

## Interference suppression film capacitors

MKT-P 330 4

## MKT-P RADIAL POTTED CAPACITORS

PITCH 15/22.5/27.5 mm

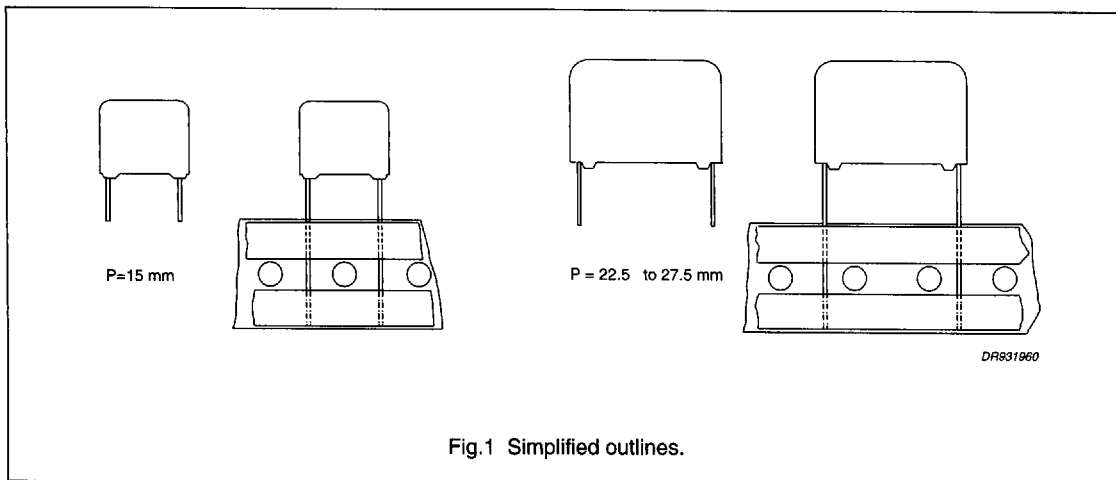


Fig.1 Simplified outlines.

## FEATURES

- 15 to 27.5 mm lead pitch
- Supplied loose in box and taped on reel
- Consists of a low-inductive wound cell of metallized polyester film and blank paper, potted in a flame-retardant case.

## APPLICATIONS

- For X2 electromagnetic interference suppression.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E6 series)	0.01 to 1 $\mu$ F
Capacitance tolerance	$\pm 20\%$ ; $\pm 10\%$
Rated voltage (AC), 50 to 60 Hz	250 V
Climatic category	40/085/21
Rated temperature	85 °C
Maximum application temperature	85 °C
Reference specification	IEC 384-14; First Edition 1981
Safety approvals	UL1283; VDE 565-1; Semko; IMQ
Materials qualified	in accordance with UL94V-0
Safety class	X2

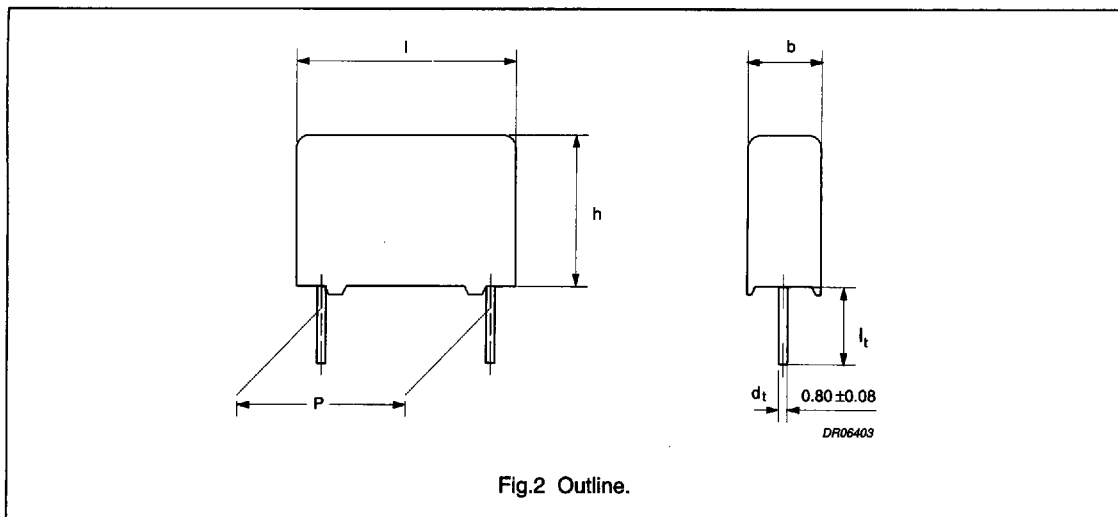
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## MKT-P 330 4 GENERAL DATA

PITCH 15/22.5/27.5 mm



## Specific reference data for the 250 V AC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 10 kHz
Tangent of loss angle	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$	100 V/ $\mu$ s	
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 15000 \text{ M}\Omega$	
RC between leads, for $C > 0.33 \mu\text{F}$	$> 5000 \text{ s}$	
Test voltage (DC)	1075 V; 1 s	

## Available 250 V AC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 20\%$	2222 330 40...	preferred
		$\pm 10\%$	2222 330 41...	on request
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 20\%$	2222 330 47...	on request
		$\pm 10\%$	2222 330 48...	on request
Loose in box	$l_t = 25.0 \pm 2.0 \text{ mm}$	$\pm 20\%$	2222 330 44...	on request
		$\pm 10\%$	2222 330 45...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 20\%$	2222 330 42...	on request
		$\pm 10\%$	2222 330 43...	on request

## Note

1. H = in-tape height; for detailed specifications refer to this handbook, Chapter "Packaging".

## Available 250 V AC versions on request

PACKAGING	DIMENSIONS	C-tol	VALUES	ORDERING
Ammopack	$l_t = 3.2 \text{ to } 35$	-	E12 series	on request

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## Safety approvals

SAFETY APPROVALS	FILE NUMBERS
UL1283	E 109565
VDE 565-1, class X2	1016.30-4670-1010
SEMKO SEN 432901	8325176
IMQ CEI 40-7/1980	V 1557



DR06402a

Fig.3 Safety approvals.

 $U_{Rac} = 250 \text{ V (AC) X2}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 330 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			short leads		long leads	H = 18.5 mm	
			$l_t =$ 5.0 $\pm$ 1.0 mm	SPQ	$l_t =$ 25.0 $\pm$ 2.0 mm	SPQ	
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ		
C-tol = 20%							
<b>Pitch = 15.0 <math>\pm</math> 0.4 mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>							
0.01 0.015 0.022 0.033	5.0 $\times$ 11.0 $\times$ 17.5	1.2	40103	1000	1000	1100	
0.047			40153				40223
0.068			40223				40333
0.1			40333				40473
0.047	6.0 $\times$ 12.0 $\times$ 17.5	1.4	40473	1000	1000	900	
0.068	7.0 $\times$ 13.5 $\times$ 17.5	2.0	40683	1000	500	800	
0.1	8.5 $\times$ 15.0 $\times$ 17.5	2.6	40104	1000	500	650	
<b>Pitch = 22.5 <math>\pm</math> 0.4 mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>							
0.15	7.0 $\times$ 16.5 $\times$ 26.0	3.0	40154	200	500	550	
0.22	8.5 $\times$ 18.0 $\times$ 26.0	3.7	40224	200	500	450	
0.33	10.0 $\times$ 19.5 $\times$ 26.0	5.4	40334	200	500	350	
<b>Pitch = 27.5 <math>\pm</math> 0.4 mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>							
0.47	13.0 $\times$ 23.0 $\times$ 31.0	10.8	40474	100	125	250	
0.68	15.0 $\times$ 25.0 $\times$ 31.0	12.9	40684	100	125	200	
1	18.0 $\times$ 28.0 $\times$ 31.0	18.2	40105	100	125	150	

## Note

1. The shading indicates preferred types.

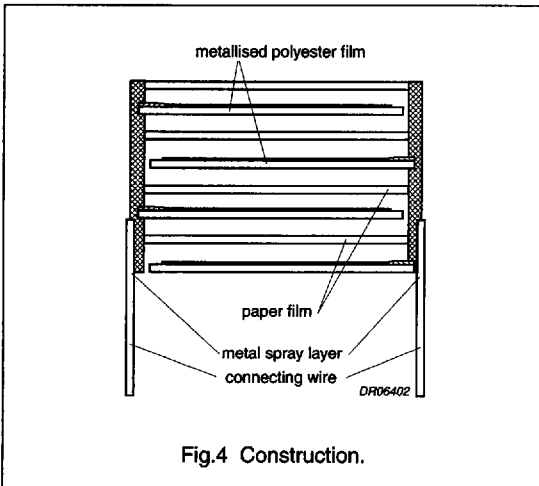
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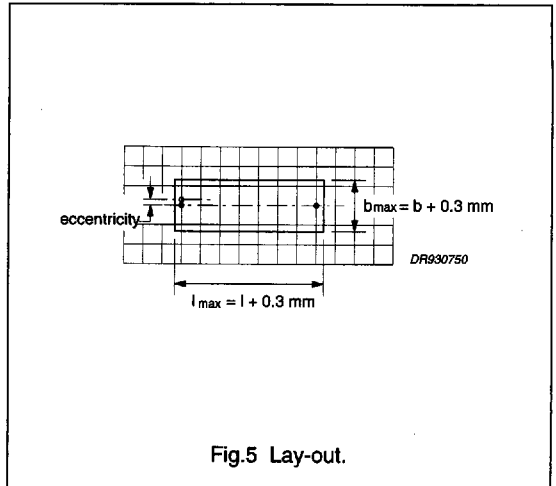
**CONSTRUCTION****Description**

- Low-inductive wound cell of metallized polyethylene terephthalate (PETP) film and paper film, potted with epoxy resin in a flame-retardant polypropylene case
- Radial copper leads: solder-coated
- Small stand-off pips allow removal of solder flux etc. during cleaning of the printed-circuit board.

**SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD**

The maximum length and width of film capacitors is shown in Fig.5:

- Eccentricity as in Fig.5. 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 717" as reference:  $h_{\max} \leq h + 0.3 \text{ mm}$ .

**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 automatic insertion machines.

For detailed tape specifications refer to this handbook, Chapter "Packaging".

**SPECIFIC METHOD OF MOUNTING TO WITHSTAND VIBRATION AND SHOCK**

It must be ensured that the stand-off pips are in good contact with the printed-circuit board:

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

**RATINGS AND CHARACTERISTICS**

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

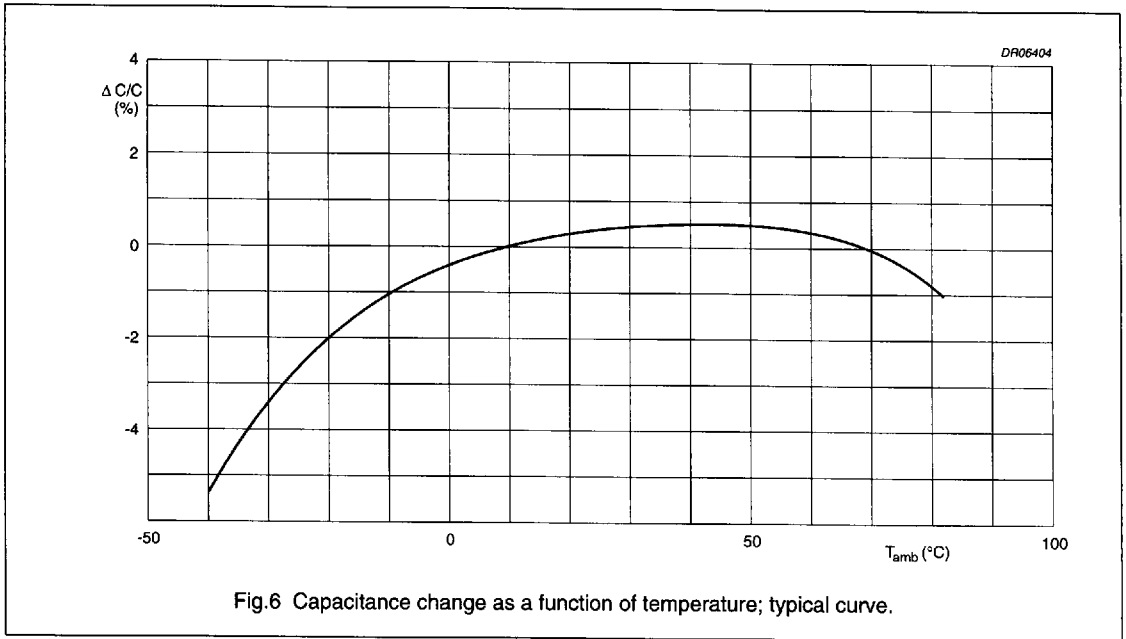
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

Interference suppression film capacitors

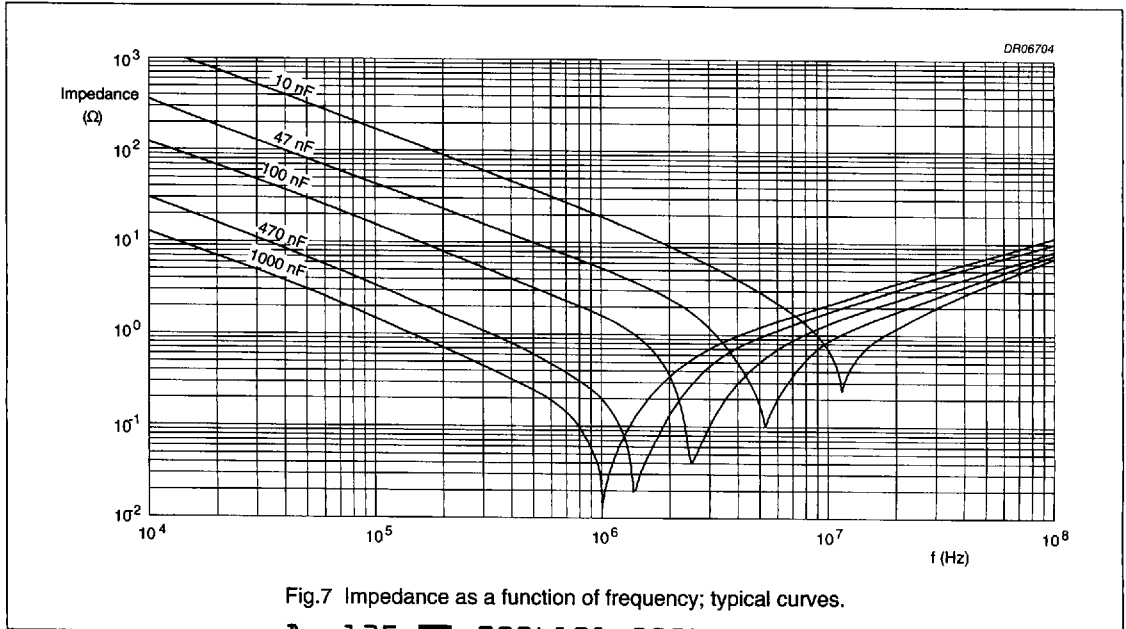
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Capacitance

All capacitance values are specified at 1 kHz.



Impedance

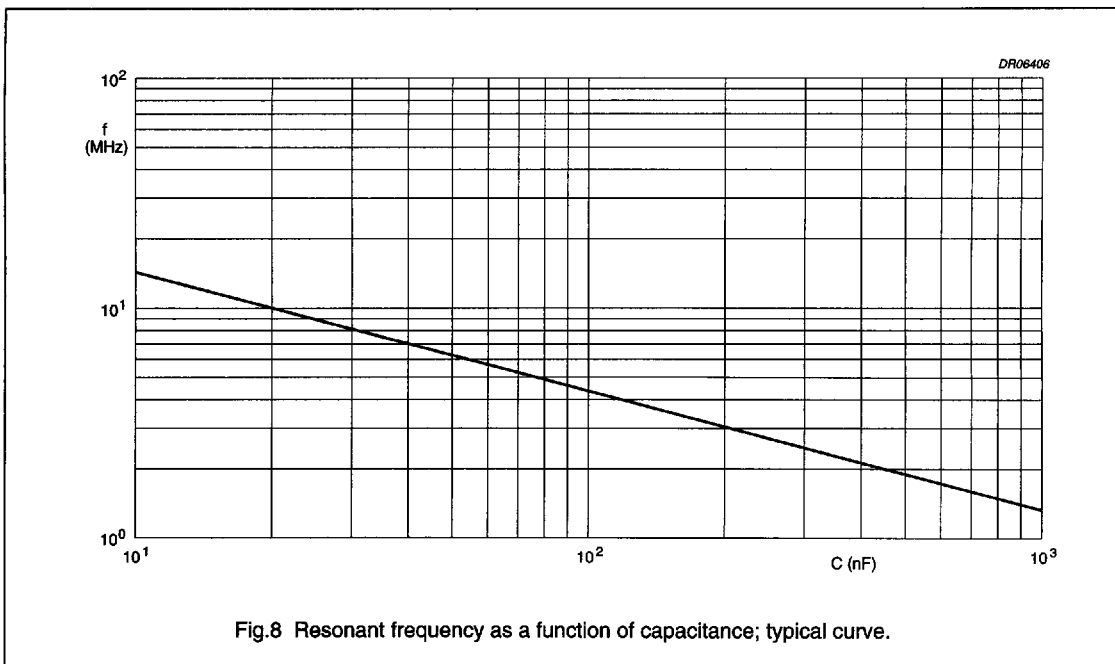


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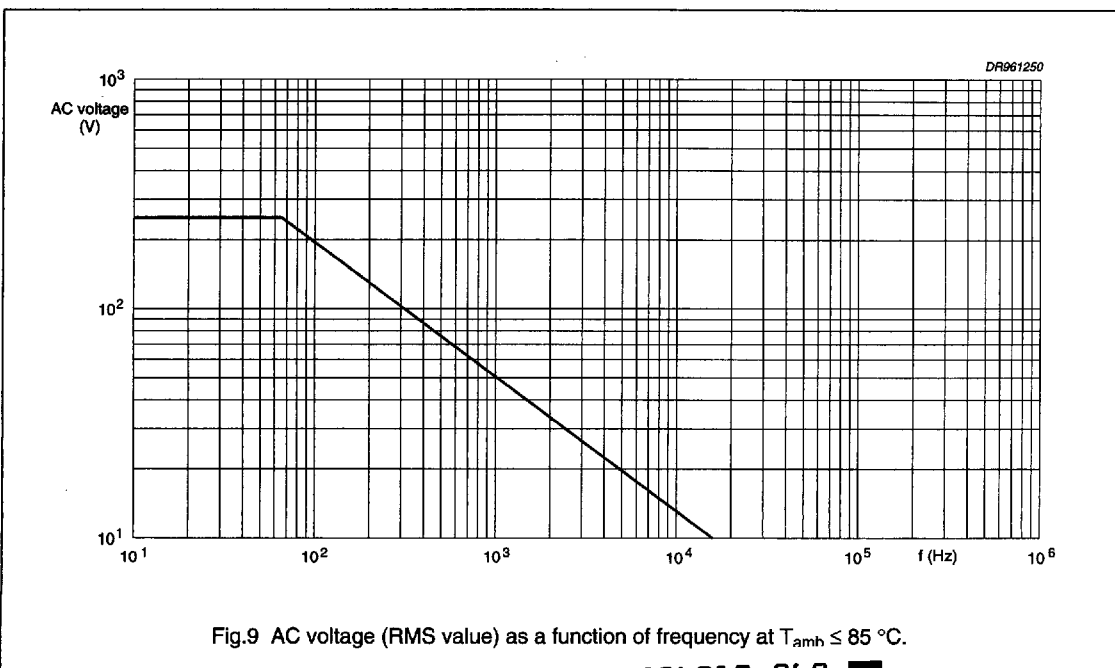
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Resonant frequency



Maximum RMS voltage (sinewave) as a function of frequency for  $T_{amb} \leq 85\text{ }^{\circ}\text{C}$

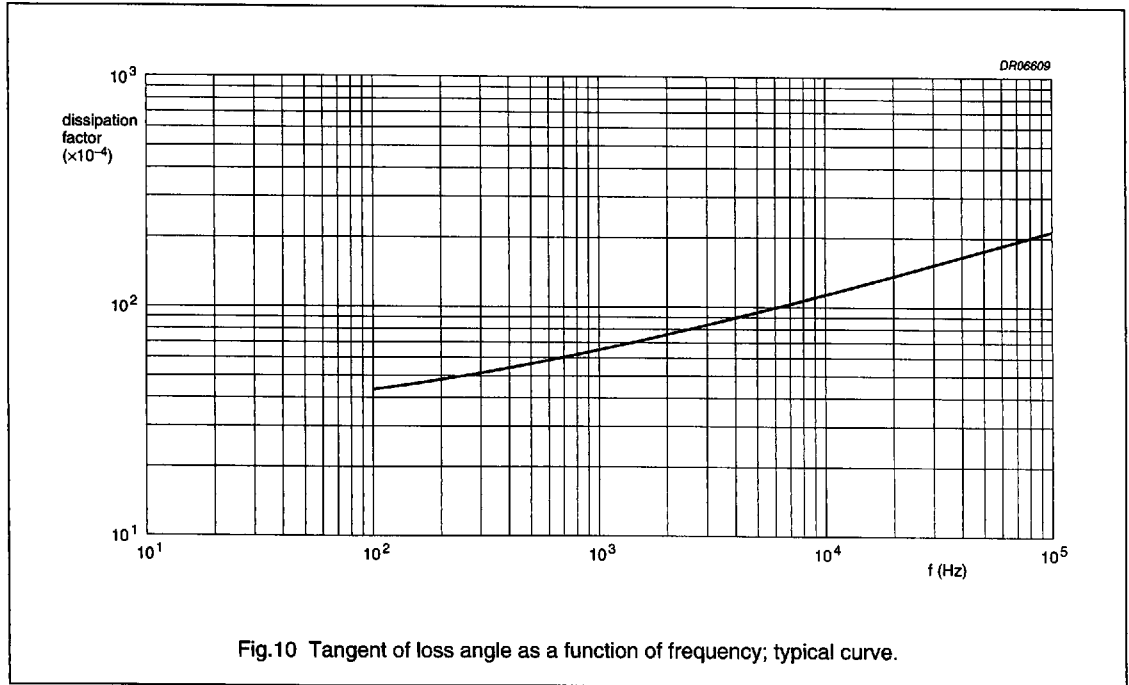


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Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE	
	at 1 kHz	at 10 kHz
0.01 to 1 $\mu$ F	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$



Temperature

- Storage temperature:  $T_{stg} = -25$  to  $+40$  °C with RH maximum 80% without condensation.

Voltage

- Test voltage (DC) between leads: 1075 V 100 % on line for 1 second
- Test voltage (AC) between interconnected leads and case (foil method): 2000 V.

Rated voltage pulse slope (dU/dt)<sub>R</sub>

Maximum pulse load: 100 V/ $\mu$ s.

If the pulse voltage is lower than the rated voltage, the values of the specific reference data can be multiplied by  $\sqrt{2} \times U_{Rac}$  and divided by the applied voltage.

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**Insulation resistance**

The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm$  seconds at  $T_{amb} = 20$  °C:

- R between leads: for value see specific reference data
- R between interconnected leads and case (foil method):  $>30\,000$  M $\Omega$ .

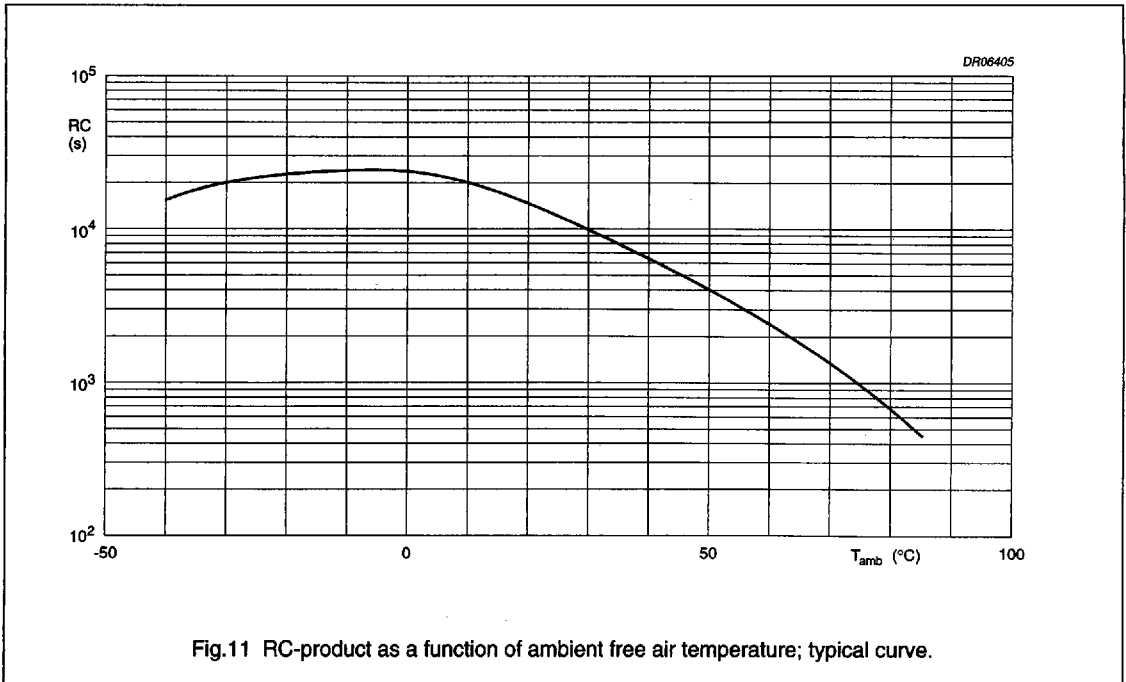


Fig.11 RC-product as a function of ambient free air temperature; typical curve.



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## MARKING

## Product marking

CAPACITORS WITH PITCH 15 TO 27.5 mm

The capacitors are marked by laser print; on the top (pitch  $\geq 22.5$  mm) or on the top and one side (pitch = 15 mm) with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: M = 20%; K =  $\pm 10\%$
3. Rated voltage (AC) (250 V)
4. Sub-class (X2)
5. Manufacturer's type designation (330 4)
6. Code for dielectric material (MKT-P)
7. Manufacturer (PHILIPS)
8. Code for factory of origin for 22.5 and 27.5 mm capacitors (HQ)
9. Year and week of manufacture (e.g. 9010)
10. Safety approvals.

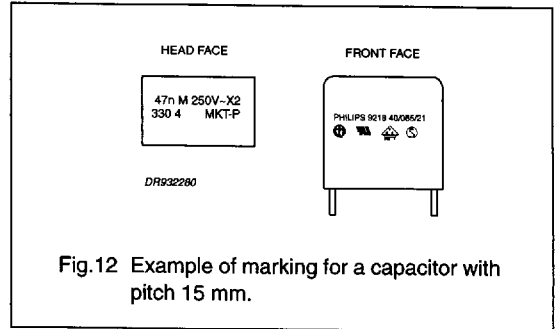


Fig.12 Example of marking for a capacitor with pitch 15 mm.

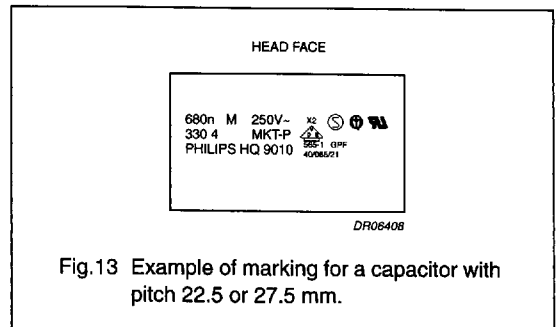


Fig.13 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.

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Package marking

The package containing the capacitors is marked as shown in Fig.14.

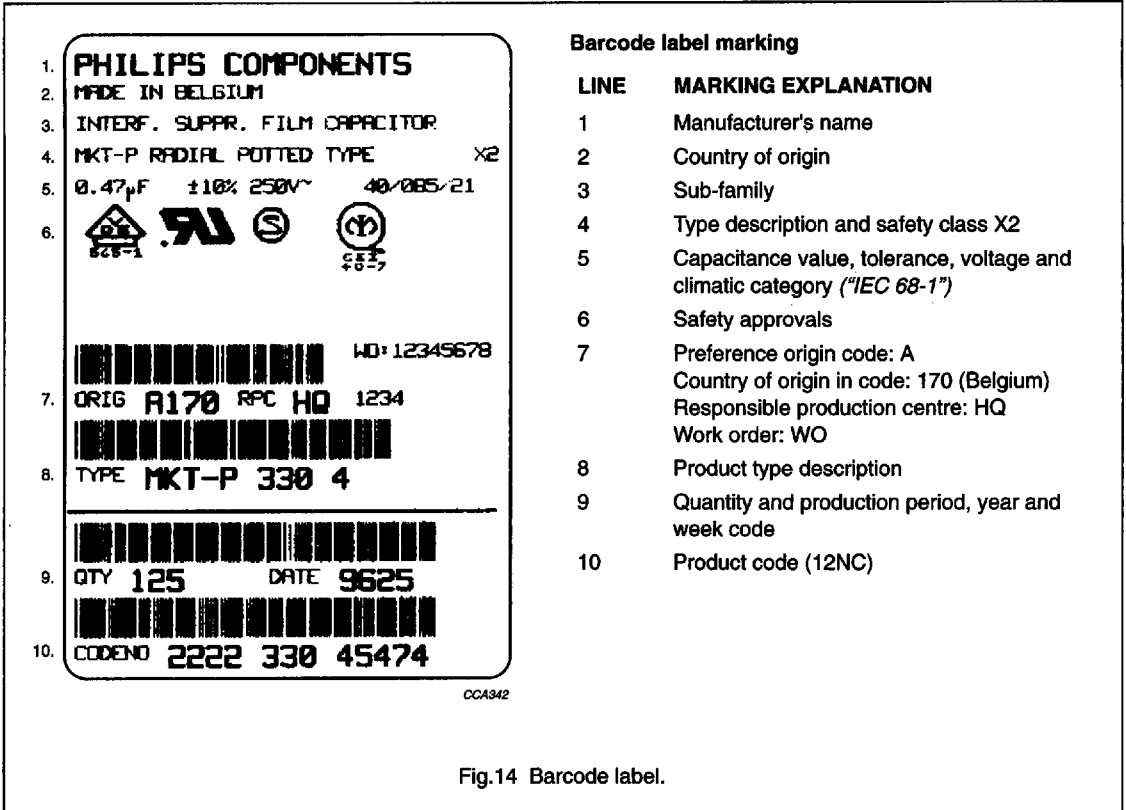


Fig.14 Barcode label.

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**QUICK REFERENCE TEST REQUIREMENTS** (see note 1)

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: "IEC 68-2-21"	solder bath: 260 °C; 10 s	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 2\%$
Component solvent resistance		$\Delta \tan \delta \leq 30 \times 10^{-4}$
<b>Robustness of component</b>		
Rapid change of temperature: "IEC 68-2-14"	5 cycles 1 cycle = 30 minutes at -40 °C and 30 minutes at 85 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm; 6 hours	
Shock: "IEC 68-2-27"	half sinewave; 490 m/s <sup>2</sup> ; 11 ms	
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 85 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$
Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30"		$R_{ins} \geq 50\%$ of specified value
Cold: "IEC 68-2-1"	2 hours; -40 °C	
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		
Voltage proof: "IEC 384-14 1 <sup>st</sup> edition 1981"	$V_p = 710$ V (DC); 1 minute	

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TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	21 days; 40 °C; 95 to 98% RH no load $V_p = 710$ V (DC); 1 minute	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-14 1 <sup>st</sup> edition 1981"	1000 hours; $1.25 \times U_{Rac}$ at 85 °C; once per hour; 0.1 s; 1000 V (RMS) via resistor of 220 $\Omega$ $V_p = 710$ V (DC); 1 minute.	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Charge and discharge: "IEC 384-14 1 <sup>st</sup> edition 1981"	10000 cycles; 5 ms; $5 \times dV/dt$	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Passive flammability: "IEC 695-2-2"	class C	no burning
Heat storage: "IEC 384-14 1 <sup>st</sup> edition 1981"	1000 hours; 85 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$
Resistance to soldering heat with preheating: "IEC 384-14 1 <sup>st</sup> edition 1981"	preheating: 85 °C; solder bath: 260 °C; 10 s	$ \Delta C/C  \leq 2\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$

**Note**

- For detailed information, see "Type specification".