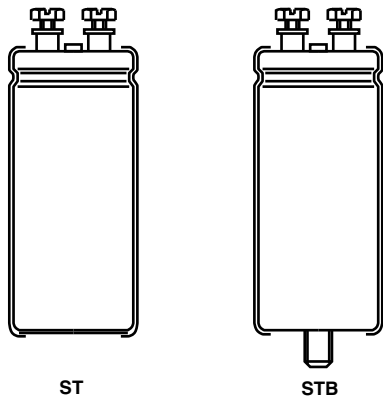


Fig.1 Component outlines



FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, cylindrical aluminum case, insulated with a blue sleeve
- Also available in bolt version (106 PED-STB)
- Pressure relief in the sealing
- Charge and discharge proof
- Extremely low ESR and ESL allowing very high ripple current load
- Very long useful life: 20 000 h at 85 °C
- High resistance to shock and vibration
- Compliant to RoHS directive 2002/95/EC

APPLICATIONS

- Computer, telecommunications and industrial systems
- Smoothing and filtering
- Standard and switched mode power supplies
- Energy storage in pulse systems

MARKING

The capacitors are marked with the following information:

- Rated capacitance (in μF)
- Tolerance on rated capacitance, code letter in accordance with IEC 60062 (Q for - 10 %/+ 30 %)
- Rated voltage (in V)
- Date code (YYMM)
- Name of manufacturer
- Code for factory of origin
- '-' sign to identify the negative terminal, visible from the top and side of the capacitor
- Code number
- Climatic category in accordance with IEC 60068
- "LL" for long life grade

QUICK REFERENCE DATA

| DESCRIPTION | VALUE |
|--|---|
| Nominal case size (\varnothing D x L in mm) | 35 x 60 to 90 x 220 |
| Rated capacitance range (E6 series), C_R | 1000 μF to 330 000 μF |
| Tolerance on C_R | - 10 % to + 30 % |
| Rated voltage range, U_R | 25 V to 100 V |
| Category temperature range | - 40 °C to + 85 °C |
| Endurance test at 85 °C | 8000 h |
| Useful life at 85 °C | 20 000 h |
| Shelf life at 0 V, 85 °C | 500 h |
| Based on sectional specification | IEC 60384-4/EN130300 |
| Climatic category IEC 60068 | 40/085/56 |

SELECTION CHART FOR C_R , U_R AND RELEVANT NOMINAL CASE SIZES (\varnothing D x L in mm)

| C_R (μF) | U_R (V) | | | |
|----------------------------|-----------|----------|----------|----------|
| | 25 | 40 | 63 | 100 |
| 1000 | - | - | - | 35 x 60 |
| 1500 | - | - | - | 35 x 60 |
| 2200 | - | - | 35 x 60 | 35 x 80 |
| 3300 | - | 35 x 60 | 35 x 60 | 35 x 105 |
| 4700 | 35 x 60 | 35 x 60 | 35 x 80 | 50 x 80 |
| 6800 | 35 x 60 | 35 x 80 | 35 x 105 | 50 x 105 |
| 10 000 | 35 x 80 | 35 x 105 | 50 x 80 | 65 x 105 |
| 15 000 | 35 x 105 | 50 x 80 | 50 x 105 | 65 x 105 |
| 22 000 | 50 x 80 | 50 x 105 | 65 x 105 | 76 x 105 |
| 33 000 | 50 x 105 | 65 x 105 | 65 x 105 | 76 x 146 |
| 47 000 | 65 x 105 | 65 x 105 | 76 x 105 | 76 x 220 |
| 68 000 | 65 x 105 | 76 x 105 | 76 x 146 | 90 x 220 |
| 100 000 | 76 x 105 | 76 x 146 | 76 x 220 | - |

| SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (∅ D x L in mm) | | | | |
|---|--------------------|----------|----------|-----|
| C _R (μF) | U _R (V) | | | |
| | 25 | 40 | 63 | 100 |
| 150 000 | 76 x 146 | 76 x 220 | - | - |
| | - | 90 x 146 | 90 x 220 | - |
| 220 000 | 76 x 220 | - | - | - |
| | 90 x 146 | 90 x 220 | - | - |
| 330 000 | 90 x 220 | - | - | - |

Table 1

| DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES | | | | | | | | | | | | | | |
|---|---------|-------|--------------------|-------|---------|---------|---------|---------|----------------------|----|-------|-----|----------------------|----------|
| DESIGN | DRAWING | L ± 1 | L _t ± 1 | D ± 1 | P ± 0.3 | T ± 0.2 | H ± 0.3 | B ± 0.3 | d ₁ ± 0.1 | M | S - 0 | Mb | l _b ± 0.1 | MASS (g) |
| 35 x 60 | 2A | 63.3 | 68.7 | 35.3 | 12.8 | 7.0 | 4.6 | 11.0 | 7.9 | M5 | 9.5 | M8 | 12.0 | 75 |
| 35 x 80 | 2A | 81.3 | 86.7 | 35.3 | 12.8 | 7.0 | 4.6 | 11.0 | 7.9 | M5 | 9.5 | M8 | 12.0 | 95 |
| 35 x 105 | 2A | 103.3 | 108.7 | 35.3 | 12.8 | 7.0 | 4.6 | 11.0 | 7.9 | M5 | 9.5 | M8 | 12.0 | 130 |
| 50 x 80 | 2A | 82.8 | 88.8 | 51.0 | 22.2 | 7.1 | 4.8 | 11.0 | 7.9 | M5 | 9.5 | M12 | 16.0 | 200 |
| 50 x 105 | 2A | 104.8 | 110.8 | 51.0 | 22.2 | 7.1 | 4.8 | 11.0 | 7.9 | M5 | 9.5 | M12 | 16.0 | 300 |
| 65 x 105 | 2A | 104.8 | 110.7 | 65.0 | 28.5 | 7.0 | 4.6 | 11.9 | 7.9 | M5 | 9.5 | M12 | 16.0 | 480 |
| 65 x 105 HC | 2B | 104.8 | 109.2 | 65.0 | 28.5 | 5.5 | 3.5 | 18.0 | 13.0 | M6 | 8.5 | M12 | 16.0 | 480 |
| 76 x 105 | 2A | 105.8 | 111.7 | 76.4 | 31.8 | 7.0 | 4.6 | 11.7 | 7.9 | M5 | 9.5 | M12 | 16.0 | 700 |
| 76 x 105 HC | 2B | 105.8 | 110.2 | 76.4 | 31.8 | 5.5 | 3.5 | 18.3 | 13.0 | M6 | 8.5 | M12 | 16.0 | 700 |
| 76 x 146 | 2A | 145.8 | 151.7 | 76.4 | 31.8 | 7.0 | 4.6 | 11.7 | 7.9 | M5 | 9.5 | M12 | 16.0 | 1000 |
| 76 x 146 HC | 2B | 145.8 | 150.2 | 76.4 | 31.8 | 5.5 | 3.5 | 18.3 | 13.0 | M6 | 8.5 | M12 | 16.0 | 1000 |
| 76 x 220 | 2A | 219.8 | 225.7 | 76.4 | 31.8 | 7.0 | 4.6 | 11.7 | 7.9 | M5 | 9.5 | M12 | 16.0 | 1500 |
| 76 x 220 HC | 2B | 219.8 | 224.2 | 76.4 | 31.8 | 5.5 | 3.5 | 18.3 | 13.0 | M6 | 8.5 | M12 | 16.0 | 1500 |
| 90 x 146 HC | 2B | 150.1 | 155.4 | 89.4 | 31.8 | 7.9 | 0.0 | 13.0 | 13.0 | M6 | 10.0 | M12 | 16.0 | 1300 |
| 90 x 220 HC | 2B | 218.1 | 223.4 | 89.4 | 31.8 | 7.9 | 0.0 | 13.0 | 13.0 | M6 | 10.0 | M12 | 16.0 | 2000 |

Notes

- For bolt version holds:
 L = L standard - 0.5 mm
 L_t = L_t standard - 0.5 mm

| DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES | | |
|---|--------------------------------------|--|
| DESIGN | PACKAGING QUANTITIES (UNITS PER BOX) | CARDBOARD BOX DIMENSIONS L x W x H in mm |
| 35 x 60 | 50 | 377 x 375 x 88 |
| 35 x 80 | 50 | 377 x 375 x 123 |
| 35 x 105 | 50 | 377 x 375 x 129 |
| 50 x 80 | 25 | 377 x 375 x 123 |
| 50 x 105 | 25 | 377 x 375 x 129 |
| 65 x 105 | 16 | 377 x 375 x 129 |
| 65 x 105 HC | 16 | 377 x 375 x 129 |
| 76 x 105 | 12 | 377 x 375 x 129 |
| 76 x 105 HC | 12 | 377 x 375 x 129 |
| 76 x 146 | 12 | 377 x 375 x 168 |
| 76 x 146 HC | 12 | 377 x 375 x 168 |
| 76 x 220 | 18 | 520 x 270 x 280 |
| 76 x 220 HC | 18 | 520 x 270 x 280 |
| 90 x 146 HC | 10 | 520 x 270 x 190 |
| 90 x 220 HC | 10 | 520 x 270 x 280 |

Note

- For bolt version holds:
 H of cardbox box: + 10 mm

DIMENSIONS in millimeters AND AVAILABLE FORMS

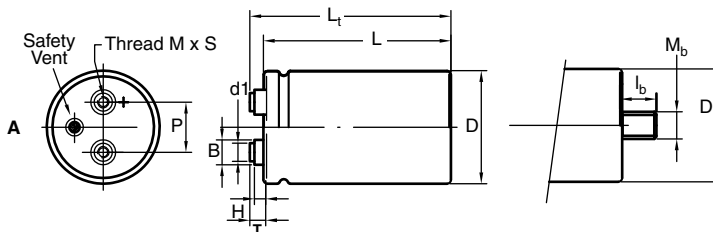


Fig. 2A: Standard M5 disc: screw terminal (ST) and screw terminal bolt nut (STB)

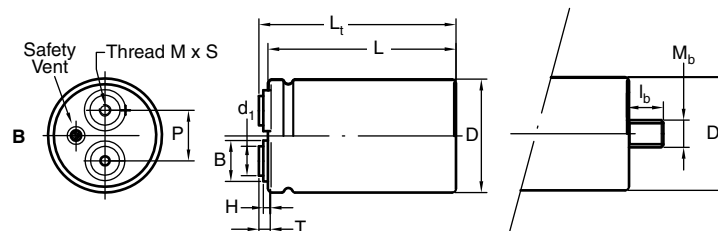


Fig. 2B: High current M6 disc: screw terminal (ST) and screw terminal bolt nut (STB)

Maximum permissible torque which may be applied to the termination screws: 2 Nm for M5; 2.5 Nm for M6
For accessories refer to datasheet "Mounting Accessories".
The capacitors are delivered with screws and washers.

ELECTRICAL DATA

| SYMBOL | DESCRIPTION |
|----------|---|
| C_R | Rated capacitance at 100 Hz, tolerance - 10 % to + 30 % |
| I_R | Rated RMS ripple current at 100 Hz, 85 °C |
| I_{L5} | Max. leakage current after 5 min at U_R |
| ESR | Max. equivalent series resistance at 100 Hz |
| Z | Impedance at 20 kHz |

Note

- Unless otherwise specified, all electrical values in tables 2 and 3 apply at $T_{amb} = 20\text{ °C}$, $P = 86\text{ kPa}$ to 106 kPa , $RH = 45\%$ to 75%

ORDERING EXAMPLE

Electrolytic capacitor 106 PED-ST series
10 000 $\mu\text{F}/25\text{ V}$; - 10 %/+ 30 %
Nominal case size: $\varnothing 35\text{ mm} \times 80\text{ mm}$; ST version
Ordering code: MAL210616103E3
Former 12NC: 222210616103

Table 2

| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | |
|--|--------------------------------------|---|---------------------------------|---------------------------|--|--------------------------------------|--|---|--|---|
| U_R (V) | C_R 100 Hz (μF) | NOMINAL CASE SIZE $\varnothing D \times L$ (mm) | I_R 100 Hz 85 °C (A) | I_{L5} 5 min (mA) | ESR max. 100 Hz (m Ω) | Z max. 20 kHz (m Ω) | STANDARD HIGH POST M5 DISC | | HIGH CURRENT M6 DISC | |
| | | | | | | | ST ORDERING CODE MAL2106..... | ST BOLT NUT ORDERING CODE MAL2106..... | ST ORDERING CODE MAL2106..... | ST BOLT NUT ORDERING CODE MAL2106..... |
| 25 | 4700 | 35 x 60 | 6.0 | 0.24 | 53 | 32 | 16472E3 | 56472E3 | - | - |
| | 6800 | 35 x 60 | 6.5 | 0.34 | 43 | 29 | 16682E3 | 56682E3 | - | - |
| | 10 000 | 35 x 80 | 7.9 | 0.50 | 32 | 22 | 16103E3 | 56103E3 | - | - |
| | 15 000 | 35 x 105 | 9.3 | 0.75 | 25 | 18 | 16153E3 | 56153E3 | - | - |
| | 22 000 | 50 x 80 | 14.0 | 1.10 | 15 | 11 | 16223E3 | 56223E3 | - | - |
| | 33 000 | 50 x 105 | 16.4 | 1.65 | 12 | 9 | 16333E3 | 56333E3 | - | - |
| | 47 000 | 65 x 105 | 23.2 | 3.35 | 8 | 6 | 16473E3 | 56473E3 | 36473E3 | 76473E3 |
| | 68 000 | 65 x 105 | 23.5 | 3.40 | 8 | 6 | 16683E3 | 56683E3 | 36683E3 | 76683E3 |
| | 100 000 | 76 x 105 | 30.1 | 5.00 | 6 | 5 | 16104E3 | 56104E3 | 36104E3 | 76104E3 |
| | 150 000 | 76 x 146 | 34.5 | 7.5 | 5 | 5 | 16154E3 | 56154E3 | 36154E3 | 76154E3 |
| | 220 000 | 76 x 220 | 40.8 | 11.0 | 5 | 5 | 16224E3 | 56224E3 | 36224E3 | 76224E3 |
| | 220 000 | 90 x 146 | 50 | 11.0 | 5 | 5 | - | - | 46224E3 | 86224E3 |
| | 330 000 | 90 x 220 | 50 | 16.5 | 5 | 5 | - | - | 46334E3 | 86334E3 |



| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | |
|--|----------------------------------|--|--|----------------------------------|-------------------------------|-----------------------------|--|---|--|---|
| U _R (V) | C _R 100 Hz (µF) | NOMINAL CASE SIZE Ø D x L (mm) | I _R 100 Hz 85 °C (A) | I _{L5} 5 min (mA) | ESR max. 100 Hz (mΩ) | Z max. 20 kHz (mΩ) | STANDARD HIGH POST M5 DISC | | HIGH CURRENT M6 DISC | |
| | | | | | | | ST ORDERING CODE MAL2106..... | ST BOLT NUT ORDERING CODE MAL2106..... | ST ORDERING CODE MAL2106..... | ST BOLT NUT ORDERING CODE MAL2106..... |
| 40 | 3300 | 35 x 60 | 5.7 | 0.27 | 56 | 32 | 17332E3 | 57332E3 | - | - |
| | 4700 | 35 x 60 | 6.0 | 0.38 | 48 | 31 | 17472E3 | 57472E3 | - | - |
| | 6800 | 35 x 80 | 7.3 | 0.55 | 36 | 24 | 17682E3 | 57682E3 | - | - |
| | 10 000 | 35 x 105 | 10.9 | 0.80 | 19 | 11 | 17103E3 | 57103E3 | - | - |
| | 15 000 | 50 x 80 | 13.0 | 1.20 | 17 | 12 | 17153E3 | 57153E3 | - | - |
| | 22 000 | 50 x 105 | 15.2 | 1.76 | 13 | 10 | 17223E3 | 57223E3 | - | - |
| | 33 000 | 65 x 105 | 21.6 | 2.64 | 9 | 7 | 17333E3 | 57333E3 | 37333E3 | 77333E3 |
| | 47 000 | 65 x 105 | 25.1 | 3.76 | 7 | 5 | 17473E3 | 57473E3 | 37473E3 | 77473E3 |
| | 68 000 | 76 x 105 | 27.3 | 5.44 | 7 | 5 | 17683E3 | 57683E3 | 37683E3 | 77683E3 |
| | 100 000 | 76 x 146 | 31.8 | 8.0 | 5 | 5 | 17104E3 | 57104E3 | 37104E3 | 77104E3 |
| | 150 000 | 76 x 220 | 38.2 | 12.0 | 5 | 5 | 17154E3 | 57154E3 | 37154E3 | 77154E3 |
| | 150 000 | 90 x 146 | 50.0 | 12.0 | 5 | 5 | - | - | 47154E3 | 87154E3 |
| 220 000 | 90 x 220 | 50.0 | 17.6 | 5 | 5 | - | - | 47224E3 | 87224E3 | |
| 63 | 2200 | 35 x 60 | 5.6 | 0.28 | 56 | 32 | 18222E3 | 58222E3 | - | - |
| | 3300 | 35 x 60 | 7.4 | 0.42 | 32 | 17 | 18332E3 | 58332E3 | - | - |
| | 4700 | 35 x 80 | 9.0 | 0.60 | 24 | 13 | 18472E3 | 58472E3 | - | - |
| | 6800 | 35 x 105 | 10.8 | 0.86 | 18 | 10 | 18682E3 | 58682E3 | - | - |
| | 15 000 | 50 x 105 | 17.5 | 1.89 | 10 | 7 | 18153E3 | 58153E3 | - | - |
| | 10 000 | 50 x 80 | 14.8 | 1.26 | 13 | 8 | 18103E3 | 58103E3 | - | - |
| | 22 000 | 65 x 105 | 23.9 | 2.78 | 7 | 5 | 18223E3 | 58223E3 | 38223E3 | 78223E3 |
| | 33 000 | 65 x 105 | 23.9 | 4.16 | 7 | 5 | 18333E3 | 58333E3 | 38333E3 | 78333E3 |
| | 47 000 | 76 x 105 | 25.4 | 5.93 | 8 | 5 | 18473E3 | 58473E3 | 38473E3 | 78473E3 |
| | 68 000 | 76 x 146 | 29.8 | 8.6 | 6 | 5 | 18683E3 | 58683E3 | 38683E3 | 78683E3 |
| | 100 000 | 76 x 220 | 36.6 | 12.6 | 5 | 5 | 18104E3 | 58104E3 | 38104E3 | 78104E3 |
| | 150 000 | 90 x 220 | 50.0 | 18.9 | 5 | 5 | - | - | 48154E3 | 88154E3 |
| 100 | 1000 | 35 x 60 | 3.7 | 0.20 | 96 | 48 | 19102E3 | 59102E3 | - | - |
| | 1500 | 35 x 60 | 4.8 | 0.30 | 59 | 27 | 19152E3 | 59152E3 | - | - |
| | 2200 | 35 x 80 | 5.9 | 0.44 | 42 | 20 | 19222E3 | 59222E3 | - | - |
| | 3300 | 35 x 105 | 7.3 | 0.66 | 29 | 15 | 19332E3 | 59332E3 | - | - |
| | 4700 | 50 x 80 | 10.1 | 0.94 | 22 | 12 | 19472E3 | 59472E3 | - | - |
| | 6800 | 50 x 105 | 12.1 | 1.36 | 16 | 9 | 19682E3 | 59682E3 | - | - |
| | 10 000 | 65 x 105 | 16.7 | 2.00 | 11 | 7 | 19103E3 | 59103E3 | 39103E3 | 79103E3 |
| | 15 000 | 65 x 105 | 17.6 | 3.00 | 10 | 6 | 19153E3 | 59153E3 | 39153E3 | 79153E3 |
| | 22 000 | 76 x 105 | 19.5 | 4.40 | 9 | 6 | 19223E3 | 59223E3 | 39223E3 | 79223E3 |
| | 33 000 | 76 x 146 | 23.0 | 6.6 | 8 | 6 | 19333E3 | 59333E3 | 39333E3 | 79333E3 |
| | 47 000 | 76 x 220 | 28.6 | 9.4 | 5 | 5 | 19473E3 | 59473E3 | 39473E3 | 79473E3 |
| | 68 000 | 90 x 220 | 50.0 | 13.6 | 5 | 5 | - | - | 49683E3 | 89683E3 |

| ADDITIONAL ELECTRICAL DATA | | |
|------------------------------------|-------------------------------|--|
| PARAMETER | CONDITIONS | VALUE |
| Voltage | | |
| Surge voltage | | U _s = 1.15 x U _R |
| Reverse voltage | | U _{rev} ≤ 1 V |
| Current | | |
| Leakage current | After 1 min at U _R | I _{L1} ≤ 0.006 C _R x U _R + 4 µF |
| | After 5 min at U _R | I _{L5} ≤ 0.002 C _R x U _R + 4 µF |
| Inductance | | |
| Equivalent series inductance (ESL) | Case Ø D = 35 mm | typ. 13 nH |
| | Case Ø D = 50 mm | typ. 16 nH |
| | Case Ø D = 65 mm | typ. 19 nH ⁽¹⁾ |
| | Case Ø D = 76 mm | typ. 20 nH ⁽¹⁾ |
| | Case Ø D = 90 mm | typ. 21 nH ⁽¹⁾ |

Note

(1) Low ESL designs available on request

RIPPLE CURRENT AND USEFUL LIFE

CCC205-05

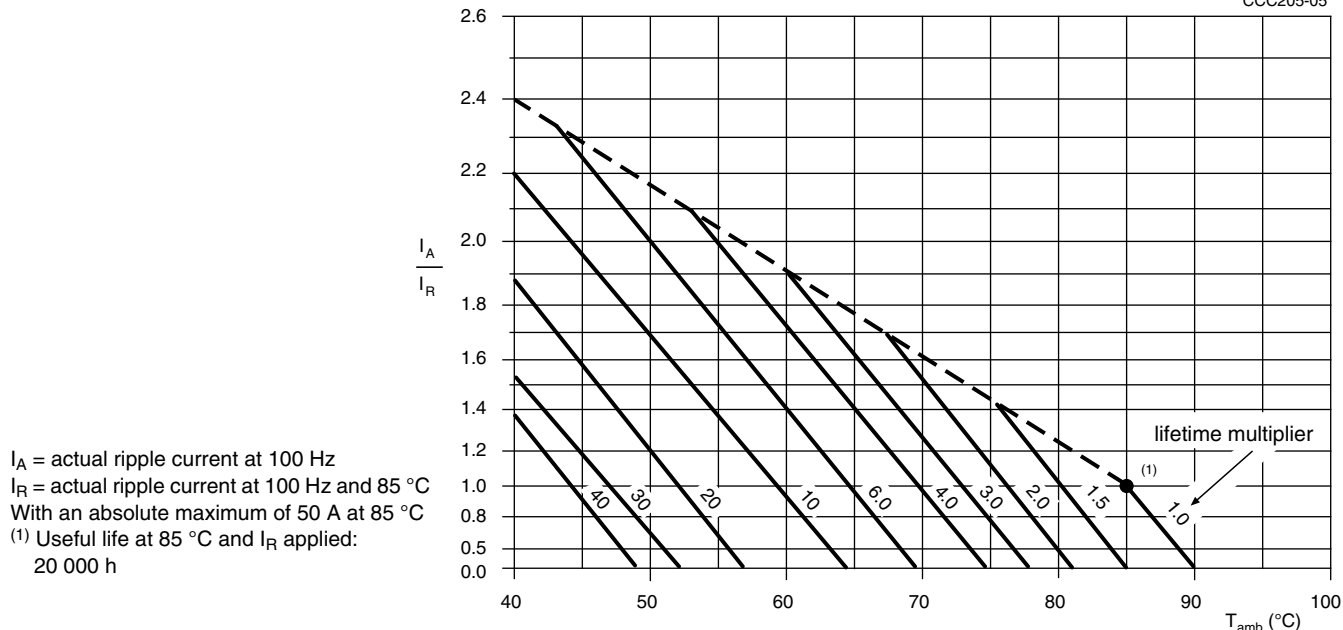


Fig.3 Multiplier of useful life as a function of ambient temperature and ripple current load

Table 3

| MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY | |
|---|------------------|
| FREQUENCY (Hz) | I_R MULTIPLIER |
| 50 | 0.83 |
| 100 | 1.00 |
| 200 | 1.10 |
| 400 | 1.15 |
| 1000 | 1.19 |
| ≥ 2000 | 1.20 |

Table 4

| TEST PROCEDURES AND REQUIREMENTS | | | |
|--|--|---|---|
| TEST | | PROCEDURE (quick reference) | REQUIREMENTS |
| NAME OF TEST | REFERENCE | | |
| Endurance | IEC 60384-4/ EN130300 subclause 4.13 | $T_{amb} = 85\text{ °C}$; U_R applied; 8000 h | $\Delta C/C: \pm 15\%$ $\tan \delta \leq 1.3 \times \text{spec. limit}$ $Z \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ |
| Useful life | CECC 30301 subclause 1.8.1 | $T_{amb} = 85\text{ °C}$; U_R and I_R applied; 20 000 h | $\Delta C/C: \pm 45\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit, no visible damage total failure percentage $\leq 1\%$ |
| Shelf life (storage at high temperature) | IEC 60384-4/ EN130300 subclause 4.17 | $T_{amb} = 85\text{ °C}$; no voltage applied; 500 h after test: U_R to be applied for 30 min, 24 h to 48 h before measurement | $\Delta C/C: \pm 10\%$ $\tan \delta \leq 1.2 \times \text{spec. limit}$ $IL5 \leq 2 \times \text{spec. limit}$ |



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