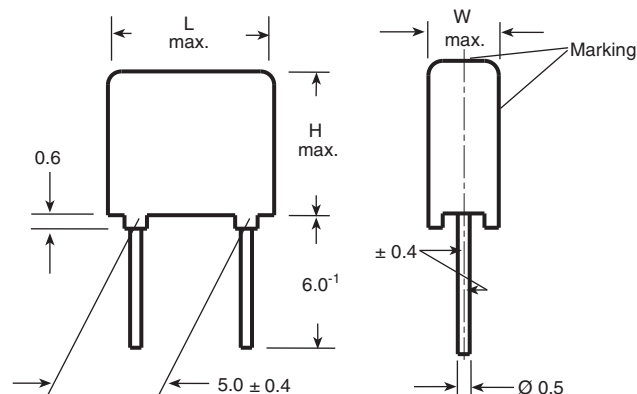




Metallized Polyester Film Capacitors MKT Radial Potted Types



APPLICATIONS

Blocking, bypassing, filtering and timing, high frequency coupling and decoupling for fast digital and analog ICs, interference suppression in low voltage applications.

REFERENCE SPECIFICATIONS

IEC 60384-2

MARKING

Manufacturer's logo/type/C-value/rated/tolerance/date of manufacture

DIELECTRIC

Polyester film

ELECTRODES

Metallized

CONSTRUCTION

Extended metallized film

TEST VOLTAGE (ELECTRODE/ELECTRODE)

1.6 x U_R for 2 s

RATED VOLTAGES (U_R)

63 V_{DC}, 100 V_{DC}, 250 V_{DC}, 400 V_{DC}

PERMISSIBLE AC VOLTAGES (RMS) UP TO 60 Hz

40 V_{AC}, 63 V_{AC}, 160 V_{AC}, 200 V_{AC}

FEATURES

- Compliant to RoHS Directive 2002/95/EC

ENCAPSULATION

Flame retardant plastic case (UL-class 94 V-0), epoxy resin sealed

CLIMATIC TESTING ACC. TO IEC 60068-1

55/100/56

CAPACITANCE RANGE (E12 SERIES)

1000 pF to 1.0 μ F

CAPACITANCE TOLERANCES

± 20 % (M), ± 10 % (K), ± 5 % (J)

LEADS

Tinned wire

RATED TEMPERATURE

85 °C

OPERATING TEMPERATURE RANGE

- 55 °C to + 100 °C

PULL TEST ON LEADS

≥ 30 N in direction of leads according to IEC 60068-2-21

RELIABILITY

Operational life > 300 000 h

Failure rate < 2 FIT (40 °C/ 0.5 U_R)

DETAIL SPECIFICATION

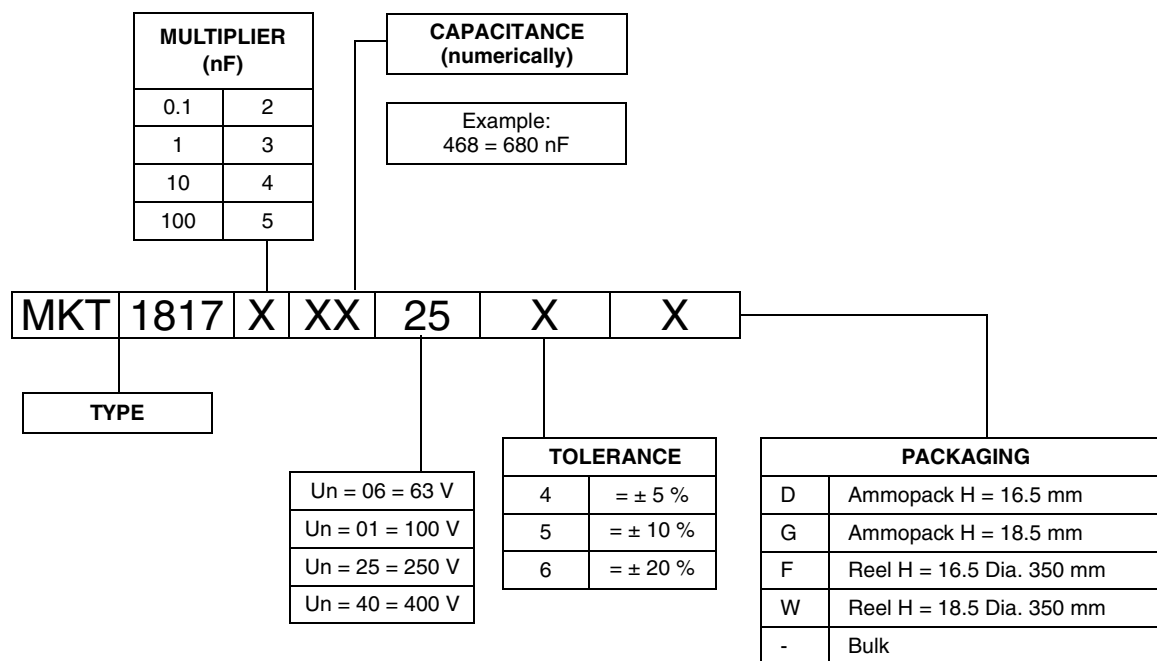
For more detailed data and test requirements contact:

dc-film@vishay.com



RoHS
COMPLIANT

COMPOSITION OF CATALOG NUMBER



Note

- For detailed tape specifications refer to "Packaging information" www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA

| DESCRIPTION | | VALUE | | |
|---|---|--|---------------------------|---------------------------|
| Tangent of loss angle: | | at 1 kHz | at 10 kHz | at 100 kHz |
| $C \leq 0.1 \mu\text{F}$ | | $\leq 80 \times 10^{-4}$ | $\leq 150 \times 10^{-4}$ | $\leq 250 \times 10^{-4}$ |
| $0.1 \mu\text{F} < C \leq 1.0 \mu\text{F}$ | | $\leq 80 \times 10^{-4}$ | $\leq 150 \times 10^{-4}$ | - |
| Pitch (mm) | Rated voltage pulse slope (dU/dt) _R at | | | |
| | 63 V _{DC} | 100 V _{DC} | 250 V _{DC} | 400 V _{DC} |
| 5 | 15 | 24 | 44 | 100 |
| If the maximum pulse voltage is less than the rated voltage higher dU/dt values can be permitted. | | | | |
| R between leads, for $C \leq 0.33 \mu\text{F}$ and $U_R \leq 100 \text{ V}$ | | > 15 000 MΩ | | |
| R between leads, for $C \leq 0.33 \mu\text{F}$ and $U_R > 100 \text{ V}$ | | > 30 000 MΩ | | |
| RC between leads, for $C > 0.33 \mu\text{F}$ and $U_R \leq 100 \text{ V}$ | | > 5000 s | | |
| RC between leads, for $C > 0.33 \mu\text{F}$ and $U_R > 100 \text{ V}$ | | > 10 000 s | | |
| R between interconnecting leads and casing 100 V (foil method) | | > 30 000 MΩ | | |
| Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s | | 1.6 x U _{RDC} , 1 min | | |
| Withstanding (DC) voltage between leads and case | | 2.0 x U _{RDC} , with minimum of 200 V _{DC} ; 1 min | | |
| Maximum application temperature | | 100 °C | | |



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| CAPACITANCE | CAPACITANCE CODE | VOLTAGE CODE 06 63 V _{DC} /40 V _{AC} | | | VOLTAGE CODE 01 100 V _{DC} /63 V _{AC} | | | VOLTAGE CODE 25 250 V _{DC} /160 V _{AC} | | | VOLTAGE CODE 40 400 V _{DC} /200 V _{AC} | | |
|-------------|------------------|---|-----------|-----------|--|-----------|-----------|---|-----------|-----------|---|-----------|-----------|
| | | w (mm) | h (mm) | l (mm) | w (mm) | h (mm) | l (mm) | w (mm) | h (mm) | l (mm) | w (mm) | h (mm) | l (mm) |
| 1000 pF | -210 | - | - | - | - | - | - | - | - | - | 2.5 | 6.0 | 7.5 |
| 1500 pF | -215 | - | - | - | - | - | - | - | - | - | 2.5 | 6.0 | 7.5 |
| 2200 pF | -222 | - | - | - | - | - | - | - | - | - | 2.5 | 6.0 | 7.5 |
| 3300 pF | -233 | - | - | - | - | - | - | 2.5 | 6.0 | 7.5 | 3.0 | 6.5 | 7.5 |
| 4700 pF | -247 | - | - | - | - | - | - | 2.5 | 6.0 | 7.5 | 3.5 | 8.5 | 7.5 |
| 6800 pF | -268 | - | - | - | - | - | - | 2.5 | 6.0 | 7.5 | 3.5 | 8.5 | 7.5 |
| 0.01 µF | -310 | - | - | - | - | - | - | 2.5 | 6.0 | 7.5 | 4.5 | 9.5 | 7.5 |
| 0.015 µF | -315 | - | - | - | - | - | - | 2.5 | 6.0 | 7.5 | 4.5 | 9.5 | 7.5 |
| 0.022 µF | -322 | - | - | - | 2.5 | 6.0 | 7.5 | 3.0 | 6.5 | 7.5 | 5.5 | 11.5 | 7.5 |
| 0.033 µF | -333 | - | - | - | 2.5 | 6.0 | 7.5 | 3.5 | 8.5 | 7.5 | - | - | - |
| 0.047 µF | -347 | - | - | - | 2.5 | 6.0 | 7.5 | 4.5 | 9.5 | 7.5 | - | - | - |
| 0.068 µF | -368 | - | - | - | 2.5 | 6.0 | 7.5 | 4.5 | 9.5 | 7.5 | - | - | - |
| 0.10 µF | -410 | 2.5 | 6.0 | 7.5 | 3.5 | 8.5 | 7.5 | 5.5 | 11.5 | 7.5 | - | - | - |
| 0.15 µF | -415 | 3.5 | 8.5 | 7.5 | 4.5 | 9.5 | 7.5 | - | - | - | - | - | - |
| 0.22 µF | -422 | 3.5 | 8.5 | 7.5 | 5.0 | 10.0 | 7.5 | - | - | - | - | - | - |
| 0.33 µF | -433 | 4.5 | 9.5 | 7.5 | 5.5 | 11.5 | 7.5 | - | - | - | - | - | - |
| 0.47 µF | -447 | 5.0 | 10.0 | 7.5 | - | - | - | - | - | - | - | - | - |
| 0.68 µF | -468 | 5.0 | 10.5 | 7.5 | - | - | - | - | - | - | - | - | - |
| 1.0 µF | -510 | 5.5 | 11.5 | 7.5 | - | - | - | - | - | - | - | - | - |

RECOMMENDED PACKAGING

| PACKAGING CODE | TYPE OF PACKAGING | HEIGHT (H) (mm) | REEL DIAMETER (mm) | ORDERING CODE EXAMPLES | PITCH 5 |
|----------------|-------------------|--------------------|-----------------------|---------------------------|------------|
| D | Ammo | 16.5 | S ⁽¹⁾ | MKT1817-233-255-D | x |
| G | Ammo | 18.5 | S ⁽¹⁾ | MKT1817-233-255-G | x |
| F | Reel | 16.5 | 350 | MKT1817-233-255-F | x |
| W | Reel | 18.5 | 350 | MKT1817-233-255-W | x |
| - | Bulk | - | - | MKT1817-233-255 | x |

Note

⁽¹⁾ S = box size 55 mm x 210 mm x 340 mm (w x h x l)

MOUNTING**Normal Use**

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting on printed-circuit boards by means of automatic insertion machines.

For detailed tape specifications refer to "Packaging Information" www.vishay.com/doc?28139

Specific Method of Mounting to Withstand Vibration and Shock

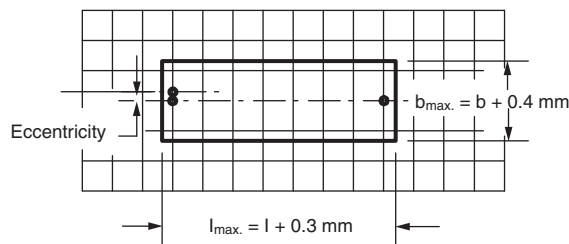
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

- For pitches ≤ 15 mm the capacitors shall be mechanically fixed by the leads
- For larger pitches the capacitors shall be mounted in the same way and the body clamped

Space Requirements on Printed-Circuit Board

The maximum length and width of film capacitors is shown in the drawing:

- Eccentricity as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned
- Product height with seating plane as given by "IEC 60717" as reference: $h_{\max.} \leq h + 0.3$ mm

**Ratings and Characteristics Reference Conditions**

Unless otherwise specified, all electrical values apply to an ambient temperature of $23\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$, an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of $50\% \pm 2\%$.

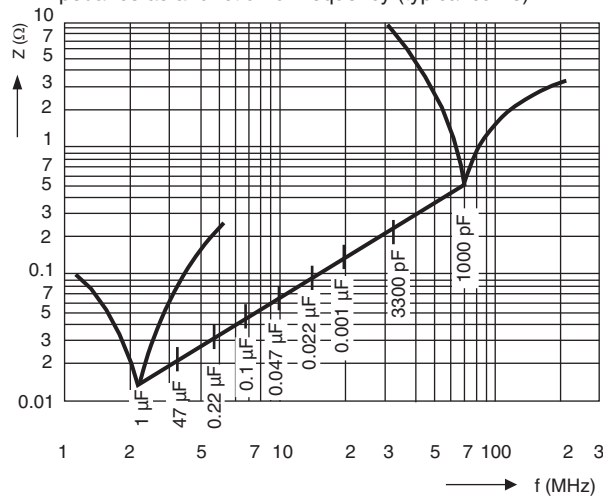
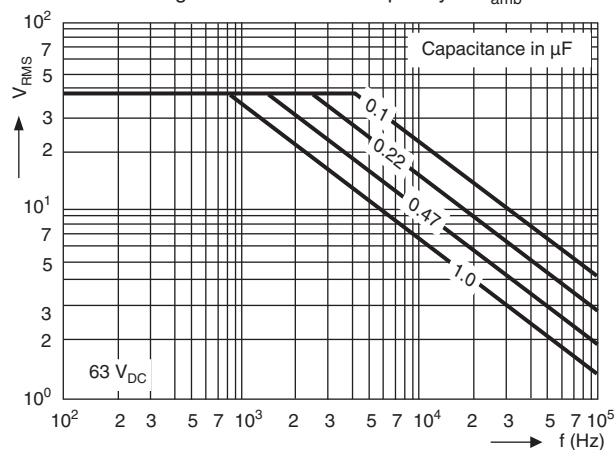
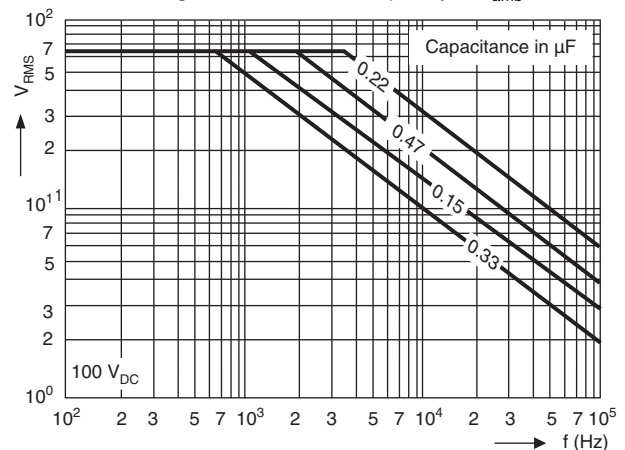
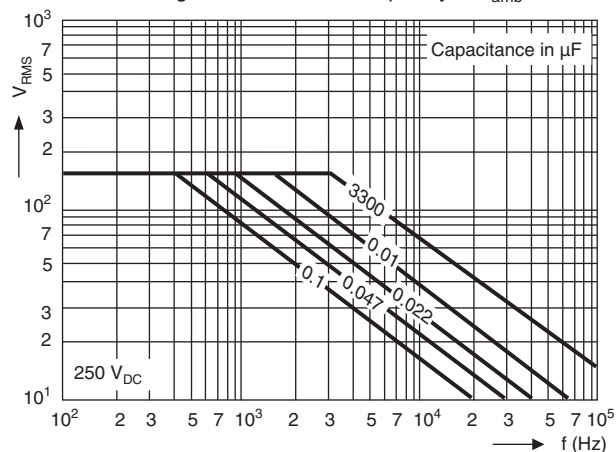
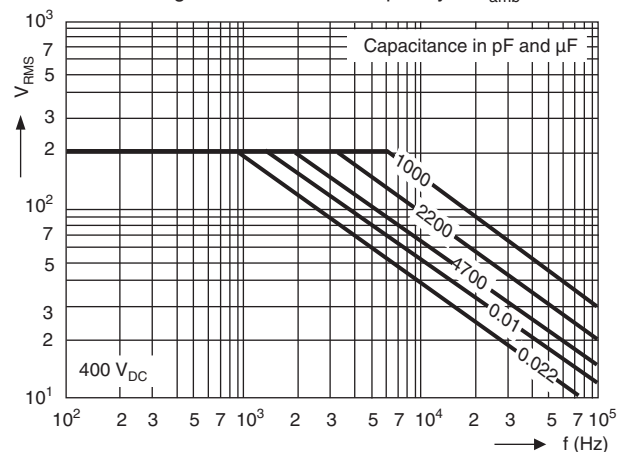
For reference testing, a conditioning period shall be applied over $96\text{ h} \pm 4\text{ h}$ by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.



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Impedance as a function of frequency (typical curve)

Max. RMS voltage as a function of frequency at $T_{\text{amb}} \leq 85^\circ\text{C}$ Max. RMS voltage as a function of frequency at $T_{\text{amb}} \leq 85^\circ\text{C}$ Max. RMS voltage as a function of frequency at $T_{\text{amb}} \leq 85^\circ\text{C}$ Max. RMS voltage as a function of frequency at $T_{\text{amb}} \leq 85^\circ\text{C}$ 

INSPECTION REQUIREMENTS

Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-2 and Specific Reference Data”.

Group C Inspection

| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
|---|---|--|
| SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1 | | |
| 4.1 Dimensions (detail) | | As specified in chapters “General data” of this specification |
| 4.3.1 Initial measurements | Capacitance Tangent of loss angle: For $C \leq 1 \mu\text{F}$ at 10 kHz for $C > 1 \mu\text{F}$ at 1 kHz | |
| 4.3 Robustness of terminations | Method: 1A Solder bath: $280^\circ\text{C} \pm 5^\circ\text{C}$ | No visible damage |
| 4.4 Resistance to soldering heat (see note 3) | Duration: 10 s Isopropylalcohol at room temperature Method: 2 | |
| 4.14 Component solvent resistance | Immersion time: $5 \text{ min} \pm 0.5 \text{ min}$ Recovery time: Min. 1 h, max. 2 h | |
| 4.4.2 Final measurements | Visual examination Capacitance Tangent of loss angle | No visible damage Legible marking $ \Delta C/C \leq 2\%$ of the value measured initially Increase of $\tan \delta$: ≤ 0.003 for: $C \leq 1 \mu\text{F}$ or ≤ 0.002 for: $C > 1 \mu\text{F}$ Compared to values measured in 4.3.1 |
| SUB-GROUP C1B OTHER PART OF SAMPLE OF SUB-GROUP C1 | | |
| 4.6.1 Initial measurements | Capacitance Tangent of loss angle: For $C \leq 1 \mu\text{F}$ at 10 kHz for $C > 1 \mu\text{F}$ at 1 kHz | |
| 4.6 Rapid change of temperature | $\theta A = -55^\circ\text{C}$ $\theta B = +100^\circ\text{C}$ 5 cycles Duration $t = 30 \text{ min}$ Visual examination | |
| 4.7 Vibration (see note 3) | Mounting: See section “Mounting” of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s^2 (whichever is less severe) Total duration 6 h | No visible damage |



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| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
|--|--|--|
| 4.7.2 Final inspection | Visual examination | No visible damage |
| 4.9 Shock (see note 3) | Mounting: See section "Mounting" of this specification Pulse shape: Half sine Acceleration: 490 m/s ² Duration of pulse: 11 ms | |
| 4.9.2 Final measurements | Visual examination Capacitance Tangent of loss angle Insulation resistance | No visible damage $ \Delta C/C \leq 5\%$ of the value measured in 4.6.1 Increase of $\tan \delta$: ≤ 0.003 for: $C \leq 1 \mu\text{F}$ or ≤ 0.002 for: $C > 1 \mu\text{F}$ Compared to values measured in 4.6.1 $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |
| SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B | | |
| 4.10 Climatic sequence 4.10.2 Dry heat 4.10.3 Damp heat cyclic Test Db First cycle 4.10.4 Cold 4.10.6 Damp heat cyclic Test Db remaining cycles 4.10.6.2 Final measurements | Temperature: + 100 °C Duration: 16 h Temperature: - 55 °C Duration: 2 h Voltage proof = U_{RDC} for 1 min within 15 min after removal from testchamber Visual examination Capacitance Tangent of loss angle Insulation resistance | No breakdown or flash-over No visible damage Legible marking $ \Delta C/C \leq 5\%$ of the value measured in 4.4.2 or 4.9.3. Increase of $\tan \delta$: ≤ 0.005 for: $C \leq 1 \mu\text{F}$ or ≤ 0.003 for: $C > 1 \mu\text{F}$ Compared to values measured in 4.3.1. or 4.6.1 $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |
| SUB-GROUP C2 | | |
| 4.11 Damp heat steady state 4.11.1 Initial measurements | 56 days; 40 °C; 90 % to 95 % RH Capacitance Tangent of loss angle at 1 kHz | |

| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
|-----------------------------|--|---|
| 4.11.3 Final measurements | Voltage proof = U_{RDC} for 1 min within 15 min after removal from test chamber Visual examination Capacitance Tangent of loss angle Insulation resistance | No breakdown or flash-over No visible damage Legible marking $ \Delta C/C \leq 5\%$ of the value measured in 4.11.1. Increase of $\tan \delta$: ≤ 0.005 for: $C \leq 1 \mu F$ or Compared to values measured in 4.11.1. $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |
| SUB-GROUP C3 | | |
| 4.12 Endurance | Duration: 2000 h $1.25 \times U_{RDC}$ at $85^\circ C$ $1.0 \times U_{RDC}$ at $100^\circ C$ | |
| 4.12.1 Initial measurements | Capacitance Tangent of loss angle: For $C \leq 1 \mu F$ at 10 kHz for $C > 1 \mu F$ at 1 kHz | |
| 4.12.5 Final measurements | Visual examination Capacitance Tangent of loss angle Insulation resistance | No visible damage Legible marking $ \Delta C/C \leq 5\%$ compared to values measured in 4.12.1. Increase of $\tan \delta$: ≤ 0.003 for: $C \leq 1 \mu F$ or ≤ 0.002 for: $C > 1 \mu F$ Compared to values measured in 4.12.1. $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |
| SUB-GROUP C4 | | |
| 4.13 Charge and discharge | 10 000 cycles Charged to U_{RDC} Discharge resistance: $R = \frac{U_R}{C \times 5 \times (dU/dt)_R}$ | |
| 4.13.1 Initial measurements | Capacitance Tangent of loss angle: For $C \leq 1 \mu F$ at 10 kHz for $C > 1 \mu F$ at 1 kHz | |
| 4.13.3 Final measurements | Capacitance Tangent of loss angle Insulation resistance | $ \Delta C/C \leq 3\%$ compared to values measured in 4.13.1. Increase of $\tan \delta$: ≤ 0.003 for: $C \leq 1 \mu F$ ≤ 0.002 for: $C > 1 \mu F$ Compared to values measured in 4.13.1. $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |



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