



1997

Data Handbook PA05

## **QUALITY ASSURED**

Our quality system focuses on the continuing high quality of our components and the best possible service for our customers. We have a three-sided quality strategy: we apply a system of total quality control and assurance; we operate customer-oriented dynamic improvement programmes; and we promote a partnering relationship with our customers and suppliers.

## **PRODUCT SAFETY**

In striving for state-of-the-art perfection, we continuously improve components and processes with respect to environmental demands. Our components offer no hazard to the environment in normal use when operated or stored within the limits specified in the data sheet.

Some components unavoidably contain substances that, if exposed by accident or misuse, are potentially hazardous to health. Users of these components are informed of the danger by warning notices in the data sheets supporting the components. Where necessary the warning notices also indicate safety precautions to be taken and disposal instructions to be followed. Obviously users of these components, in general the set-making industry, assume responsibility towards the consumer with respect to safety matters and environmental demands.

All used or obsolete components should be disposed of according to the regulations applying at the disposal location. Depending on the location, electronic components are considered to be 'chemical', 'special' or sometimes 'industrial' waste. Disposal as domestic waste is usually not permitted.



# Film Capacitors

## CONTENTS

	Page
INTRODUCTION	3
SELECTION GUIDE	13
PACKAGING	29
PRODUCT DATA	
General purpose: MKT lacquered capacitors	55
MKT potted capacitors	175
MKPS, MKC, KT capacitors	245
Interference suppression capacitors	299
AC and Pulse capacitors	393
Precision capacitors	589
Fluorescent lamp starter capacitors	639
DATA HANDBOOK SYSTEM	653

## DEFINITIONS

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

## LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

## **INTRODUCTION**



## FILM CAPACITORS

The dielectric material of a film capacitor is a plastic or paper film. In the table below, an overview is given of the film dielectrics used in Philips film capacitor products.

## Film dielectrics used in Philips film capacitor products

PARAMETER	DIELECTRIC <sup>(1)</sup>						UNIT
	P	KT	KC	KPS	KS	KP	
Dielectric constant: at 1 kHz	3.0	3.3	2.8	3.0	2.4	2.2	
Dissipation factor ( $\times 10^{-4}$ )							
at 1 kHz	50	50	12	3	2	1	
at 10 kHz	120	110	50	6	2	2	
at 100 kHz	200	170	100	12	2	2	
at 1 MHz	300	200	110	18	4	4	
Volume resistivity	$10^{+16}$	$10^{+17}$	$10^{+17}$	$10^{+17}$	$10^{+18}$	$10^{+18}$	$\Omega\text{cm}$
Dielectric strength	100	400	300	250	500	600	$\text{V}/\mu\text{m}$
Maximum application temperature	100	125	125	150	85	100	$^{\circ}\text{C}$
Power density: at 10 kHz	67	50	21	2.5	0.67	0.6	$\text{W}/\text{cm}^3$

## Note

1. P = paper; KT = polyethylene terephthalate; KC = polycarbonate; KPS = polyphenylene sulfide; KS = polystyrene; KP = polypropylene.

Because of their typical properties, the polyester and polycarbonate dielectrics are used in general purpose applications where a small bias DC voltage and small AC voltages at low frequencies are usual. The most important properties are the high capacitance per volume for polyester and, the capacitance stability over a wide temperature range for polycarbonate.

A rather new dielectric is polyphenylene sulfide (KPS). Its high melting point allows it to be used in a non-encapsulated SMD product. The properties of KPS determine the stability of the product characteristics.

Polypropylene and polystyrene films are used in high frequency or high voltage applications due to their very low dissipation factor and high dielectric strength.

Paper film is still used in capacitors for mains applications, as for example in interference suppression capacitors.

Typical properties as functions of temperature or frequency are illustrated in Figs 1 to 4.

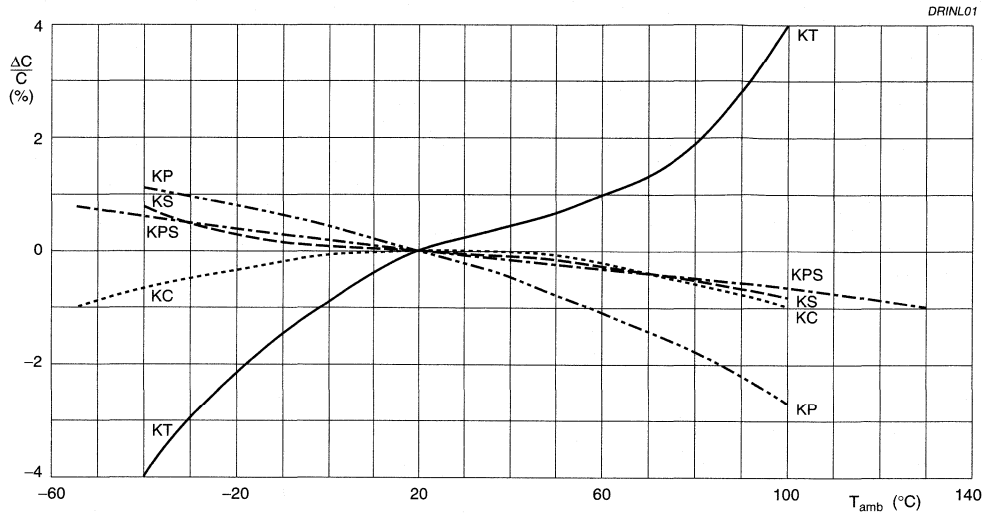


Fig.1 Capacitance change as a function of ambient free air temperature at 1 kHz; typical curves.

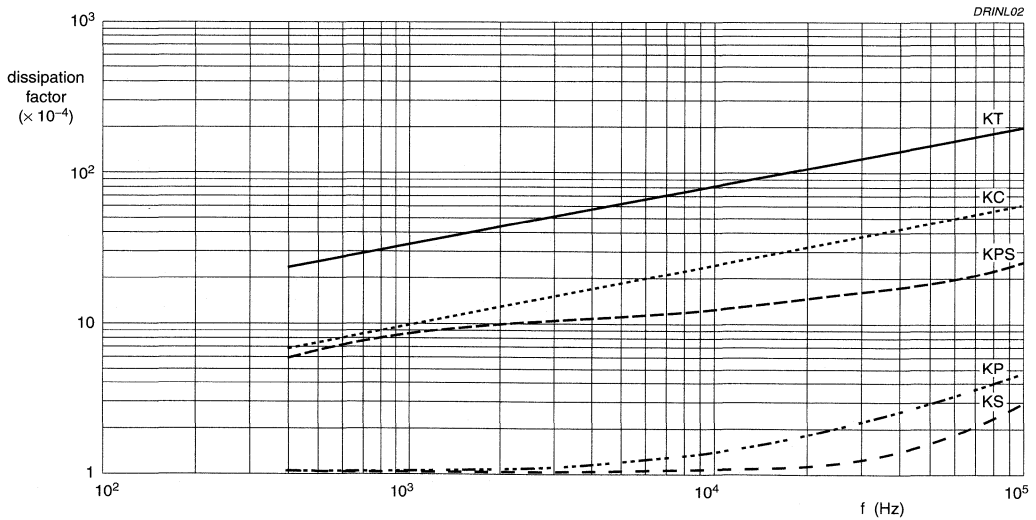
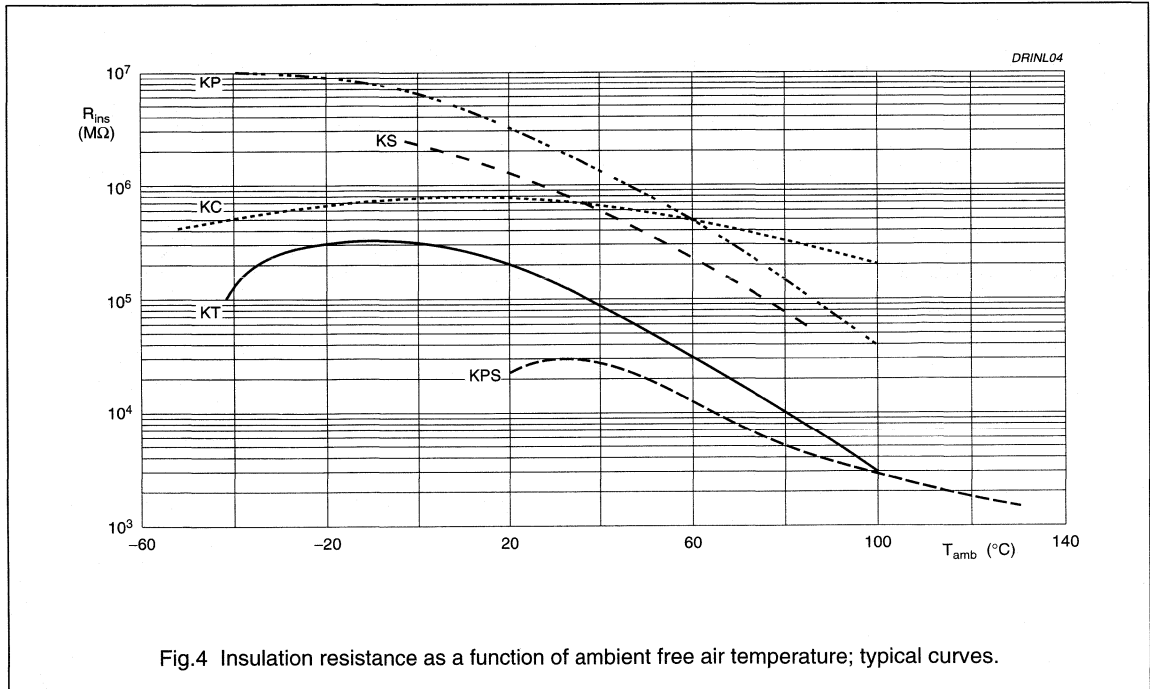
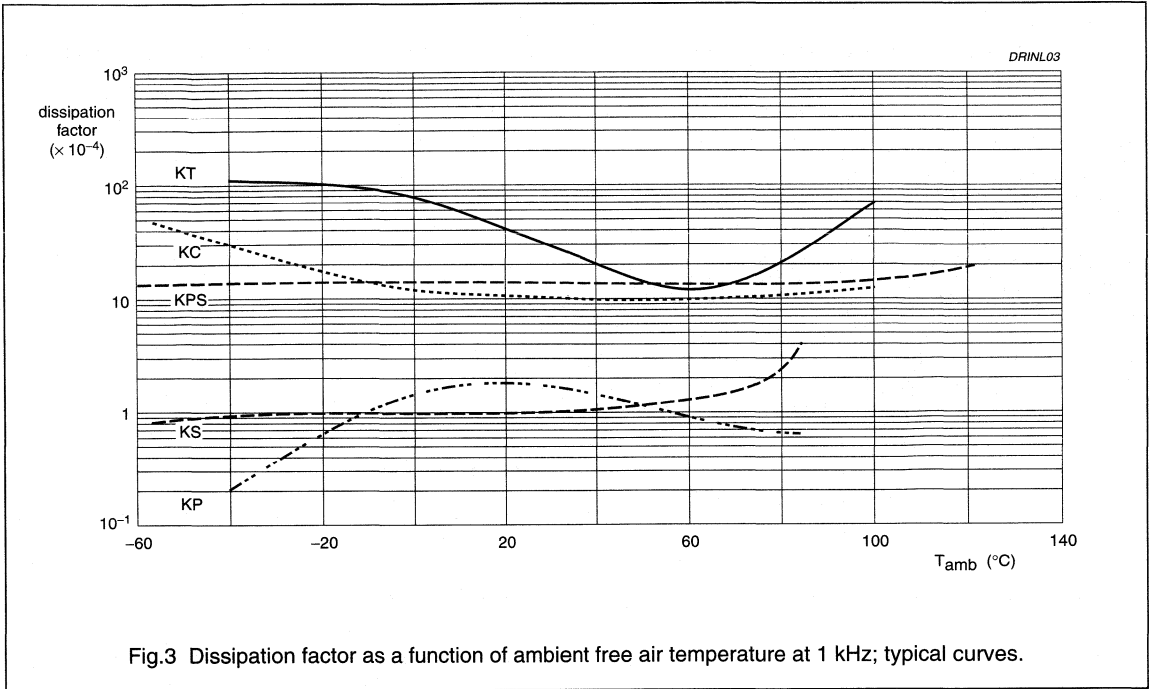


Fig.2 Dissipation factor as a function of frequency at 20 °C; typical curves.



### CONSTRUCTION OF THE CAPACITOR CELL

The type of electrode used determines whether the capacitor is a metallized film or film/foil type.

The electrodes used for metallized film capacitors consist of a thin metal layer with a thickness of approximately 30 to 50 nm. The electrodes of film/foil capacitors have discrete metal foils with thicknesses of approximately 5 to 10  $\mu\text{m}$ .

Due to their construction, film/foil capacitors can carry higher currents than metallized ones, but are larger in volume.

Metallized capacitors have a self-healing behaviour as an intrinsic characteristic. All capacitor cells are low inductive wound, except for the SMD products which are produced by stacked film technology.

Depending on the AC voltage, single or series constructions are used. Single section capacitors are normally used for products with an AC rating up to 275 V (AC). Series constructions are used for higher voltages.

### GENERAL DEFINITIONS

#### Rated voltage ( $U_{Rdc}$ )

The maximum DC voltage (in V) which may be continuously applied to a capacitor at any operating ambient temperature below the rated temperature.

#### Category voltage ( $U_C$ )

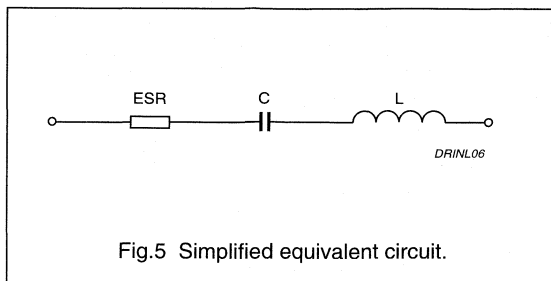
The maximum AC voltage (or DC voltage) which may be applied continuously to a capacitor at its upper category temperature.

#### Rated AC voltage ( $U_{Rac}$ )

The maximum RMS voltage (in V) of specified frequency (mostly 50 Hz), which may be continuously applied to a capacitor at any operating ambient temperature below the rated temperature.

### Capacitance

The capacitance of a capacitor is the capacitive part of the equivalent circuit composed of capacitance, series resistance and inductance.



### Rated capacitance

The rated capacitance, normally marked on the product, is the value for which the capacitor has been designed.

### Capacitance tolerance

The percentage of the allowed deviation of the capacitance from the rated capacitance is measured at a free air ambient temperature of  $23 \pm 1$  °C and RH of  $50 \pm 2\%$ .

### Tolerance coding in accordance with "IEC 62"

PERCENTAGE OF DEVIATION	LETTER CODE
$\pm 1.0\%$	F
$\pm 2.0\%$	G
$\pm 5.0\%$	J
$\pm 10.0\%$	K
$\pm 20.0\%$	M

A letter "A" indicates that the tolerance is defined in the type specification or customer detail specification.

### Temperature coefficient and cyclic drift of capacitance

The terms characterizing these two properties apply to capacitors of which the variations of capacitance as a function of temperature are linear or approximately linear and can be expressed with a certain precision.



**TEMPERATURE COEFFICIENT OF CAPACITANCE**

The rate of capacitance change with temperature, measured over the specified temperature range. It is normally expressed in parts per million per Kelvin ( $10^{-6}/K$ ).

**TEMPERATURE CYCLIC DRIFT OF CAPACITANCE**

The maximum irreversible variation of capacitance observed at room temperature during or after the completion of a number of specified temperature cycles. It is usually expressed as a percentage of the capacitance related to a reference temperature. This is normally 20 °C.

**Rated voltage pulse slope (dV/dt)**

The maximum voltage pulse slope that the capacitor can withstand with a pulse voltage equal to the rated voltage. For pulse voltages other than the rated voltage, the maximum voltage pulse slope may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

The voltage pulse slope multiplied by the capacitance gives the peak current for the capacitor.

**Dissipation factor and equivalent series resistance**

The dissipation factor or tangent of loss angle ( $\tan \delta$ ) is the power loss of the capacitor divided by the reactive power of the capacitor at a sinusoidal voltage of specified frequency.

The equivalent series resistance (ESR) is the resistive part of the equivalent circuit composed of capacitance, series resistance and inductance.

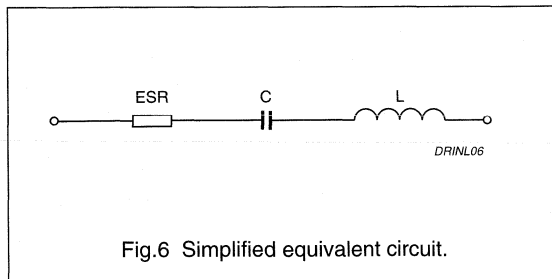


Fig.6 Simplified equivalent circuit.

**Insulation resistance and time constant**

The insulation resistance ( $R_{ins}$ ) is defined by the applied DC voltage divided by the leakage current after a well defined minimum time.

The time constant is the product (in seconds) of the nominal capacitance and the insulation resistance between the leads.

**Ambient temperature**

The ambient temperature is the temperature of the air surrounding the component.

**Climatic category**

The climatic category code (e.g. 50/100/56) indicates to which climatic category a film capacitor type belongs. The category is indicated by a series of three sets of digits separated by oblique strokes corresponding to the minimum ambient temperature of operation, the maximum temperature of operation and the number of days of exposure to damp heat (Steady state - test Ca) respectively that they will withstand.

**Category temperature range**

The range of ambient temperatures for which the capacitor has been designed to operate continuously. This is defined by the temperature limits of the appropriate category.

**Upper category temperature**

The maximum ambient temperature for which a capacitor has been designed to operate continuously at category voltage.

**Lower category temperature**

The minimum ambient temperature for which a capacitor has been designed to operate continuously.

**Rated temperature**

The maximum ambient temperature at which the rated voltage may be applied continuously.

**Maximum application temperature**

The equivalent of the upper category temperature.

**Self-healing**

The process by which the electrical properties of a metallized capacitor, after a local breakdown, are rapidly and essentially restored to the values before the breakdown.

**Temperature characteristic of capacitance**

The term characterizing this property applies mainly to capacitors of which the variations of capacitance as a function of temperature, linear or non-linear, cannot be expressed with precision and certainty.

The temperature characteristic of capacitance is the maximum reversible variation of capacitance, produced over a given temperature range within the category temperature range.

It is expressed normally as a percentage of the capacitance related to a reference temperature of 20 °C.

### Storage temperature

The temperature range with a RH of maximum 80% without condensation at which the initial characteristics can be guaranteed for at least 2 years.

### Maximum power dissipation

The power dissipated by a capacitor is a function of the voltage ( $U_{\text{esr}}$ ) across or the current ( $I$ ) through the equivalent series resistance ESR and is expressed by:

$$P = \frac{U_{\text{esr}}^2}{\text{ESR}}$$

$$P = \text{ESR} \times I^2$$

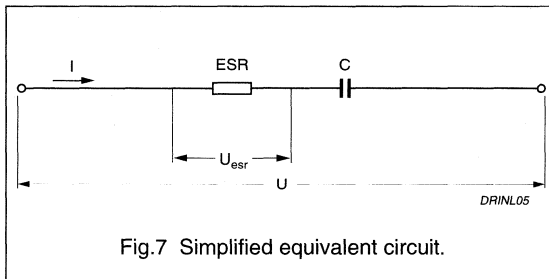


Fig.7 Simplified equivalent circuit.

$$U_{\text{esr}}^2 = \frac{\text{ESR}^2}{\text{ESR}^2 + 1/\omega^2 C^2} \times U^2$$

Given that for film capacitors  $\tan \delta = \omega \times C \times \text{ESR} \ll 0.1$  the formula can be simplified to:

$$U_{\text{esr}}^2 = \text{ESR}^2 \times \omega^2 \times C^2 \times U^2$$

or with  $\text{ESR} = \tan \delta / \omega C$

the formula becomes:

$$P = \omega \times C \times \tan \delta \times U^2$$

$$P = \frac{\tan \delta}{\omega \times C} \times I^2$$

For the  $\tan \delta$  we take the maximum value found in the specification,  $C$  is in farads and  $\omega = 2\pi f$ .  $U$  or  $I$  are assumed to be known.

The maximum permissible power dissipation ( $P_{\text{max}}$ ), which depends on the dimensions of the capacitor and on the ambient free air temperature are given in the specification.

In applications where sinewaves occur, we have to take for  $U$  the RMS-voltage and for  $I$  the RMS-current of the sinewave.

In applications where periodic signals occur, the signal has to be expressed in Fourier-terms:

$$U = U_0 + \sum_{k=1}^{\infty} U_k \times \sin(k\omega t + \Phi_k)$$

$$I = \sum_{k=1}^{\infty} I_k \times \sin(k\omega t + \Phi_k)$$

with  $U_0$  the DC voltage,  $U_k$  and  $I_k$  (the voltage and current of the  $k$ -th harmonic respectively) the formula for the dissipated power becomes:

$$P = \sum_{k=1}^{\infty} k \times \omega \times c \times \tan \delta_k \times \frac{U_k^2}{2}$$

$$P = \sum_{k=1}^{\infty} \frac{\tan \delta_k \times I_k^2}{2 \times k \times \omega \times C}$$

and  $\tan \delta_k$  is the  $\tan \delta$  at the  $k$ -th harmonic.

**TEST INFORMATION****Robustness of leads**

TENSILE STRENGTH OF LEADS (Ua)  
(LOAD IN LEAD AXIS DIRECTION)

Lead diameter 0.5, 0.6 and 0.8 mm: load 10 N, 10 s.

BENDING (Ub)

Lead diameter 0.5, 0.6 and 0.8 mm: load 5 N,  $4 \times 90^\circ$ .

Lead diameter 1.0 mm: load 10 N,  $4 \times 90^\circ$ .

TORSION (Uc) (FOR AXIAL CAPACITORS ONLY)

Severity 1: three rotations of  $360^\circ$ .

Severity 2: two rotations of  $180^\circ$ .

**Rapid change of temperature (Na)**

The rapid change of temperature test is intended to determine the effect on capacitors of a succession of temperature changes and consists of 5 cycles of 30 minutes at lower category temperature and 30 minutes at higher category temperature.

**Dry heat (Ba)**

This test determines the ability of the capacitors to be used or stored at high temperature. The standard test is 16 hours at upper category temperature.

**Damp heat cyclic (Db)**

This test determines the suitability of capacitors for use and storage under conditions of high humidity when combined with cyclic temperature changes and, in general, producing condensation on the surface of the capacitor.

One cycle consists of 24 hours exposure to  $55^\circ\text{C}$  and 95 to 100% relative humidity (RH).

**Cold (Aa)**

This test determines the ability of the capacitors to be used or stored at low temperature. The standard test is 2 hours at the lower category temperature.

**Damp heat steady state (Ca)**

This test determines the suitability of capacitors for use and storage under conditions of high humidity. The test is primarily intended to permit observation of the effects of high humidity at constant temperature over a specified period.

The capacitors are exposed to a damp heat environment which is maintained at a temperature of  $40^\circ\text{C}$  and a RH of 90 to 95% for the number of days specified by the third set of digits of the climatic category code.

**Soldering conditions**

With regard to the resistance to soldering heat and the solderability, our products comply with "IEC 384-1" and the additional type specifications.

For our precision capacitors where capacitance stability is important, we refer to the paragraph "Soldering conditions" in the type specification.

In the tables "Quick reference test requirements" an overview is given for the various soldering parameters per product type.

**Solvent resistance of components**

Soldered capacitors may be cleaned using appropriate cleansing agents, such as alcohol, fluorhydro-carbons or their mixtures. Solvents or cleansing agents based on chlorohydrocarbons or ketones should not to be used, as they may attack the capacitor or the encapsulation.

After cleaning it is always recommended to dry the components carefully.

Special attention should be given to non or partially encapsulated products (e.g. KS 424 ... 431).



## **SELECTION GUIDE**

General purpose  
film capacitors

Selection guide

**MKT 365/366/367/368/369**

**Page 57**

Dielectric	metallized polyester				
Encapsulation	epoxy lacquered				
Qualified to	IEC 384-2				
Climatic category	55/100/56				
Packaging <sup>(1)</sup>	loose; taped				
Tolerance	±20%, ±10%, ±5%				
<b>C</b> ( $\mu\text{F}$ ) <sup>(2)</sup>	<b>U<sub>Rdc</sub> (V)</b>				
	<b>63</b>	<b>100</b>	<b>250</b>	<b>400</b>	<b>630</b>
0.00022					
0.00033					
0.00047					
0.00068					
0.001					
0.0015					
0.0022					
0.0033					
0.0047					
0.0068					
0.01				A B C	
0.015					C
0.022			A B C		
0.033					
0.047					
0.068		A			
0.1					
0.15	A	B C			
0.22					
0.33	A	B C			
0.47					
0.68					
1.0					
1.5					
2.2					
3.3					
4.7					
6.8					
10					
15					

**Notes**

1. Pitch size in shaded cells: A = 5.08 mm; B = 7.62 mm; C = 10.16 mm; D = 15.24 mm; E = 22.86 and F = 27.94 mm.
2. Intermediate values of E12-series are also available.

General purpose  
film capacitors

Selection guide

MKT 465/466/467/468				
Page 131				
metallized polyester epoxy lacquered				Dielectric Encapsulation
IEC 384-2				Qualified to
55/100/56				Climatic category
loose; taped				Packaging <sup>(1)</sup>
±10%, ±5%				Tolerance
<b>U<sub>Rdc</sub> (V)</b>				<b>C</b> <b>(μF)<sup>(2)</sup></b>
<b>100</b>	<b>250</b>	<b>400</b>	<b>630</b>	
				0.00022
				0.00033
				0.00047
				0.00068
				0.001
				0.0015
				0.0022
				0.0033
				0.0047
				0.0068
				0.01
				0.015
				0.022
				0.033
				0.047
				0.068
				0.1
				0.15
				0.22
				0.33
				0.47
				0.68
				1.0
				1.5
				2.2
				3.3
				4.7
				6.8
				10
				15

Notes

1. Pitch size in shaded cells: A = 5.0 mm; B = 7.5 mm; C = 10.0 mm; D = 15.0 mm; E = 22.5 mm; F = 27.5 mm.
2. Intermediate values of E12-series, are also available.
3. Only 5.6 μF is available for 250 V and only 0.82 μF is available for 630 V.

General purpose  
film capacitors

Selection guide

**MKT 370/371/372/373**

**Page 175**

Dielectric	metallized polyester
Encapsulation	potted with epoxy resin
Qualified to	IEC 384-2
Climatic category	55/100/56
Packaging <sup>(1)</sup>	loose; taped
Tolerance	±10%, ±5%

C ( $\mu$ F) <sup>(2)</sup>	U <sub>Rdc</sub> (V)			
	63	100	250	400
0.00022				
0.00033				
0.00047				
0.00068				
0.001				
0.0015				
0.0022				
0.0033				
0.0047				
0.0068				
0.01				
0.015				
0.022				
0.033				
0.047				
0.068				
0.1	A	B		
0.15		A	B	
0.22			A	
0.33	A	B		
0.47				
0.68				
1.0				
1.5				
2.2				
3.3				
4.7				
6.8				
10				
15				

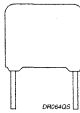

**Notes**

1. Pitch size in shaded cells: A = 5.08 mm; B = 7.62 mm; C = 10.0 mm; D = 15.0 mm; E = 22.5 mm; F = 27.5 mm.
2. Intermediate values of E12-series are also available.



General purpose  
film capacitors

Selection guide

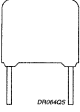
MKT 470				MKPS 390/391/392/393/394				
Page 223				Page 245				
								
metallized polyester				metallized polyphenyl sulphide				Dielectric
potted with epoxy resin								Encapsulation
IEC 384-2				IEC: 40/782/FDIS and EN 132500				Qualified to
55/125/56				55/125/56				Climatic category
loose; taped				taped				Packaging
±10%, ±5%				±10%, ±5%				Tolerance
U <sub>Rdc</sub> (V)				U <sub>Rdc</sub> (V)				C (μF) <sup>(1)</sup>
63	100	250	400	25	160			
							0.00022	
						1206 <sup>(2)</sup>	0.00033	
							0.00047	
							0.00068	
						1210 <sup>(2)</sup>	0.001	
							0.0015	
							0.0022	
						1812 <sup>(2)</sup>	0.0033	
							0.0047	
							0.0068	
						2220 <sup>(2)</sup>	0.01	
							0.015	
							0.022	
						2824 <sup>(2)</sup>	0.033	
							0.047	
							0.068	
						2220 <sup>(2)</sup>	0.1	
							0.15	
						2824 <sup>(2)</sup>	0.22	
							0.33	
							0.47	
							0.68	
							1.0	
							1.5	
							2.2	
							3.3	
							4.7	
							6.8	
							10	
							15	

Notes

- Intermediate values of E12-series are also available.
- Case size in shaded cells.

General purpose  
film capacitors

Selection guide

<b>MKC 344</b>
<b>Page 263</b>


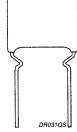
Dielectric	metallized polycarbonate			
Encapsulation	potted with epoxy resin			
Qualified to	IEC 384-6			
Climatic category	55/100/56			
Packaging <sup>(1)</sup>	loose; taped			
Tolerance	±10%, ±5%			
<b>C</b> ( $\mu\text{F}$ ) <sup>(2)</sup>	<b>U<sub>Rdc</sub> (V)</b>			
	<b>100</b>	<b>250</b>	<b>400</b>	<b>630</b>
0.00022				
0.00033				
0.00047				
0.00068				
0.001				
0.0015				
0.0022				
0.0033				
0.0047				
0.0068				
0.01				
0.015			C	C
0.022				
0.033				
0.047		C		D
0.068			D	
0.1	C			E
0.15		D		
0.22				
0.33				E
0.47		D		F
0.68			E	
1.0				F
1.5				
2.2		E		F
3.3				
4.7				
6.8		F		
10				
15				

**Notes**

1. Pitch size in shaded cells: C = 10.0 mm; D = 15.0 mm; E = 22.5 mm; F = 27.5 mm.
2. Intermediate values of E12-series are also available.

General purpose  
film capacitors

Selection guide

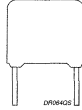
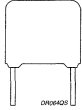
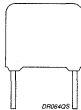
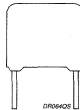


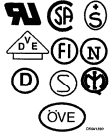

KT 347				
Page 281				
				
polyester				Dielectric
lacquered				Encapsulation
IEC 384-11				Qualified to
40/100/21				Climatic category
loose				Packaging <sup>(1)</sup>
±20%, ±10%				Tolerance
$U_{Rdc}$ (V)				C
100	250	400	630	( $\mu F$ ) <sup>(2)</sup>
				0.00022
				0.00033
				0.00047
				0.00068
				0.001
				0.0015
				0.0022
				0.0033
				0.0047
				0.0068
				0.01
				0.015
				0.022
				0.033
				0.047
				0.068
				0.1
				0.15
				0.22
				0.33
				0.47
				0.68
				1.0
				1.5
				2.2
				3.3
				4.7
				6.8
				10
				15

Notes

1. Pitch size in shaded cells: C = 10.16 mm; D = 15.24 mm; E = 22.86 mm; F = 27.94 mm.
2. Intermediate values of E12-series are also available.

# Interference suppression film capacitors

# Selection guide

	MKP 336 6	MKP 336 1	MKP 336 2	MP-KT 333 4	
	Page 301	Page 313	Page 313	Page 333	
					
Class	Y2	X1	X2	X2	
Dielectric	metallized polypropylene			metallized paper and polyester	
Encapsulation	potted with epoxy resin				
Qualified to	IEC 384-14, 2nd edition; EN 132400				
Approvals					
Climatic category	55/100/21/C	55/100/21/C	55/100/21/C	40/085/21C	
Tan δ (10 kHz)	$\leq 10 \times 10^{-4}$	$\leq 70 \times 10^{-4}$	$\leq 70 \times 10^{-4}$	$\leq 200 \times 10^{-4}$	
R <sub>ins</sub> for C ≤ 330 nF	>15000 MΩ	>15000 MΩ	>15000 MΩ	>15000 MΩ	
RC for C > 330 nF	–	>5000 s	>5000 s	>5000 s	
Pulse slope at U <sub>R</sub>	200 V/μs	200 V/μs	100 V/μs	250 to 1500 V/μs	
Packaging <sup>(1)</sup>	loose; taped				
Tolerance	±20%, ±10%			±10%	
C (μF) (E6-series)	U <sub>Rac</sub> (V) 250	U <sub>Rac</sub> (V) 275	U <sub>Rac</sub> (V) 275	U <sub>Rac</sub> (V) 250	
0.001	C	C	C		
0.0015					
0.0022					
0.0033					
0.0047					
0.0068					
0.01	D	D	D	D	
0.015					
0.022					
0.033					
0.047	E	E	E	E	
0.068					
0.1					
0.15	F	F	F	F	
0.22					
0.33					
0.47					
0.68					
1.0					
1.5					
2.2					

**Note**

1. Pitch size in shaded cells: C = 10.0 mm; D = 15.0 mm; E = 22.5 mm; F = 27.5 mm.

# Interference suppression film capacitors

## Selection guide

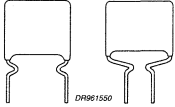
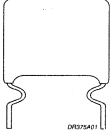
MKT/MKT 331 6	MKP 335 1	MKT-P 330 4	MKT 2222 311 901..	
Page 345	Page 357	Page 369	Page 381	
X2	X2	X2	X2	Class
metallized polyester	metallized polypropylene	metallized polyester and paper	metallized polyester	Dielectric
potted with epoxy resin			epoxy lacquered	Encapsulation
IEC 384-14, 2nd edition; EN 132400		IEC 384-14; First Edition 1981		Qualified to
				Approvals
55/100/56/C	40/085/21C	40/085/21	40/085/21	Climatic category
$\leq 130 \times 10^{-4}$	$\leq 70 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	Tan $\delta$ (10 kHz)
$> 30000 \text{ M}\Omega$	$> 30000 \text{ M}\Omega$	$> 15000 \text{ M}\Omega$	$> 30000 \text{ M}\Omega$	$R_{ins}$ for $C \leq 330 \text{ nF}$
-	$> 10000 \text{ s}$	$> 5000 \text{ s}$	-	RC for $C > 330 \text{ nF}$
100 to 200 V/ $\mu\text{s}$	100 V/ $\mu\text{s}$	100 V/ $\mu\text{s}$	100 V/ $\mu\text{s}$	Pulse slope at $U_R$
loose; taped	loose; taped	loose; taped	loose	Packaging <sup>(1)</sup>
$\pm 20\%$ , $\pm 10\%$	$\pm 20\%$ , $\pm 10\%$	$\pm 20\%$ , $\pm 10\%$	$\pm 20\%$	Tolerance
$U_{Rac}$ (V)	$U_{Rac}$ (V)	$U_{Rac}$ (V)	$U_{Rac}$ (V)	C ( $\mu\text{F}$ )
300	250	250	250	(E6-series)
				0.001
				0.0015
				0.0022
				0.0033
				0.0047
				0.0068
				0.01
				0.015
				0.022
				0.033
				0.047
				0.068
				0.1
				0.15
				0.22
				0.33
				0.47
				0.68
				1.0
				1.5
				2.2

**Note**

1. Pitch size in shaded cells: D = 15.0 mm (only for 2222 311 901.. D = 15.24 mm); E = 22.5 mm; F = 27.5 mm.

# AC & Pulse film capacitors

## Selection guide

	KP 374			KP/MKP 375				
	Page 395			Page 421				
								
Dielectric	polypropylene			metallized polypropylene				
Encapsulation	epoxy lacquered			epoxy lacquered				
Qualified to	IEC 384-13			IEC 384-17				
Climatic category	40/085/56 for KP 374 3/4.. 55/100/56 for KP 374 6..			55/100/56				
Packaging <sup>(1)</sup>	loose for KP 374 3/4.. loose; taped for KP 374 6..			loose; taped				
Tolerance	±5% for KP 374 3/4.. ±10%, ±5% for KP 374 6..			±5%, ±3.5%				
C (μF) <sup>(2)</sup>	U <sub>Rdc</sub> (V)			U <sub>Rdc</sub> (V)				
	200	250	630	630	1000	1600	2000	2500
0.0001								
0.00015								
0.00022								
0.00033								
0.00047								
0.00068								
0.001								
0.0015								
0.0022			A	B	C			
0.0033								
0.0047								
0.0068								
0.01								
0.015								
0.022								
0.033								
0.047								
0.068								
0.1								
0.15	E		E					
0.22								
0.33								
0.47		F		F				
0.68								

**Notes**

1. Pitch size in shaded cells: A = 5.0 mm; B = 7.5 mm; C = 10.0 mm; D = 15.0 mm; E = 22.5 mm; F = 27.5 mm.
2. Intermediate values of E24-series are also available.

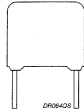


AC & Pulse  
film capacitors

Selection guide

**MKP/MKP 378**

**Page 483**



Dielectric	metallized polypropylene
Encapsulation	potted with epoxy resin
Qualified to	IEC 384-17
Climatic category	55/085/56
Packaging <sup>(1)</sup>	loose; taped
Tolerance	±5%

C ( $\mu\text{F}$ ) <sup>(2)</sup>	U <sub>Rdc</sub> (V)							
	630	1000	1600	2000	2500	3000 <sup>(3)</sup>	4000 <sup>(3)</sup>	5000 <sup>(3)</sup>
0.001								
0.0015								
0.0022								
0.0033								
0.0047								
0.0068								
0.01								
0.015								
0.022								
0.033								
0.047								
0.068								
0.1								
0.15								
0.22								
0.33								
0.47								
0.68								
1.0								
1.5								
2.2								
3.3								
4.7								
6.8								


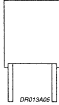
**Notes**

1. Pitch size in shaded cells: D = 15.0 mm; E = 22.5 mm; F = 27.5 mm.
2. Intermediate values of E24-series are also available.
3. E24-series are available on request.



# AC & Pulse film capacitors

## Selection guide

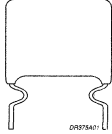
MKP 379 Page 515					MKP 380 Page 515					
										
metallized polypropylene potted with epoxy resin					metallized polypropylene potted with epoxy resin					Dielectric
IEC 384-17 55/085/56					IEC 384-17 55/085/56					Encapsulation
loose; taped ±5%					loose; taped ±10%, ±5%					Qualified to
										Climatic category
										Packaging <sup>(1)</sup>
										Tolerance
$U_{Rdc}$ (V)				$U_{Rdc}$ (V)					C	
160	250	400	630	100	160	250	400	630	( $\mu F$ ) <sup>(2)</sup>	
									0.001	
									0.0015	
									0.0022	
									0.0033	
									0.0047	
									0.0068	
									0.01	
									0.015	
									0.022	
									0.033	
									0.047	
									0.068	
									0.1	
									0.15	
									0.22	
									0.33	
									0.47	
									0.68	
									1.0	
									1.5	
									2.2	
									3.3	
									4.7	
									6.8	

**Notes**

1. Pitch size in shaded cells: A = 5.0 mm; B = 7.5 mm; C = 10.0 mm; D = 15.0 mm; E = 22.5 mm; F = 27.5 mm.
2. Intermediate values of E24-series are also available.
3. Available on request.

AC & Pulse  
film capacitors

Selection guide

<b>MKP 479</b>	
<b>Page 559</b>	
	

Dielectric	metallized polypropylene			
Encapsulation	epoxy lacquered			
Qualified to	IEC 384-17			
Climatic category	55/100/56			
Packaging <sup>(1)</sup>	loose; taped			
Tolerance	±5%			
<b>C</b> <b>(<math>\mu</math>F)<sup>(2)</sup></b>	<b>U<sub>Rdc</sub> (V)</b>			
	<b>160</b>	<b>250</b>	<b>400</b>	<b>630</b>
0.001				
0.0015				
0.0022				
0.0033				
0.0047				
0.0068				
0.01	C			C
0.015	C			C
0.022	D		C	C
0.033	D		C	D
0.047	D	C		D
0.068	D	C	D	D
0.1	D	C	D	D
0.15	D	D	D	E
0.22	D	D	E	E
0.33	D	E	E	F
0.47	D	E	F	F
0.68	E	E	F	F
1.0	E	F		
1.5	F			
2.2		F		
3.3				
4.7				
6.8				

**Notes**

1. Pitch size in shaded cells: C = 10.0 mm; D = 15.0 mm; E = 22.5 mm; F = 27.5 mm.
2. Intermediate values of E24-series are also available.

Precision  
film capacitors

Selection guide

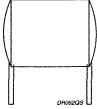
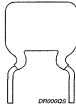
KS 424/431				KP 460/464					KS 443		
Page 591				Page 603					Page 627		
polystyrene naked or epoxy lacquered				polypropylene epoxy lacquered					polystyrene potted with epoxy resin		Dielectric Encapsulation
IEC 384-7 40/085/21				IEC 384-13 40/100/56					IEC 384-7 55/070/56 (class 1) 55/085/56 (class 3)		Qualified to Climatic category
loose; taped ±5%, ±2%, ±1%				loose; taped ±5%, ±2%, ±1%					loose ±1%		Packaging <sup>(1)(2)</sup> Tolerance
U <sub>Rdc</sub> (V)				U <sub>Rdc</sub> (V)					U <sub>Rdc</sub> (V)		C (pF) <sup>(3)</sup>
63	160	250	630	63	160	250	400	630	63		
											47
											68
											100
											150
											220
											330
											470
											680
											1000
											1500
											2200
											3300
											4700
											6800
											10000
											15000
											22000
											33000
											47000
											68000
											100000
											150000
											162000

Notes

1. Body length in shaded cells: G = 11.0 mm; H = 15.0 mm.
2. Box dimensions in shaded cells: J = 5.0 × 7.5 mm; K = 7.5 × 7.5 mm; L = 6.25 × 6.25 mm; M = 10.0 × 10.0 mm.
3. Intermediate values of E24-series (with ±5%, ±2% or ±1% tolerance), E48-series (with ±2% or ±1% tolerance) and E96-series (with ±1% tolerance) are also available.

# Fluorescent lamp starter capacitors

## Selection guide

	KT 311 90028/29 KP 311 90034/35	KT 311 90032/90033 KT 311 90036 TO 90039
	Page 641	Page 646
		
Dielectric	polyester; polypropylene	polyester
Encapsulation		epoxy lacquered
Qualified to	IEC 155 and IEC 384-11 for KT version IEC 384-13 for KP version	IEC 384-11
Climatic category	40/100/21	40/125/56
Packaging <sup>(1)</sup>	loose; taped	loose
Tolerance		±20%
<b>C</b> ( $\mu\text{F}$ ) <sup>(2)</sup>	<b><math>U_{\text{Rac}}</math> (V)</b> <b>250</b>	<b><math>U_{\text{Rac}}</math> (V)</b> <b>250</b>
0.0012		7.5
0.0030		7.5
0.0056	11.5	

### Notes

1. Pitch size in shaded cells.
2. Intermediate values of E12-series are also available.

## **PACKAGING**

## Taping specifications

## Film Chip capacitors

## FILM CHIP CAPACITORS

Styles: 390 to 394

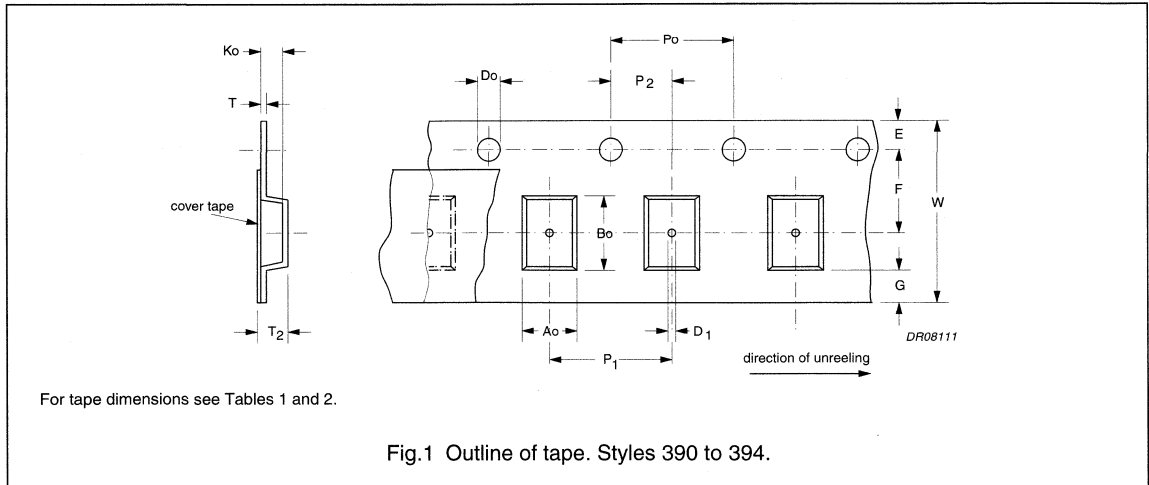


Table 1 Tape dimensions valid for all case sizes; see also Table 2

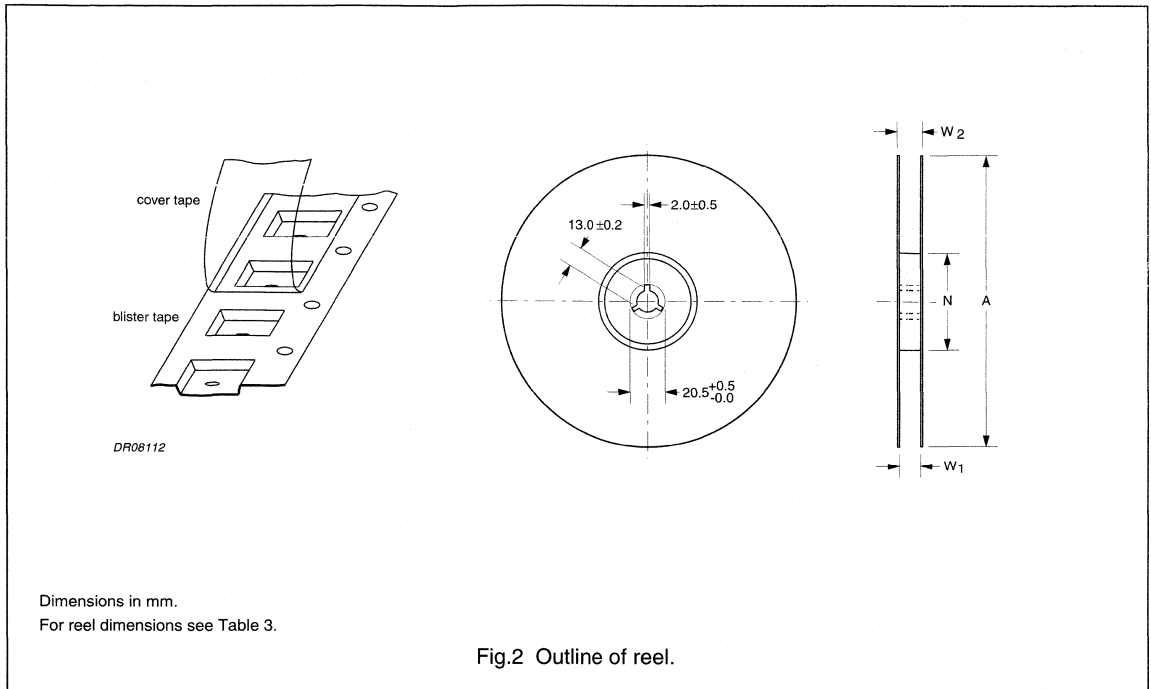
SYMBOL	PARAMETER	VALUE	TOL.	UNIT
$D_o$	feed hole diameter	1.5	$\pm 0.1$	mm
E	feed hole position	1.75	$\pm 0.1$	mm
G	margin to component window	0.75 min.	—	mm
$P_0$	feed hole spacing	4.0	$\pm 0.1$	mm
$P_2$	feed hole centre to component centre	2.00	$\pm 0.05$	mm
T	tape thickness	0.6 max.	—	mm

Table 2 Tape dimensions; see Fig. 1

CASE SIZE	$W \pm 0.3$ (mm)	$A_o \pm 0.1$ (mm)	$B_o \pm 0.1$ (mm)	$K_o$ MAX. (mm)	$F \pm 0.05$ (mm)	$P_1 \pm 0.1$ (mm)	$D_1$ MIN. (mm)	$T_2$ MAX. (mm)
1206	8.0	1.9	3.5	1.40	3.5	4.0	1.0	2.5
1210	8.0	2.8	3.5	1.85	3.5	4.0	1.0	2.9
1812	12.0	3.9	5.3	2.50	5.5	8.0	1.5	3.5
2220 <sup>(1)</sup>	12.0	5.8	6.4	2.50	5.5	8.0	1.5	3.5
2220 <sup>(2)</sup>	12.0	5.8	6.4	4.50	5.5	8.0	1.5	5.5
2824 <sup>(3)</sup>	16.0	6.6	7.6	2.60	7.5	8.0	1.5	3.6
2824 <sup>(4)</sup>	16.0	6.9	7.8	5.30	7.5	8.0	1.5	6.3

## Notes

1. For 2222 393 ..... capacitors  $\leq 100$  nF.
2. For 2222 393 ..... capacitors  $> 100$  nF.
3. For 2222 394 ..... capacitors  $\leq 220$  nF.
4. For 2222 394 ..... capacitors  $> 220$  nF.



**Table 3** Reel dimensions; see Fig.2

TAPE WIDTH W (mm)	W <sub>1</sub> (mm)	W <sub>2</sub> MAX. (mm)	A (mm)	N (mm)
8	8.40 +0/+1.5	14.4	180 -2/+0	62 ±1.5
12	12.4 +0/+2.0	18.4	330 -2/+0	62 ±1.5
16	16.4 +0/+2.0	22.4	330 -2/+0	62 ±2.0

**Characteristics of tape for film chip capacitors**

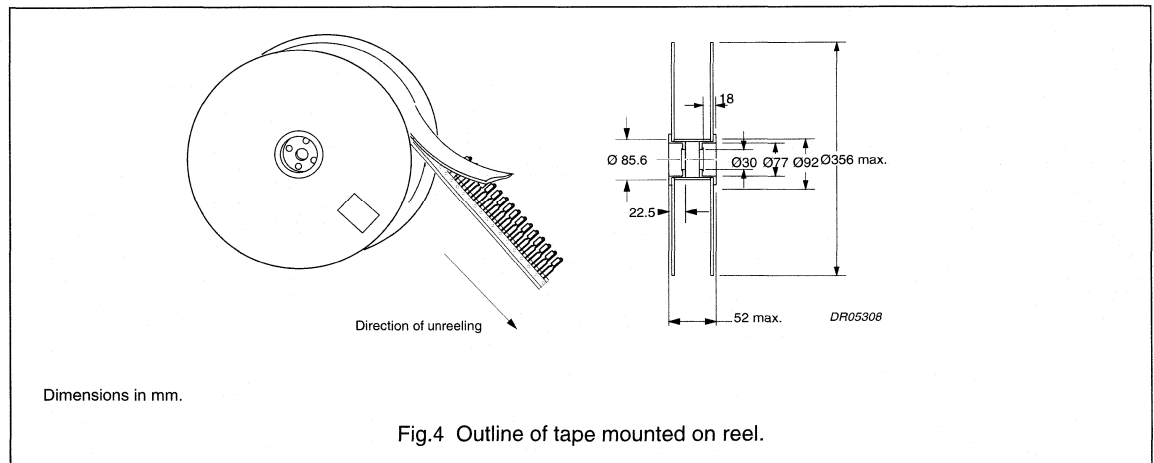
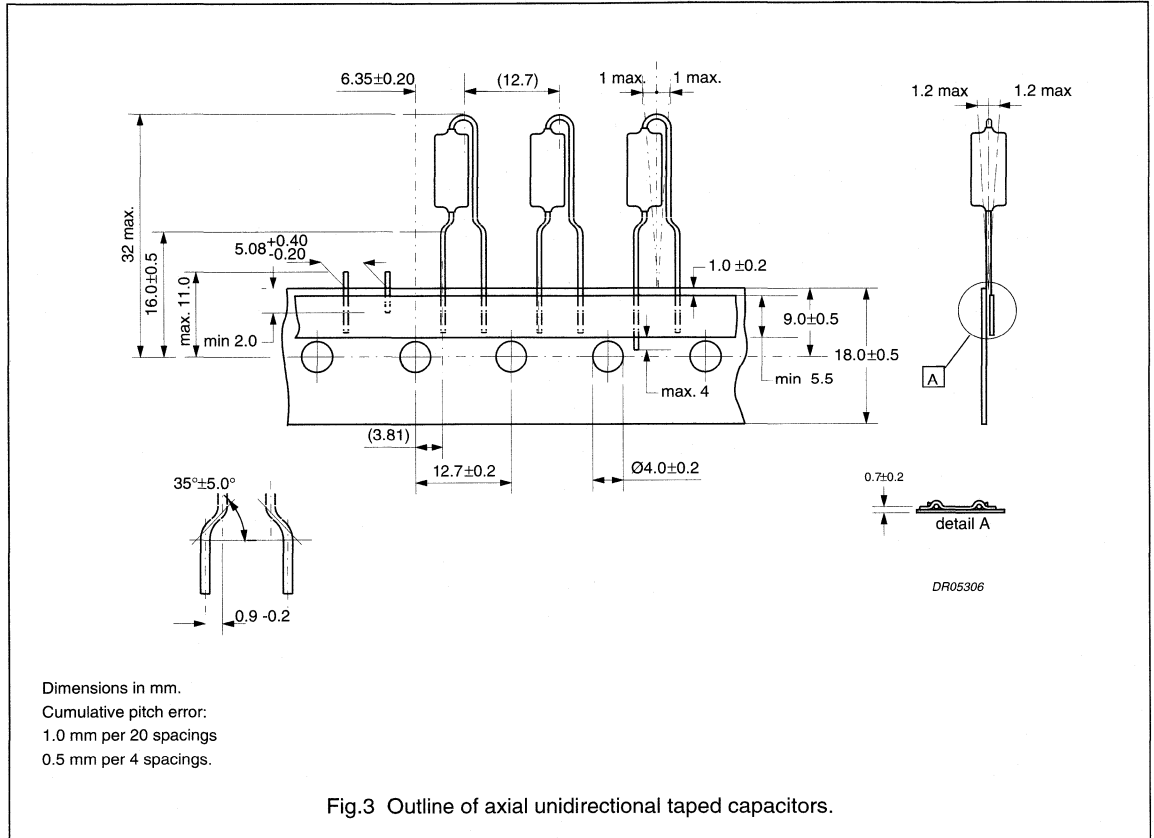
DESCRIPTION	VALUE
Breaking force of cover tape in direction of unreeling	≥10 N
Peel-off force of cover tape:	0.2 to 1.0 N
Speed of tape transfer	300 mm/min
Angle between cover tape during peel-off and direction of unreeling	165 to 180°
Minimum number of positions not used at the beginning/end of the tape	40 positions
Leader length of the tape (in accordance with "IEC 286-3")	400 mm

Taping specifications

Axial film capacitors

AXIAL UNIDIRECTIONAL FILM CAPACITORS

Styles: 460 to 464





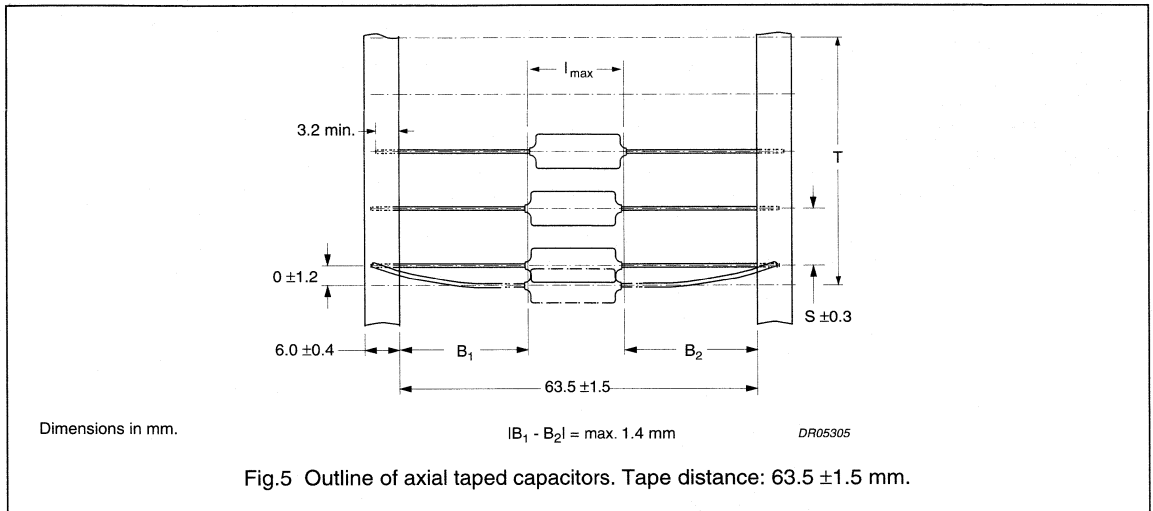
# Taping specifications

# Axial film capacitors

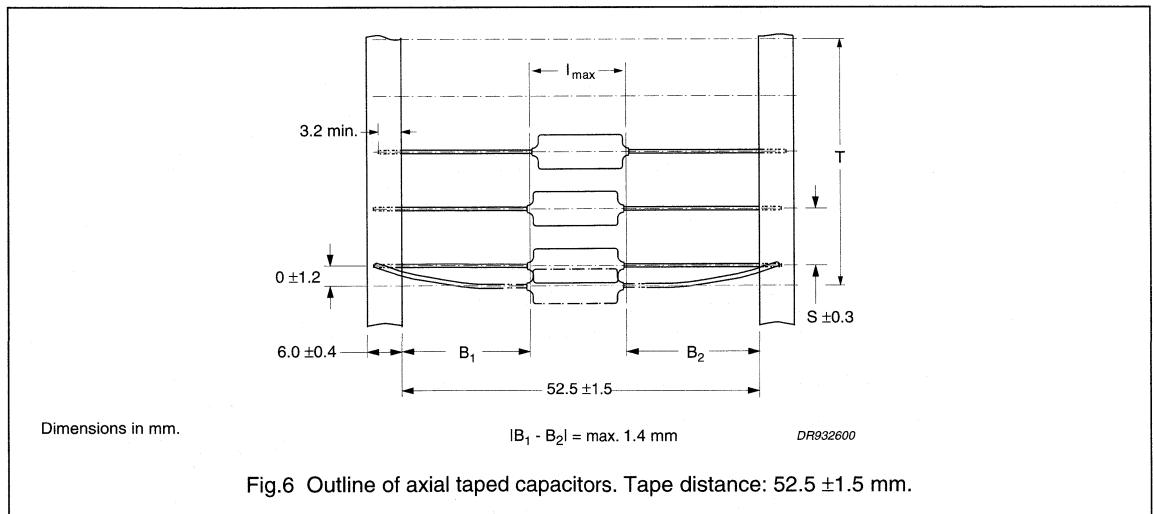
## AXIAL FILM CAPACITORS

Styles 424 to 431, 460 to 464

TAPE DISTANCE:  $63.5 \pm 1.5$  mm



TAPE DISTANCE:  $52.5 \pm 1.5$  mm



### Distance T for number (n) of capacitors

STYLE 424 to 431	STYLE 460 to 464	S (mm)	T FOR NUMBER (n) OF CAPACITORS	
			n < 50	50 ≤ n < 100
$d_{\text{max}}$ (mm)				
≤ 4.5	≤ 5	5	5 (n-1) ± 2	5 (n-1) ± 4
> 4.5	> 5	10	10 (n-1) ± 2	10 (n-1) ± 4

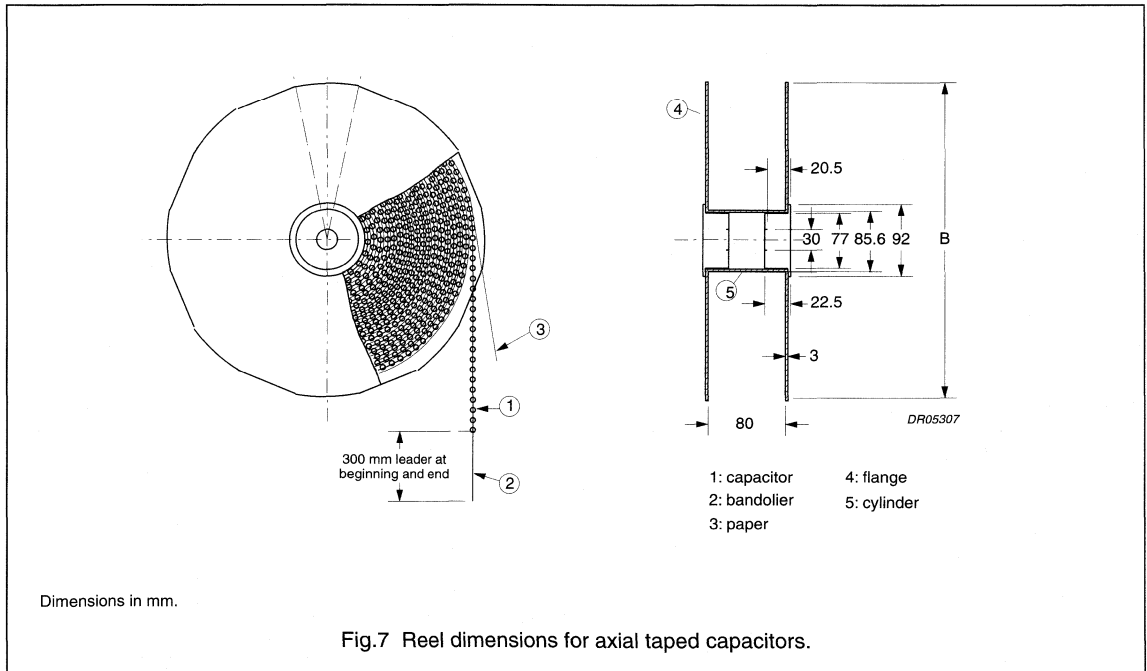
# Taping specifications

# Axial film capacitors

## Characteristics of tape for axial film capacitors

DESCRIPTION	VALUE
Pull-out force of the component	>2 N
Peel-off force of adhesive tape	≥6 N
Tearing force of tape	≥10 N
<b>Storage conditions</b>	
Storage temperature	-25 to +40 °C
Relative humidity	maximum 80% without condensation

## Axial products



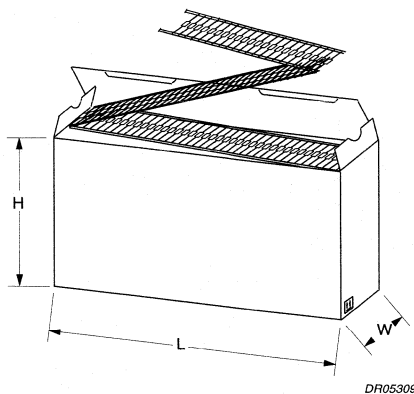
## Reel diameter B as a function of maximum product body thickness $d_{max}$

PRODUCT BODY THICKNESS $d_{max}$ (mm)		REEL DIAMETER B (mm)
STYLE 424 to 431	STYLE 460 to 464	
≤4.5	≤5.0	305
>4.5	>5.0	356

## Taping specifications

## Axial film capacitors

Ammopack for styles: 424 to 431, 460 to 464



Dimensions in mm.

Fig.8 Outline of ammpack.

Box dimensions and packaging quantities as a function of body thickness ( $d_{max}$ )

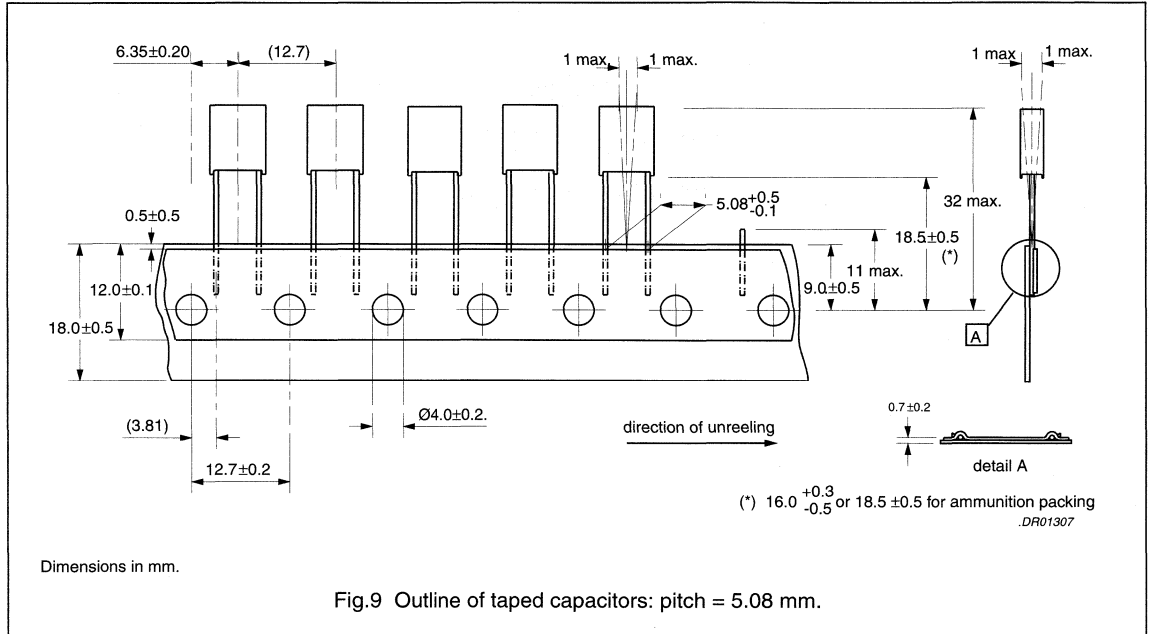
BODY THICKNESS $d_{max}$ (mm)	SMALLEST PACKAGING QUANTITIES (SPQ)	EXTERNAL BOX DIMENSIONS L × W × H (mm)
5.0	1750	345 × 80 × 147
5.5	1550	345 × 80 × 147
6.0	1300	345 × 80 × 147
6.5	1000	345 × 80 × 147
7.0	850	345 × 80 × 147
7.5	750	345 × 80 × 147
8.0	650	345 × 80 × 147

Taping specifications

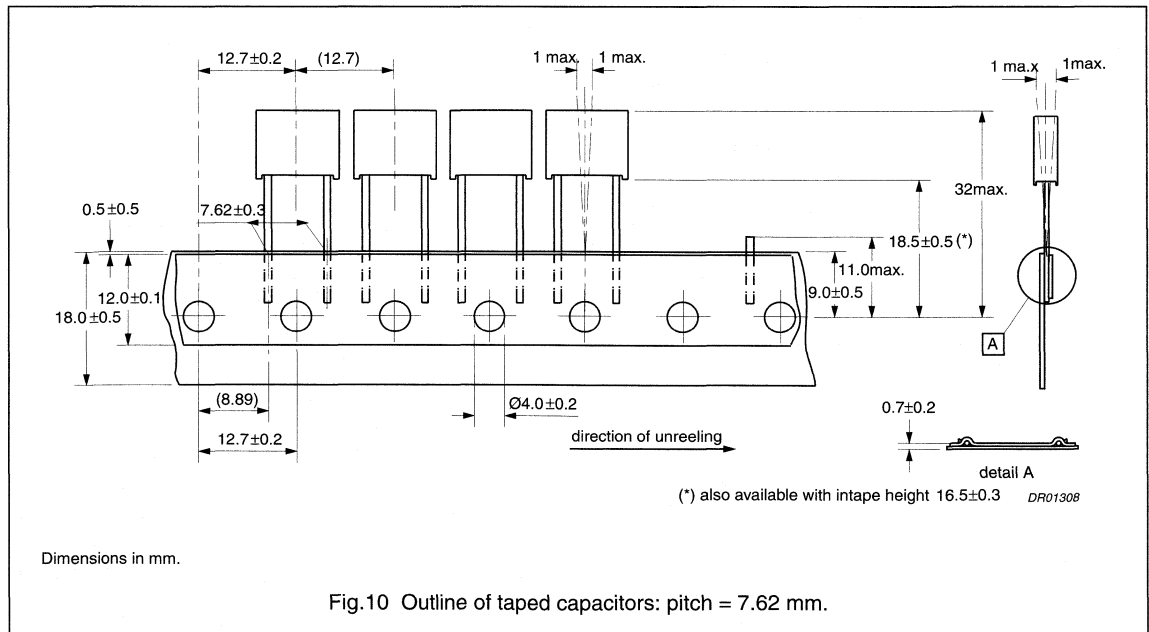
Radial potted film capacitors

**RADIAL POTTED FILM CAPACITORS**

**Style: 370; pitch = 5.08 mm**



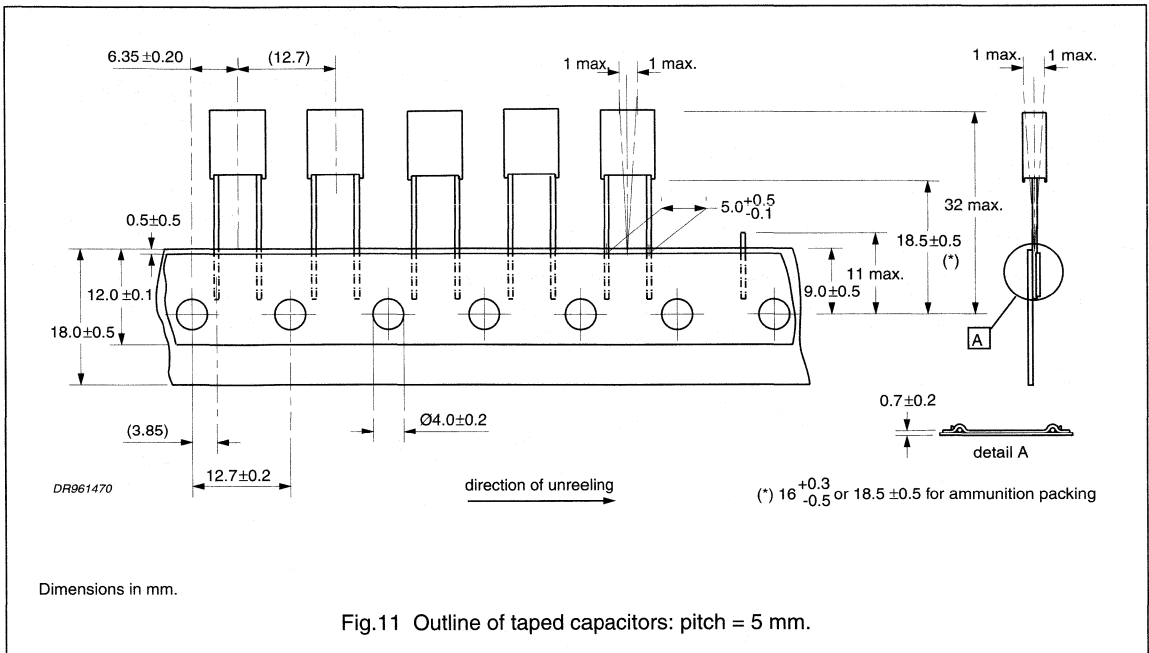
**Style: 371; pitch = 7.62 mm**



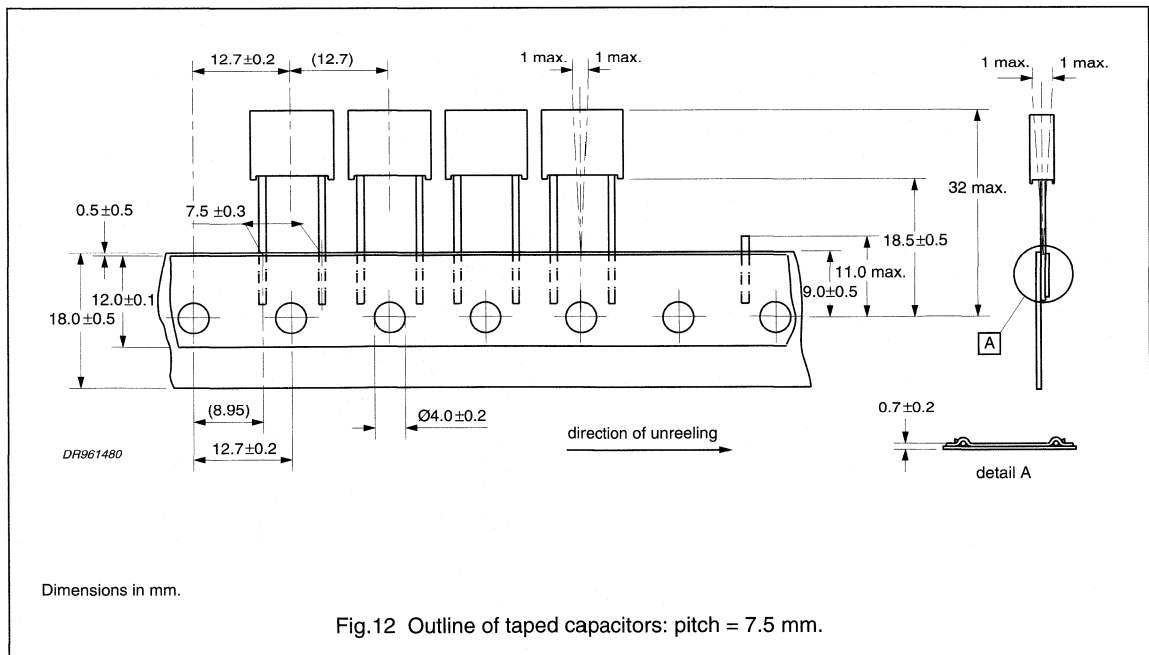
# Taping specifications

# Radial potted film capacitors

Styles: 380 and 470; pitch = 5 mm



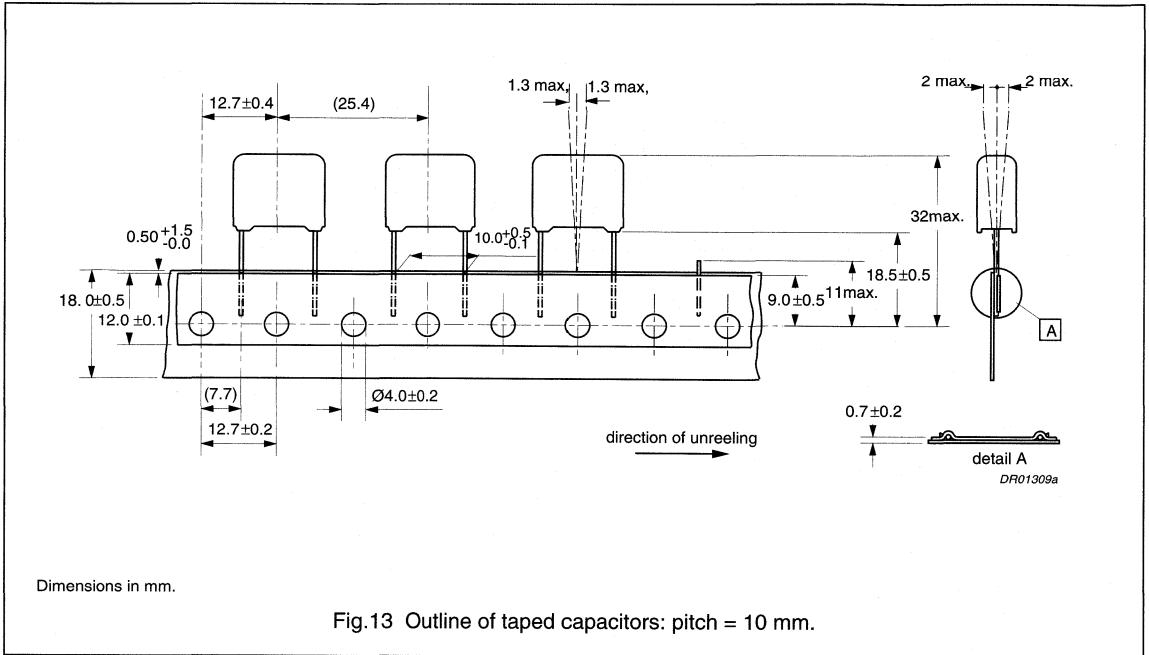
Style: 379; pitch = 7.5 mm



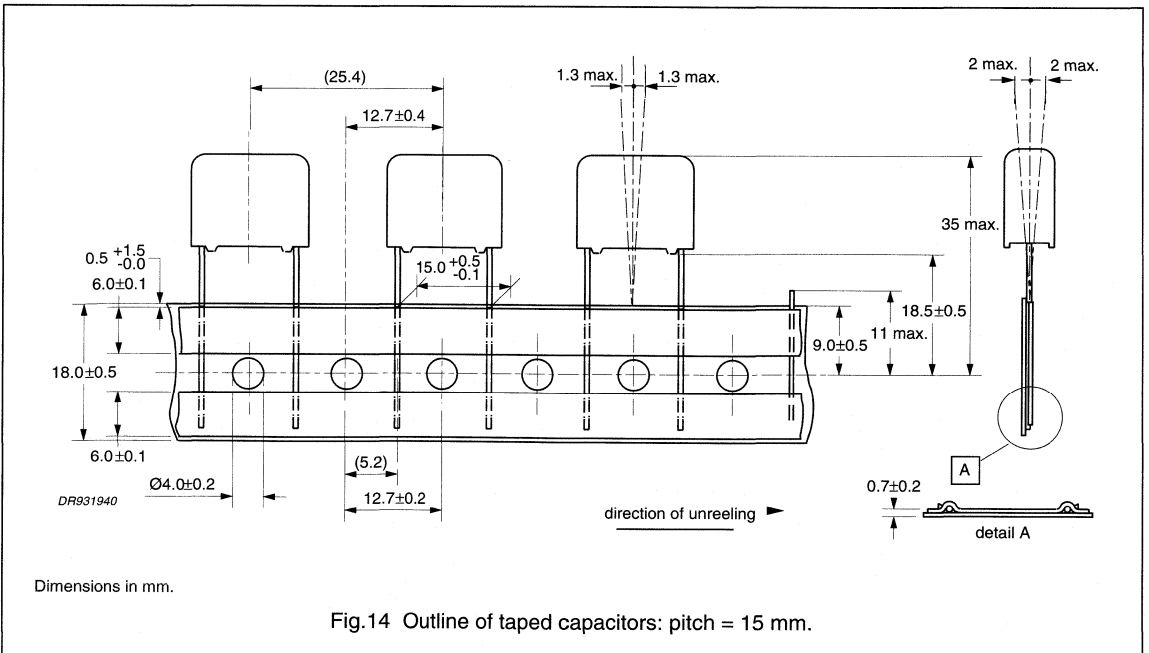
Taping specifications

Radial potted film capacitors

Styles: 344, 336 1, 336 2, 336 6, 372, 379; pitch = 10 mm



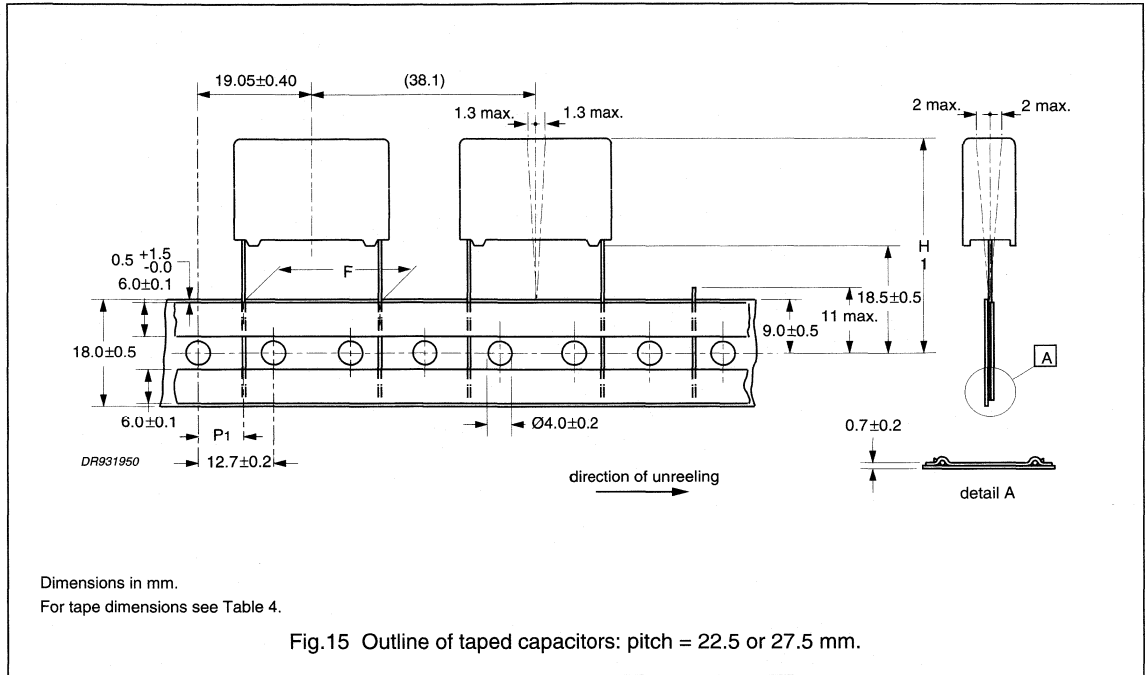
Styles: 330 4, 331 6, 333 4, 335 1, 336 1, 336 2, 336 6, 344, 373, 376, 378, 379; pitch = 15 mm



## Taping specifications

## Radial potted film capacitors

Styles: 330 4, 331 6, 333 4, 335 1, 336 1, 336 2, 344, 373, 376, 378, 379; pitch = 22.5 or 27.5 mm



**Table 4** Tape dimensions; see Fig.15

SYMBOL	PARAMETER	VALUE		TOL.	UNIT
F	lead to lead distance	22.5	27.5	+0.5/-0.1	mm
H <sub>1</sub>	component height from tape centre	40 max.	48 max.	-	mm
P <sub>1</sub>	feed hole to lead centre	(7.8)	(5.3)	-	mm

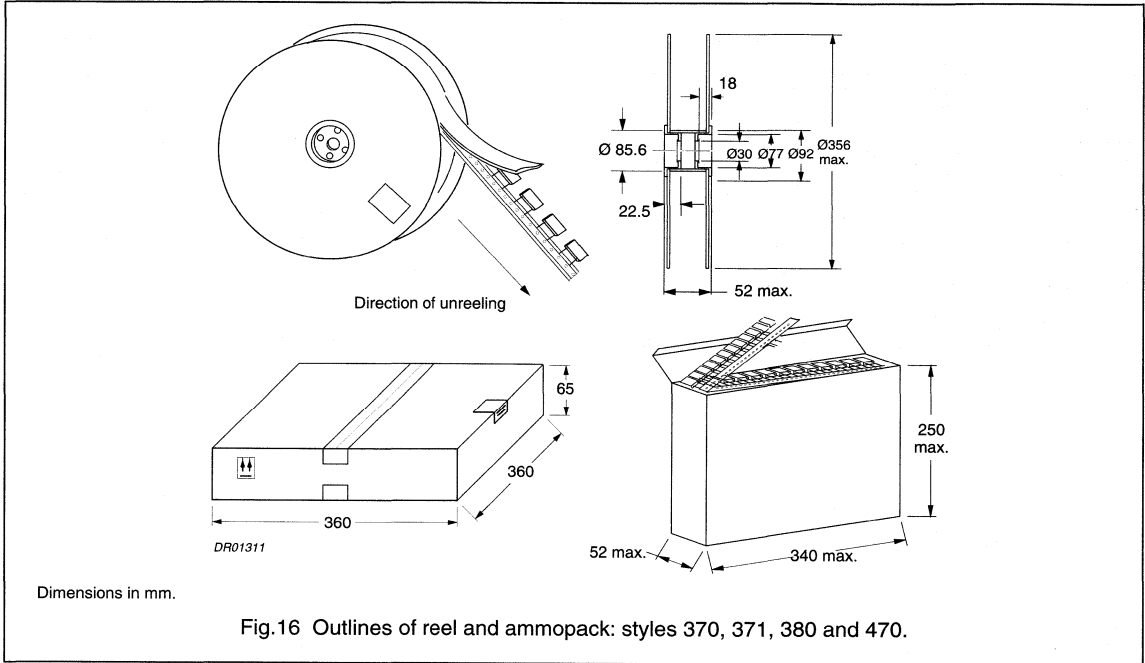
**Characteristics of tape for radial potted film capacitors**

DESCRIPTION	VALUE
Pull-out force of the component	≥5 N
Peel-off force of adhesive tape	≥6 N
Tearing force of tape	≥15 N
<b>Storage conditions</b>	
Storage temperature	-25 to +40 °C
Maximum relative humidity without condensation	80%

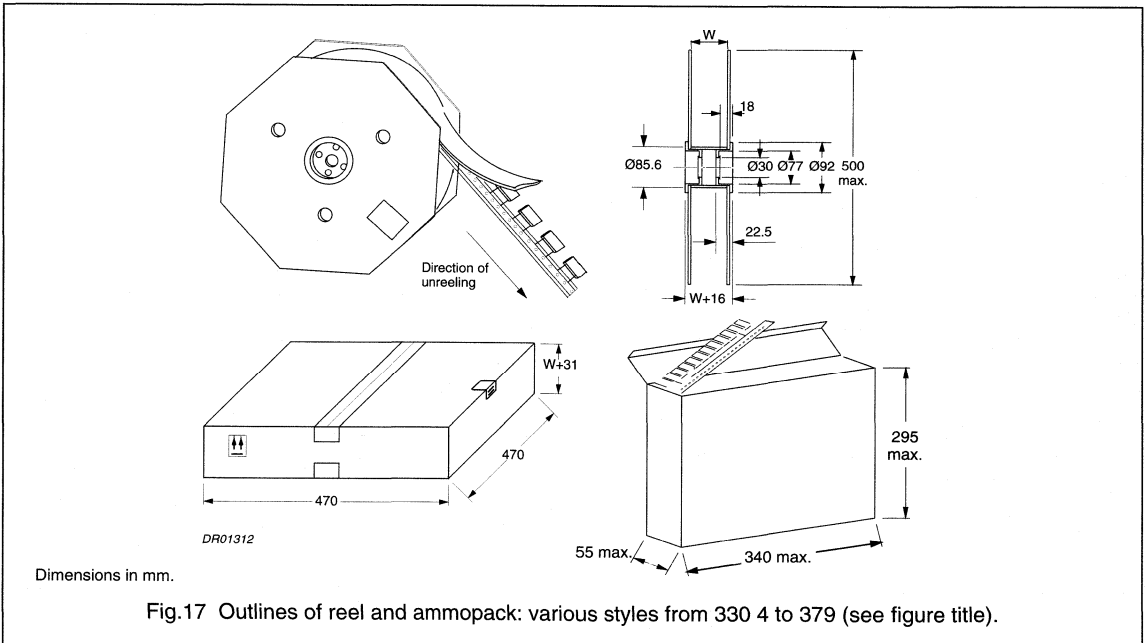
Taping specifications

Radial potted film capacitors

Styles: 370, 371, 380 and 470



Styles: 330 4, 330 5, 331 6, 333 4, 335 1, 336 1, 336 2, 336 6, 344, 373, 376, 378, 379





## Taping specifications

## Radial potted film capacitors

## Reel width (W) as a function of product height

PRODUCT HEIGHT h (mm)	REEL WIDTH W $\pm 2$ mm
9.0	40
10.0 up to and including 15.0	45
15.5 up to and including 19.5	50
21.0 up to and including 23.0	55
25.0 up to and including 28.0	60
31.0	65

The cumulative pitch error is: 1.0 mm per 20 pitches.

The maximum number of empty positions per reel shall not exceed 0.5%<sup>(1)</sup> of the total number of components per reel, but no more than 2 consecutive positions may be vacant provided this gap is followed by 6 consecutive components.

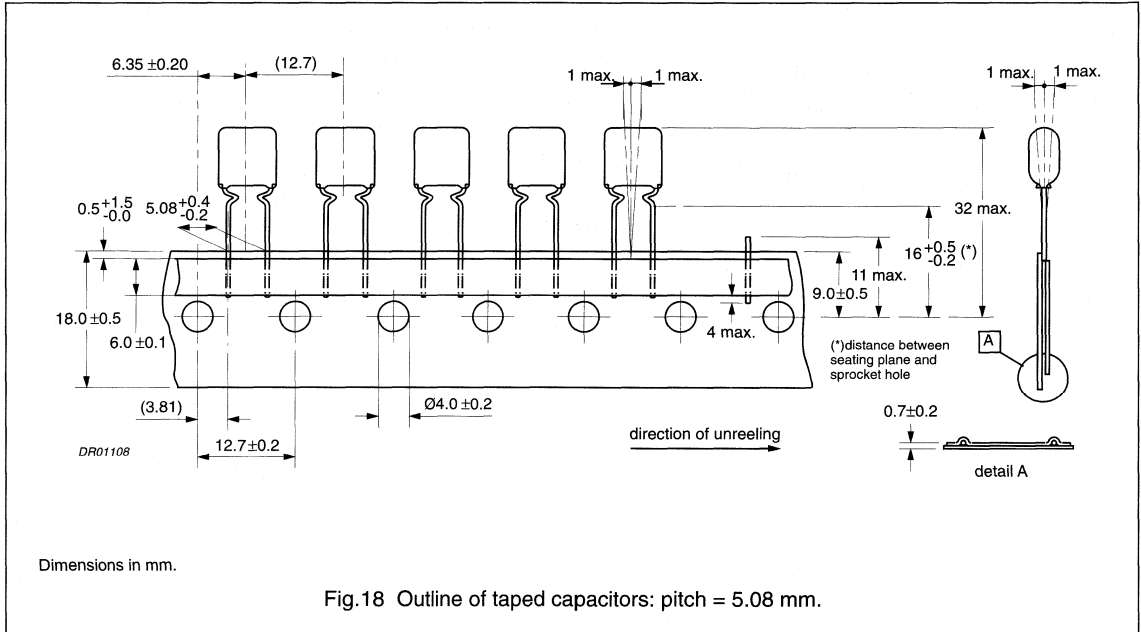
(1) This is 5% for capacitors in ammopack (except for capacitors with  $b = 2.5$  or  $3.5$  mm and  $l = 7.2$  mm).

Taping specifications

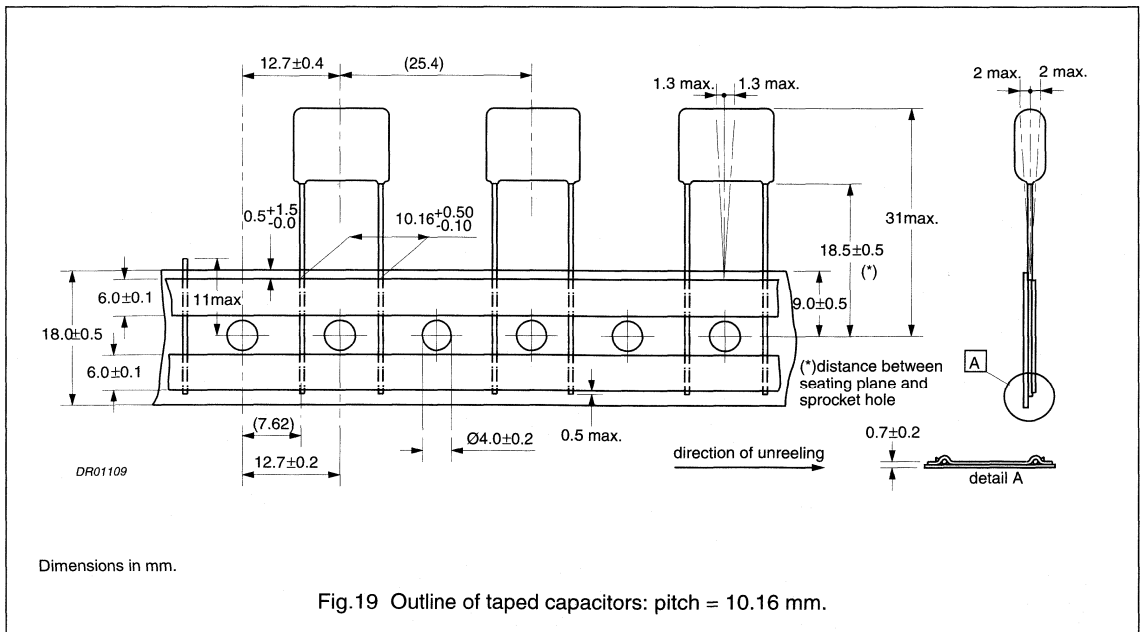
Radial lacquered film capacitors

**RADIAL LACQUERED FILM CAPACITORS**

**Style: 365; pitch = 5.08 mm**



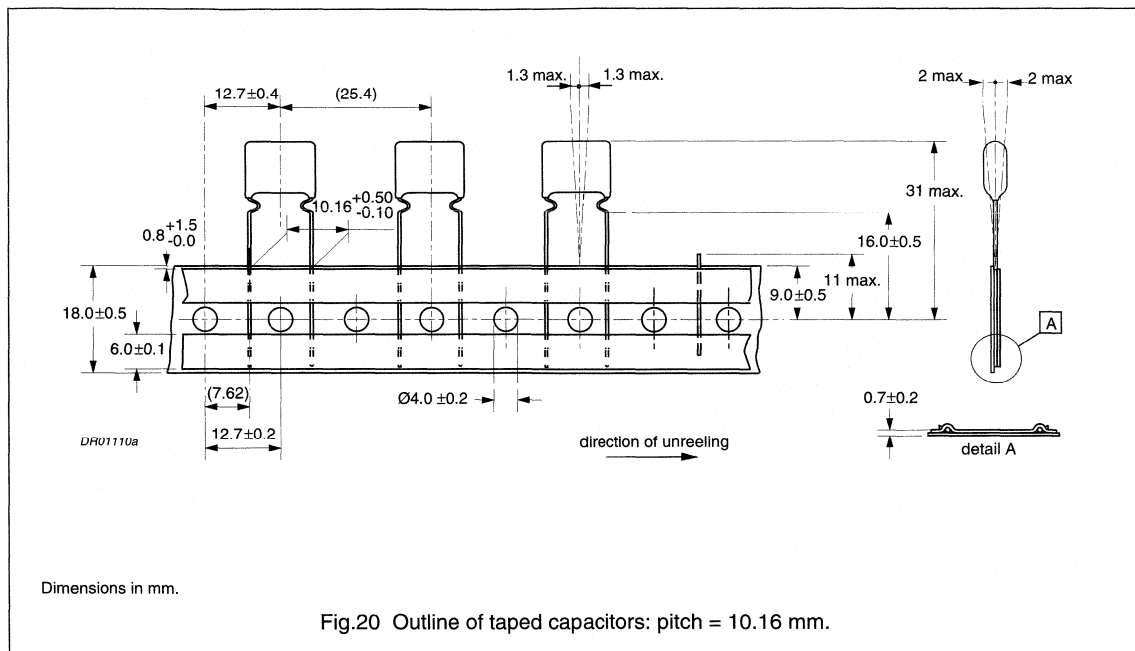
**Style: 369; pitch = 10.16 mm**



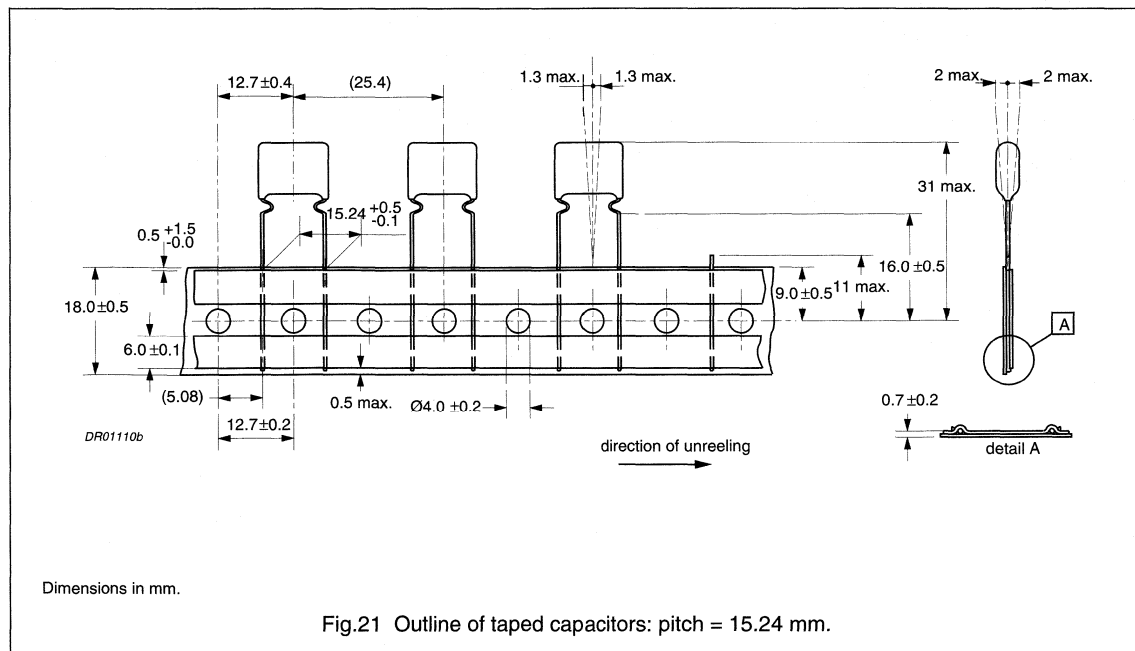
# Taping specifications

# Radial lacquered film capacitors

**Style: 368; pitch = 10.16 mm**



**Style: 368; pitch = 15.24 mm**



Taping specifications

Radial lacquered film capacitors

Style: 368; pitch = 22.86 and 27.94 mm

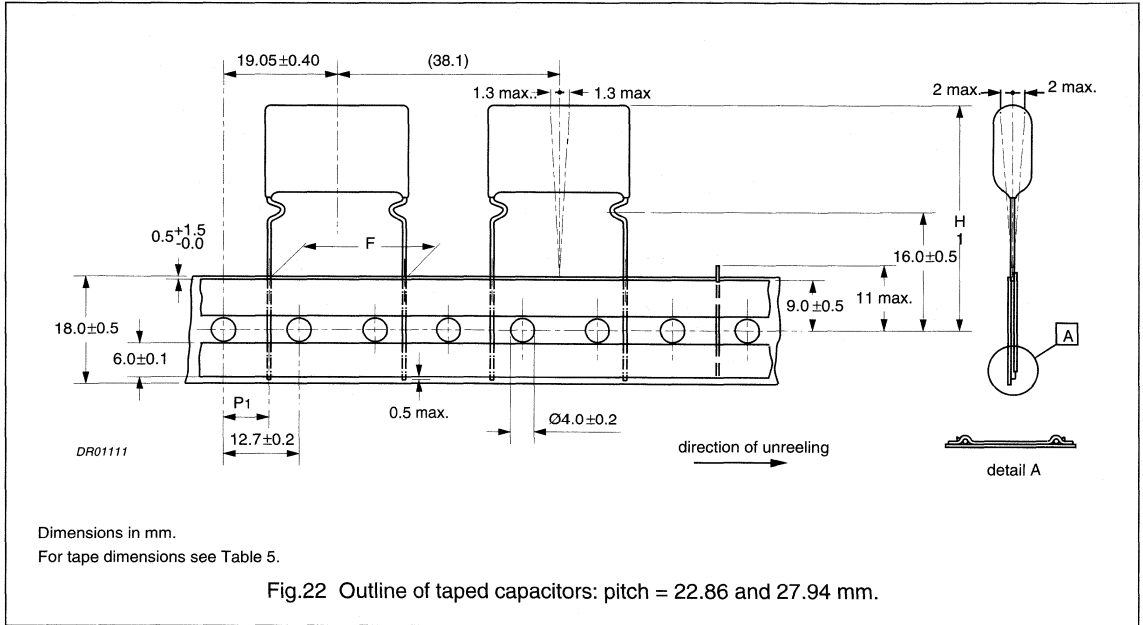


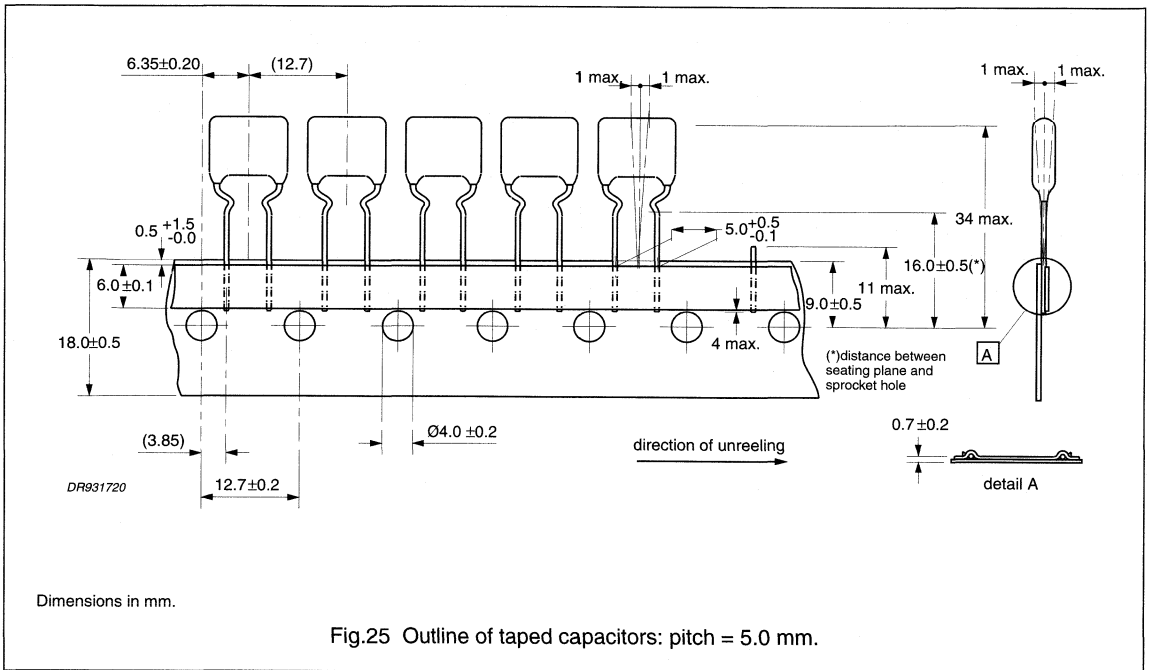
Table 5 Tape dimensions; see Fig.22

SYMBOL	PARAMETER	VALUE		TOL.	UNIT
F	lead to lead distance	22.86	27.94	+0.5/-0.1	mm
H <sub>1</sub>	component height from tape centre	38.0 max.	41.0 max.	-	mm
P <sub>1</sub>	feed hole to lead centre	(7.62)	(6.08)	-	mm

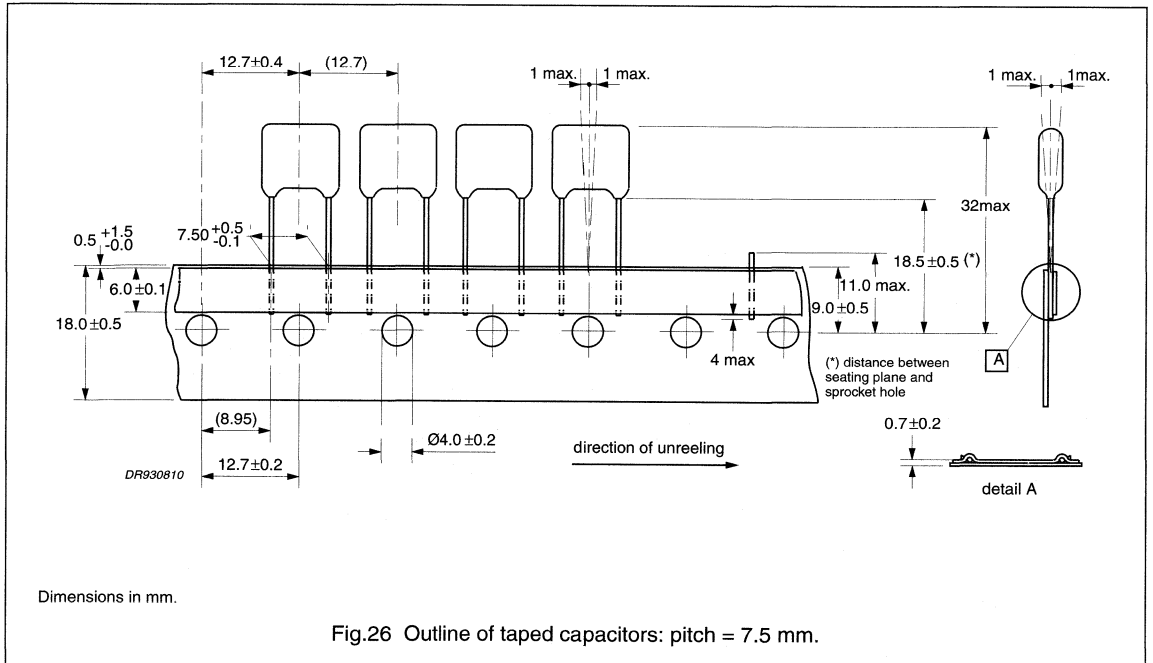


Taping specifications

Radial lacquered film capacitors

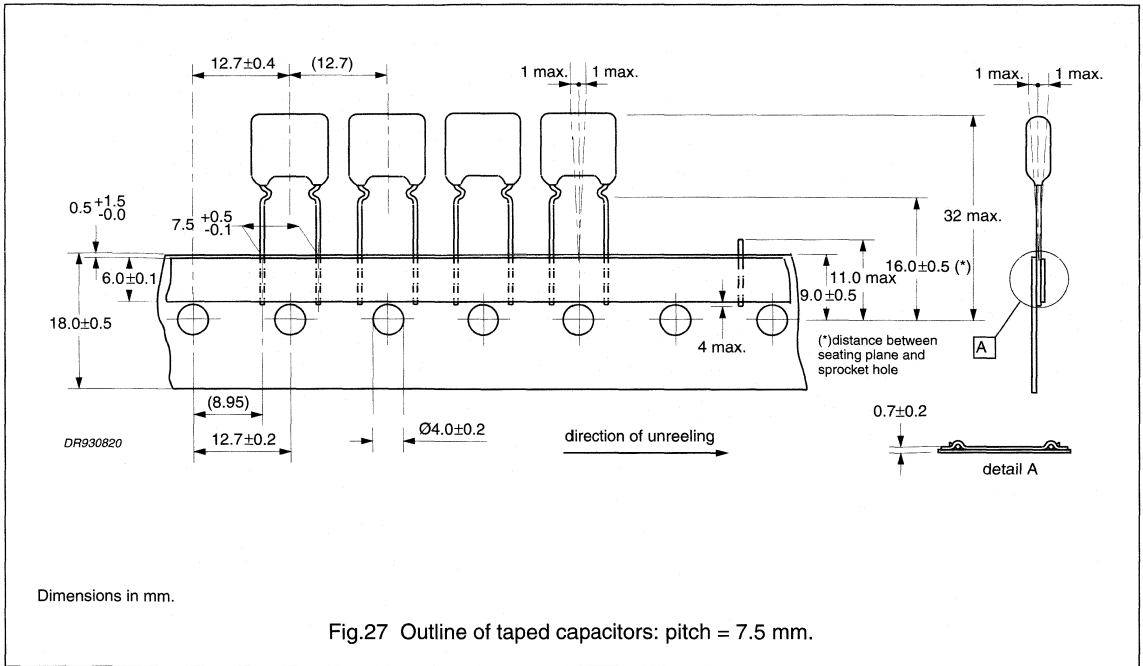


Style: 466; pitch = 7.5 mm

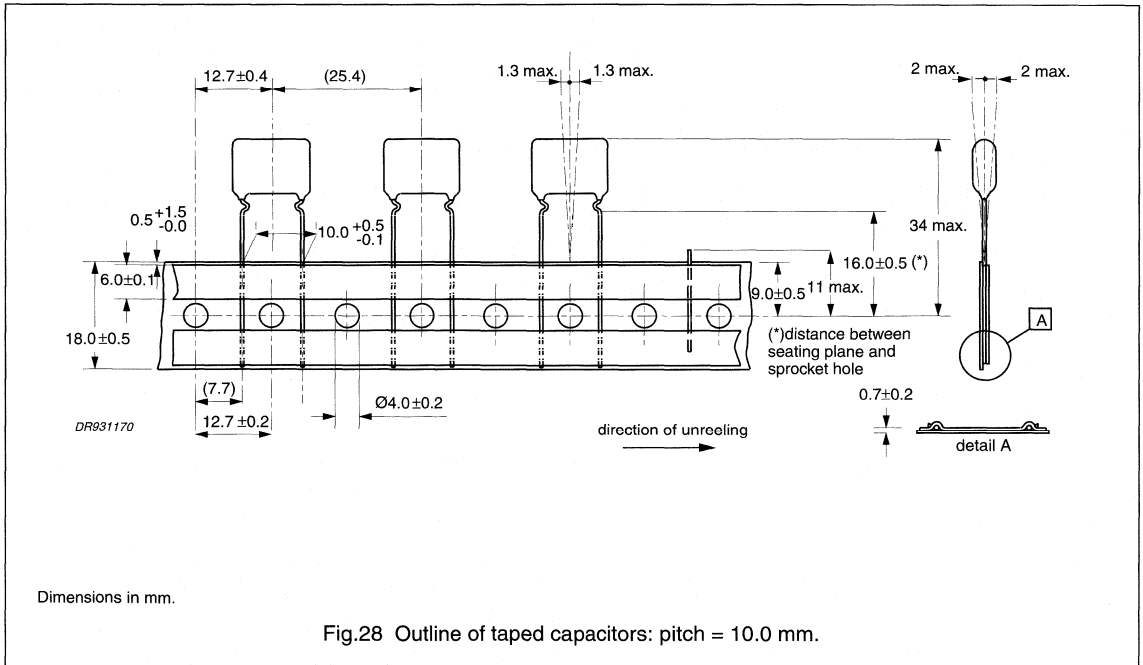


Taping specifications

Radial lacquered film capacitors



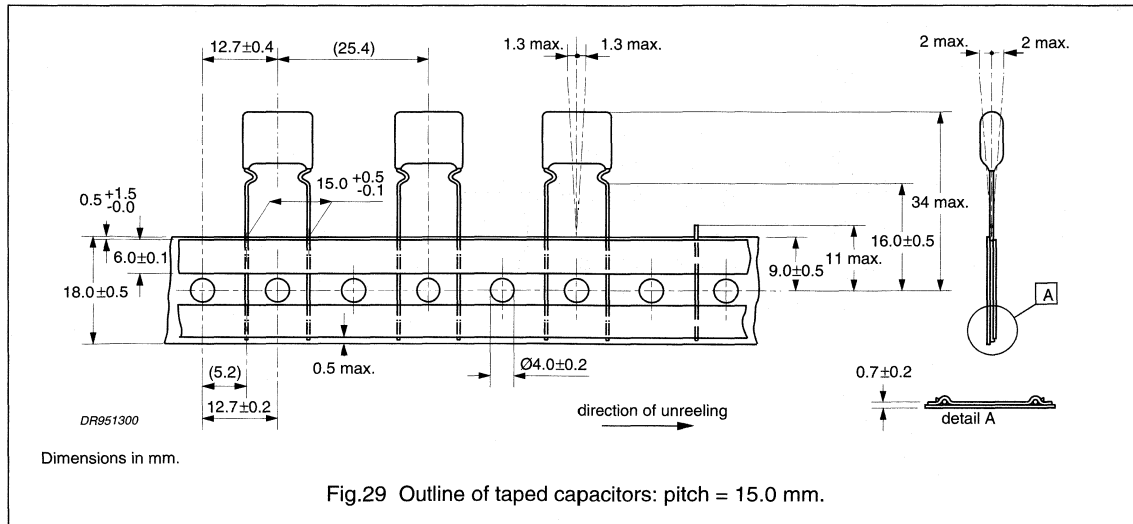
Style: 467 and 479; pitch = 10.0 mm



# Taping specifications

# Radial lacquered film capacitors

Styles: 375, 468 and 479; pitch = 15.0 mm



Styles: 375, 468 and 479; pitch = 22.5 and 27.5 mm

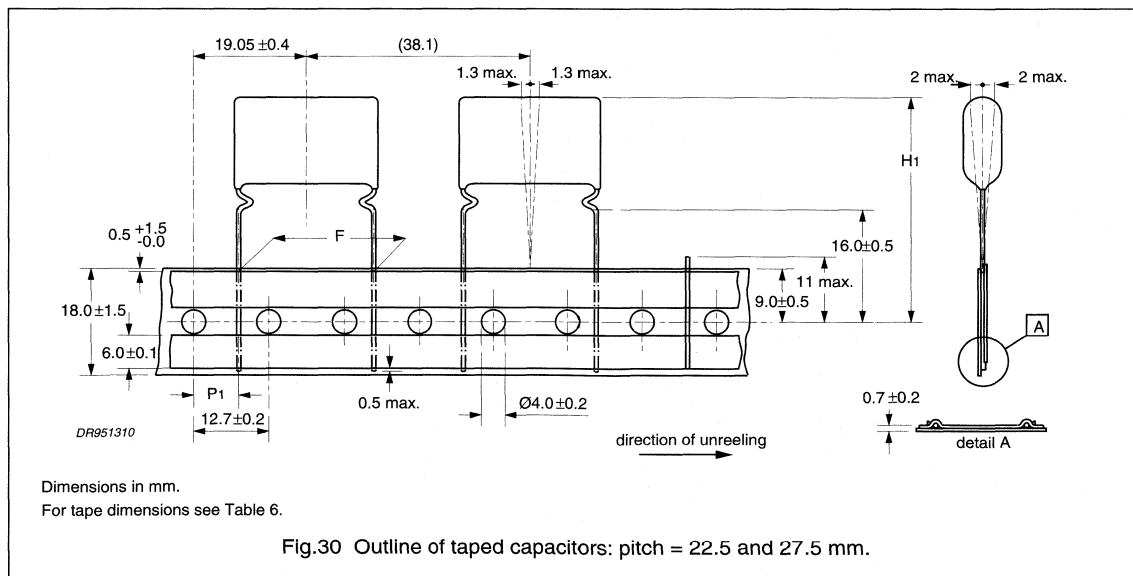


Table 6 Tape dimensions; see Fig.30

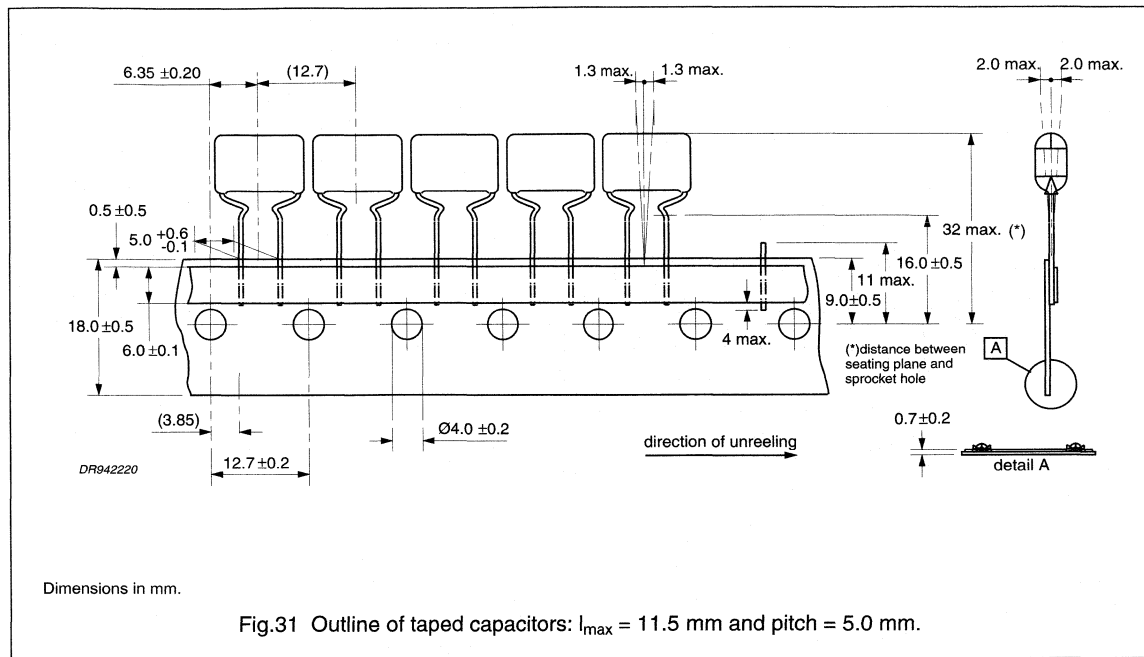
SYMBOL	PARAMETER	VALUE		TOL.	UNIT
F	lead to lead distance	22.5	27.5	+0.5/-0.1	mm
H <sub>1</sub>	component height from tape centre	38.0 max.	41.0 max.	—	mm
P <sub>1</sub>	feed hole to lead centre	(7.8)	(5.3)	—	mm



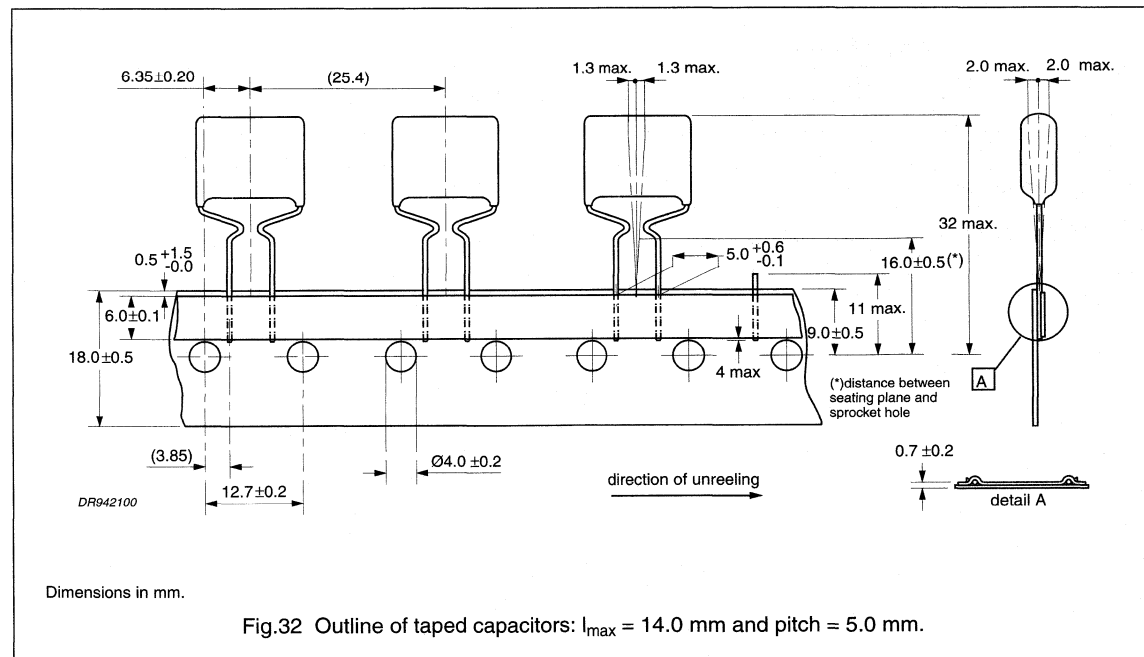
# Taping specifications

# Radial lacquered film capacitors

**Style: 374;  $l_{max} = 11.5$  mm and pitch = 5.0 mm**



**Style: 374;  $l_{max} = 14.0$  mm and pitch = 5.0 mm**

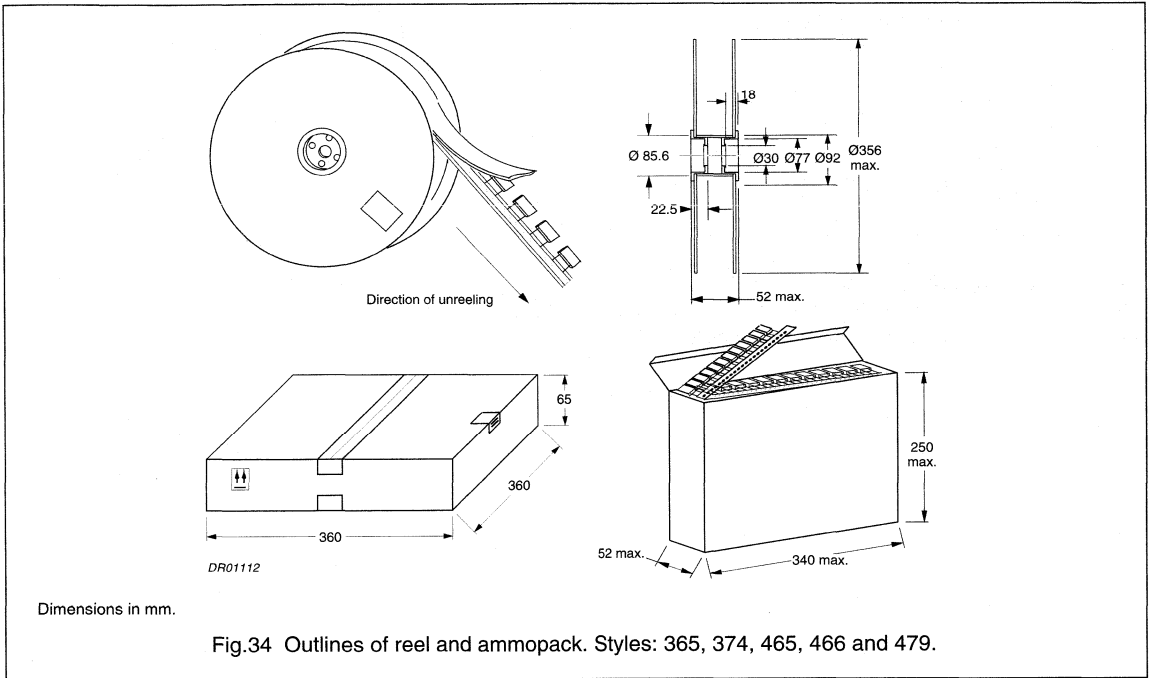




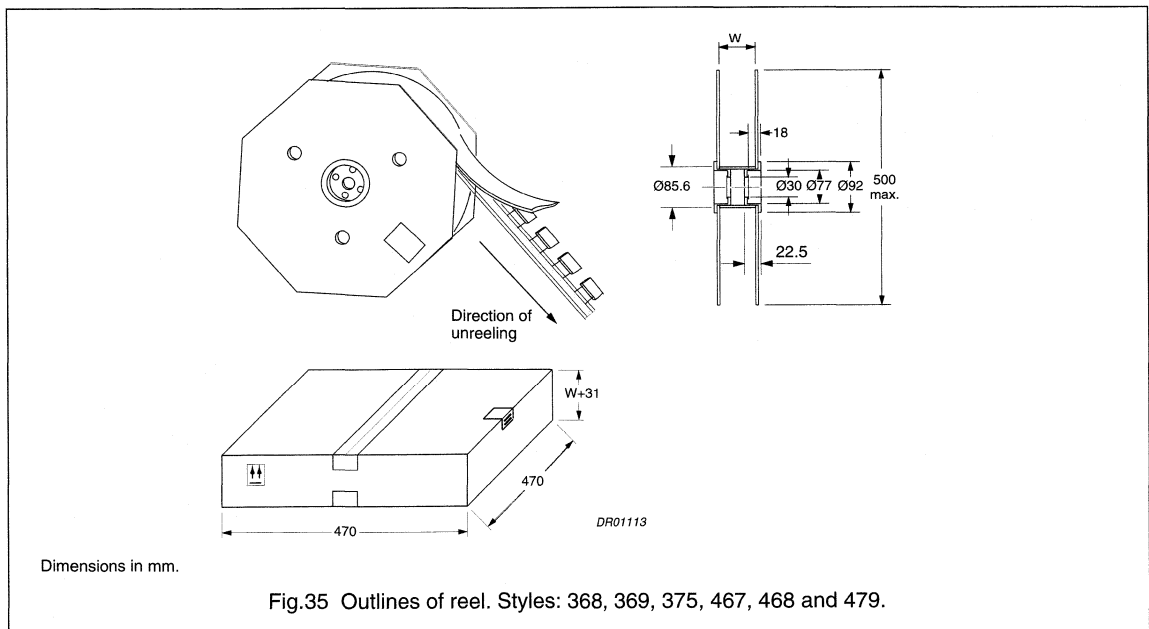
Taping specifications

Radial lacquered film capacitors

Styles: 365, 374, 465, 466 and 479



Styles: 368, 369, 375, 467, 468 and 479



## Taping specifications

## Radial lacquered film capacitors

**Reel width (W) as a function of product height**

<b>PRODUCT HEIGHT h (mm)</b>	<b>REEL WIDTH W <math>\pm 2</math> mm</b>
9.5 up to and including 13.5	40
14.0 up to and including 17.5	45
18.0 up to and including 22.5	50
23.0 up to and including 27.5	55
28.0	60

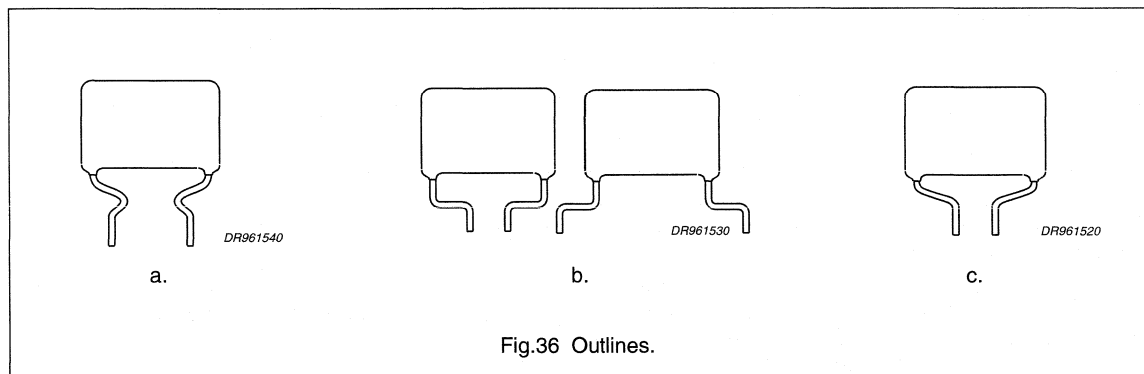
The cumulative pitch error is: 1.0 mm per 20 pitches.

The maximum number of empty positions per reel shall not exceed 0.5% of the total number of components per reel, but no more than 2 consecutive positions may be vacant.

Taping specifications

Radial lacquered film capacitors

**BENDING BACK OR BENDING OUT CAPABILITIES FOR RADIAL LACQUERED FILM CAPACITORS**



**Bending capabilities**

MAX. BODY SIZE (mm)	ORIGINAL PITCH (mm)	BENT BACK PITCH (mm)	BENT OUT PITCH (mm)	PACKAGING
<b>Bending shape (Fig.36a)</b>				
10.0	7.5	5.0	–	loose in box; ammpack, taped on reel
30.0	27.5	22.5	–	loose in box
<b>Bending shape (Fig.36b)</b>				
7.3	5.0	–	7.5	loose in box
		–	10.0	loose in box
10.0	7.5	–	10.0	loose in box
		–	15.0	loose in box
14.0	10.0	7.5	15.0	loose in box
18.5	15.0	7.5	20.0	loose in box
		10.0	22.5	loose in box
26.0	22.5	15.0	25.0	loose in box
		20.0	27.5	loose in box
30.0	27.5	20.0	–	loose in box
<b>Bending shape (Fig.36c)</b>				
14.0	10.0	5.0	–	taped on reel
		7.5	–	taped on reel
18.5	15.0	7.5	–	loose in box
		10.0	–	taped on reel
				loose in box



**GENERAL PURPOSE CAPACITORS**







**Metallized polyester film capacitors**

**MKT 365/366/367/368/369**

**MKT RADIAL EPOXY LACQUERED CAPACITORS**

**PITCH 5/7.5/10/15/22.5/27.5 mm**

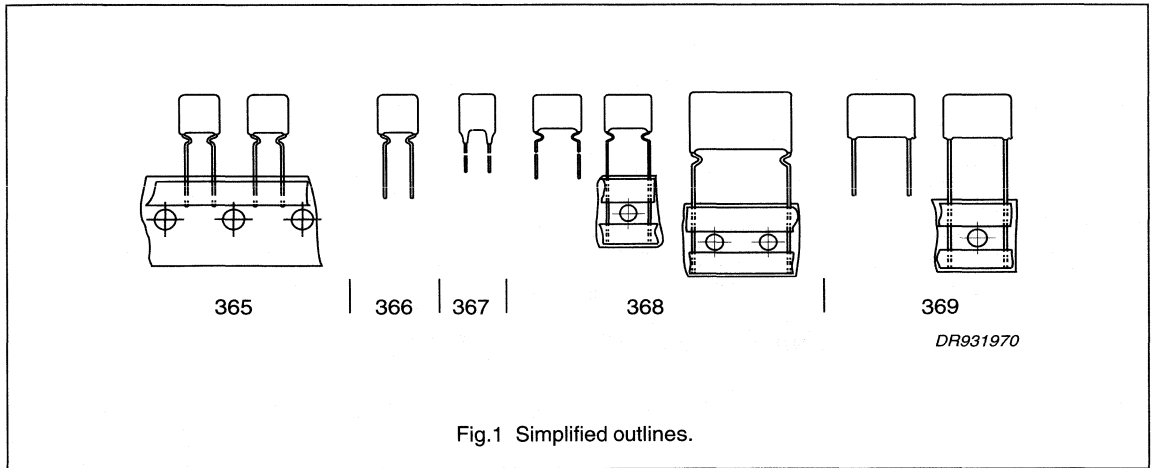


Fig.1 Simplified outlines.

**FEATURES**

- Low-inductive wound cell of metallized (PETP) film
- Cell protected by epoxy lacquer
- Radial leads of solder-coated wire
- Resistant to solvents and rinsing liquids.

**APPLICATIONS**

- Blocking and coupling
- Bypass and energy reservoir.

**QUICK REFERENCE DATA**

DESCRIPTION	VALUE
Capacitance range (E12 series)	0.001 to 6.8 $\mu$ F
Capacitance tolerance	$\pm$ 20%; $\pm$ 10%; $\pm$ 5%
Rated voltage (DC)	63 V; 100 V; 250 V; 400 V; 630 V
Climatic category	55/100/56
Rated temperature	85 °C
Maximum application temperature	100 °C
Tangent of loss angle at 10 kHz	$100 \times 10^{-4}$
Reference specification	IEC 384-2
Performance grade	grade 1 (long life)

**Metallized polyester film capacitors**

**MKT 365**

**MKT 365 GENERAL DATA**

**PITCH 5 mm**

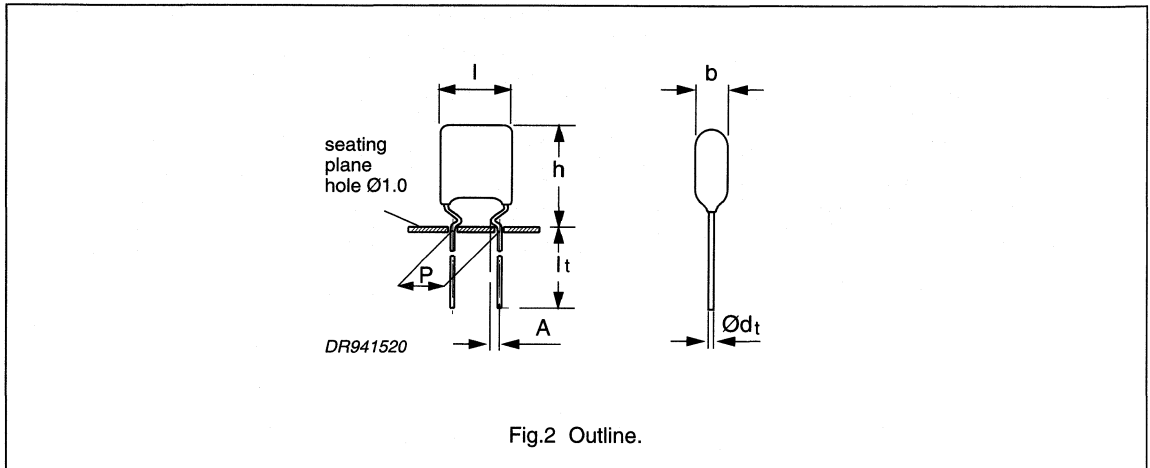


Fig.2 Outline.

**Specific reference data for the 63 V DC capacitors**

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF 0.1 μF < C ≤ 0.47 μF 0.47 μF < C ≤ 1.0 μF	≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup> ≤130 × 10 <sup>-4</sup> ≤130 × 10 <sup>-4</sup>	≤225 × 10 <sup>-4</sup> ≤300 × 10 <sup>-4</sup> -
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	110 V/μs		
R between leads, for C ≤ 0.33 μF	>15000 MΩ		
RC between leads, for C > 0.33 μF	>5000 s		

**Available 63 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	±10%	2222 365 75...	preferred
		±5%	2222 365 76...	preferred
		±20%	2222 365 74...	on request
Taped on reel		±20%	2222 365 70...	on request
		±10%	2222 365 71...	on request
		±5%	2222 365 72...	on request

**Note**

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

## Metallized polyester film capacitors

MKT 365

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 365 ..... AND PACKAGING			
			AMMOPACK; H = 16.0 mm			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>						
0.047	$3.5 \times 12.5 \times 7.3$	0.3	75473	76473	1500	1500
0.056			75563	76563		
0.068	$3.7 \times 12.5 \times 7.3$	0.3	75683	76683	1500	1500
0.082			75823	76823		
0.1			75104	76104		
0.12			75124	76124		
0.15	$3.7 \times 13.0 \times 7.3$	0.3	75154	76154	1500	1500
0.18	$3.7 \times 13.5 \times 7.3$	0.4	75184	76184	1000	1000
0.22	$4.2 \times 13.5 \times 7.3$	0.4	75224	76224	1000	1000
0.27	$4.5 \times 14.0 \times 7.3$	0.4	75274	76274	1000	1000
0.33	$4.5 \times 14.5 \times 7.3$	0.4	75334	76334	1000	1000
0.39			75394	76394		
0.47	$4.5 \times 15.5 \times 7.3$	0.4	75474	76474	1000	1000
0.56	$5.0 \times 14.0 \times 7.3$	0.4	75564	76564	1000	1000
0.68	$5.5 \times 14.5 \times 7.3$	0.4	75684	76684	1000	1000
0.82	$5.5 \times 15.0 \times 7.3$	0.5	75824	76824	1000	1000
1.0	$5.5 \times 15.5 \times 7.3$	0.5	75105	76105	1000	1000

**Note**

1. The shading indicates preferred types.

Metallized polyester film capacitors

MKT 365

MKT 365 GENERAL DATA

PITCH 5 mm

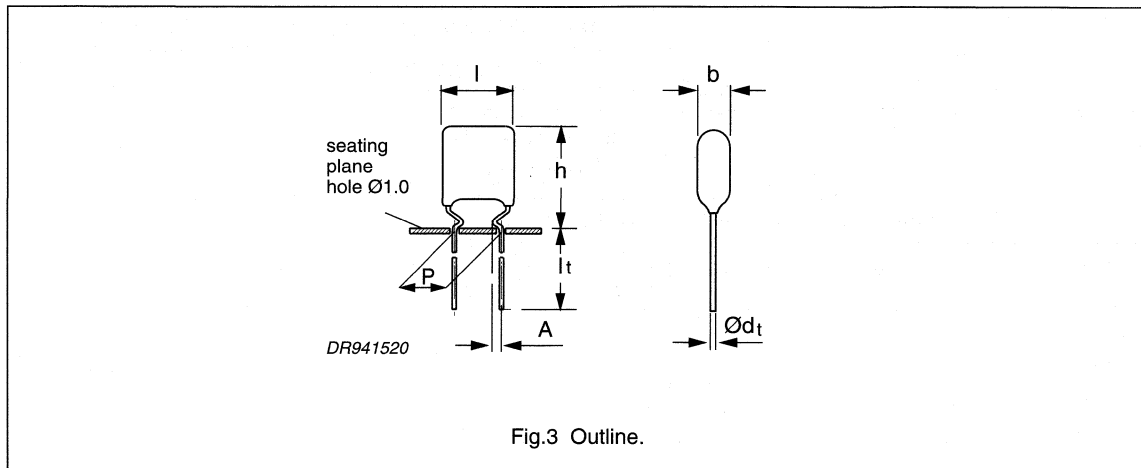


Fig.3 Outline.

Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF	≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup>	≤225 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	110 V/μs		
R between leads, for C ≤ 0.33 μF	>15000 MΩ		

Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	±10%	2222 365 85...	preferred
		±5%	2222 365 86...	preferred
		±20%	2222 365 84...	on request
Taped on reel		±20%	2222 365 80...	on request
		±10%	2222 365 81...	on request
		±5%	2222 365 82...	on request

Note

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

## Metallized polyester film capacitors

MKT 365

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 365 ..... AND PACKAGING			
			AMMOPACK; H = 16.0 mm			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>						
0.01	$3.5 \times 12.5 \times 7.3$	0.3	85103	86103	1500	1500
0.012			85123	86123		
0.015			85153	86153		
0.018			85183	86183		
0.022			85223	86223		
0.027			85273	86273		
0.033			85333	86333		
0.039			85393	86393		
0.047			85473	86473		
0.056			85563	86563		
0.068	$3.7 \times 12.5 \times 7.3$	0.3	85683	86683	1500	1500
0.082	$3.7 \times 13.0 \times 7.3$	0.3	85823	86823	1000	1000
0.1	$3.7 \times 13.5 \times 7.3$	0.4	85104	86104	1000	1000

**Note**

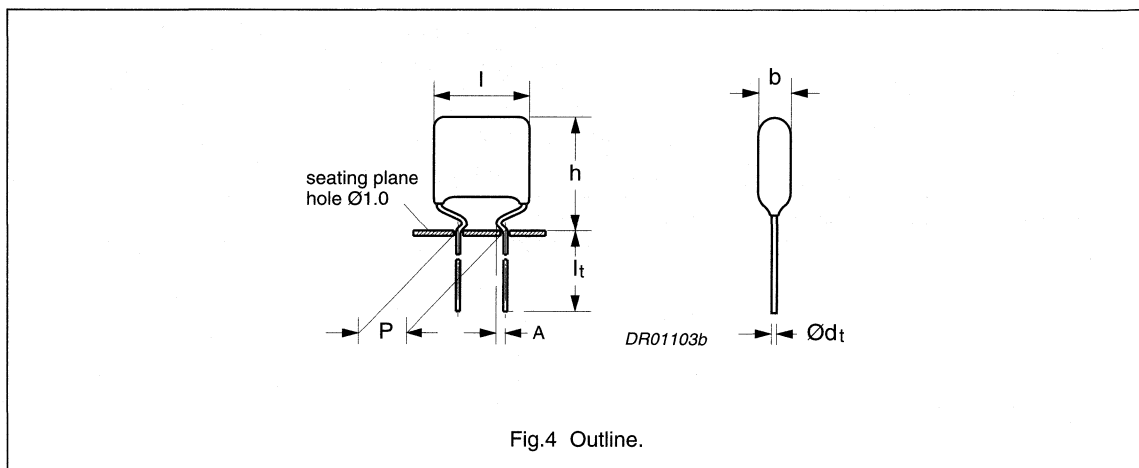
1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 365

## MKT 365 GENERAL DATA

PITCH 5 mm (bent back leads)



## Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: 0.1 $\mu\text{F}$ < C $\leq$ 0.47 $\mu\text{F}$ 0.47 $\mu\text{F}$ < C $\leq$ 1.0 $\mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$ -
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	18 V/ $\mu\text{s}$		
R between leads, for C $\leq$ 0.33 $\mu\text{F}$	>15000 M $\Omega$		
RC between leads, for C > 0.33 $\mu\text{F}$	>5000 s		

## Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	$\pm 10\%$	2222 365 15...	preferred
		$\pm 5\%$	2222 365 16...	preferred
Taped on reel		$\pm 10\%$	2222 365 11...	on request
		$\pm 5\%$	2222 365 12...	on request

## Note

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

## Metallized polyester film capacitors

MKT 365

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 365 ..... AND PACKAGING			
			AMMOPACK; H = 16.0 mm		REEL	
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>						
0.12	4.0 × 13.5 × 10.0	0.4	15124	16124	1500	1500
0.15			15154	16154		
0.18			15184	16184		
0.22			15224	16224		
0.27	4.5 × 14.0 × 10.0	0.5	15274	16274	1000	1000
0.33	5.0 × 14.5 × 10.0	0.6	15334	16334	1000	1000
0.39			15394	16394		
0.47	5.5 × 15.0 × 10.0	0.7	15474	16474	1000	1000
0.56			15564	16564		
0.68			15684	16684		
0.82			15824	16824		
1.0			15105	16105		

**Note**

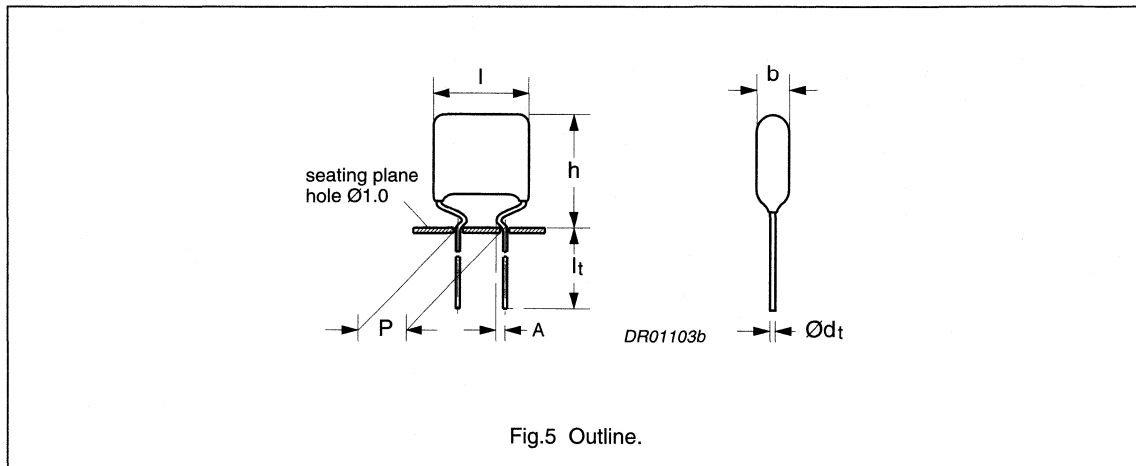
1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 365

## MKT 365 GENERAL DATA

PITCH 5 mm (bent back leads)



## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF	≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup>	≤225 × 10 <sup>-4</sup>
0.1 μF < C ≤ 0.47 μF	≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup>	≤300 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	36 V/μs		
R between leads, for C ≤ 0.33 μF	>15000 MΩ		
RC between leads, for C > 0.33 μF	>5000 s		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	±10%	2222 365 25...	preferred
		±5%	2222 365 26...	preferred
Taped on reel		±10%	2222 365 21...	on request
		±5%	2222 365 22...	on request

## Note

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



## Metallized polyester film capacitors

MKT 365

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 365 ..... AND PACKAGING			
			AMMOPACK; H = 16.0 mm		REEL	
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>1.7 \pm 0.3 \text{ mm}</math></b>						
0.039	4.0 × 13.5 × 10.0	0.4	25393	26393	1500	1500
0.047			25473	26473		
0.056			25563	26563		
0.068			25683	26683		
0.082			25823	26823		
0.1			25104	26104		
0.12	4.5 × 14.0 × 10.5	0.5	25124	26124	1000	1000
0.15	5.0 × 14.5 × 10.5	0.6	25154	26154	1000	1000
0.18			25184	26184		
0.22	5.5 × 15.0 × 10.5	0.7	25224	26224	1000	1000
0.27	6.0 × 15.5 × 10.5	0.7	25274	26274	1000	1000
0.33			25334	26334		
0.39			25394	26394		
0.47			25474	26474		

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 365

## MKT 365 GENERAL DATA

PITCH 5 mm (bent back leads)

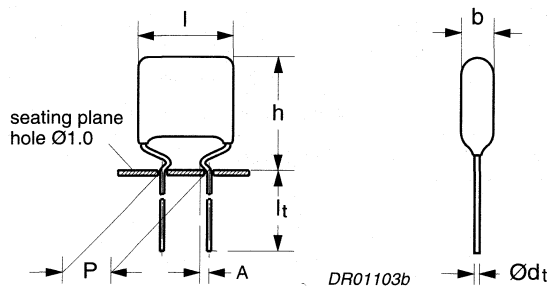


Fig.6 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	70 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$>30000 \text{ M}\Omega$		

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	$\pm 10\%$	2222 365 45...	preferred
		$\pm 5\%$	2222 365 46...	preferred
Taped on reel		$\pm 10\%$	2222 365 41...	on request
		$\pm 5\%$	2222 365 42...	on request

## Note

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

## Metallized polyester film capacitors

MKT 365

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 365 ..... AND PACKAGING			
			AMMOPACK; H = 16.0 mm		REEL	
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>1.7 \pm 0.3 \text{ mm}</math></b>						
0.018	4.0 × 13.5 × 10.0	0.4	45183	46183	1500	1500
0.022			45223	46223		
0.027			45273	46273		
0.033			45333	46333		
0.039			45393	46393		
0.047			45473	46473		

**Note**

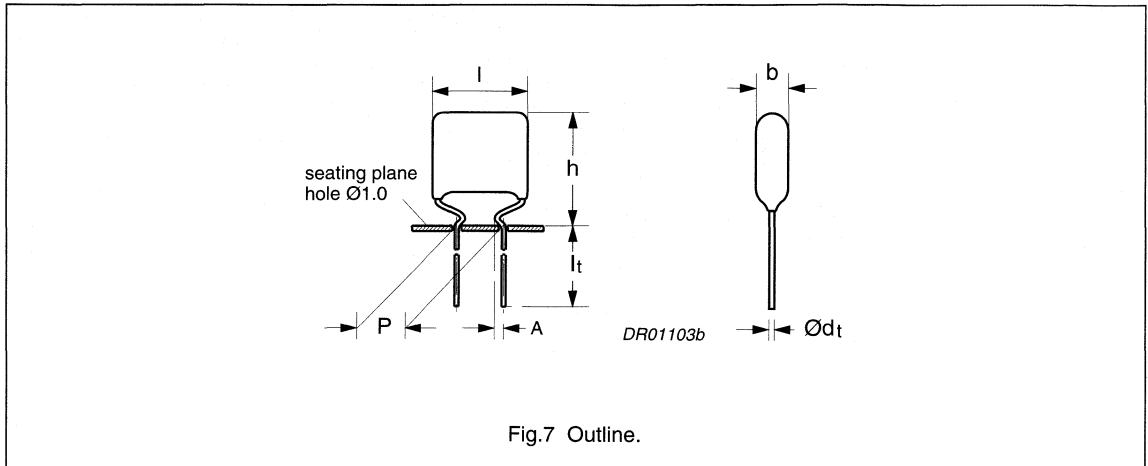
1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 365

## MKT 365 GENERAL DATA

PITCH 5 mm (bent back leads)



## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>30000 M $\Omega$		

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	$\pm 10\%$	2222 365 55...	preferred
		$\pm 5\%$	2222 365 56...	preferred
Taped on reel		$\pm 10\%$	2222 365 51...	on request
		$\pm 5\%$	2222 365 52...	on request

## Note

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

## Metallized polyester film capacitors

MKT 365

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 365 ..... AND PACKAGING			
			AMMOPACK; H = 16.0 mm			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>1.7 \pm 0.3 \text{ mm}</math></b>						
0.0033	4.0 × 13.5 × 10.0	0.4	55332	56332	1500	1500
0.0039			55392	56392		
0.0047			55472	56472		
0.0056			55562	56562		
0.0068			55682	56682		
0.0082			55822	56822		
0.01			55103	56103		
0.012			55123	56123		
0.015			55153	56153		

**Note**

1. The shading indicates preferred types.

Metallized polyester film capacitors

MKT 366

MKT 366 GENERAL DATA

PITCH 5 mm

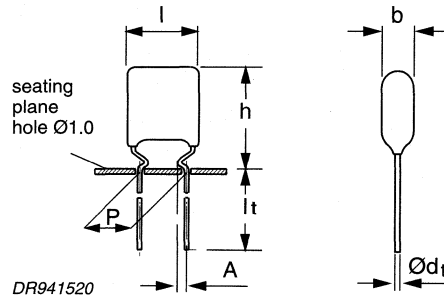


Fig.8 Outline.

Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	-
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 20\%$	2222 366 74...	on request
		$\pm 10\%$	2222 366 75...	on request
		$\pm 5\%$	2222 366 76...	on request
	$l_t = 17.0 \pm 4.0 \text{ mm}$	$\pm 20\%$	2222 366 70...	on request
		$\pm 10\%$	2222 366 71...	on request
		$\pm 5\%$	2222 366 72...	on request

## Metallized polyester film capacitors

MKT 366

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose

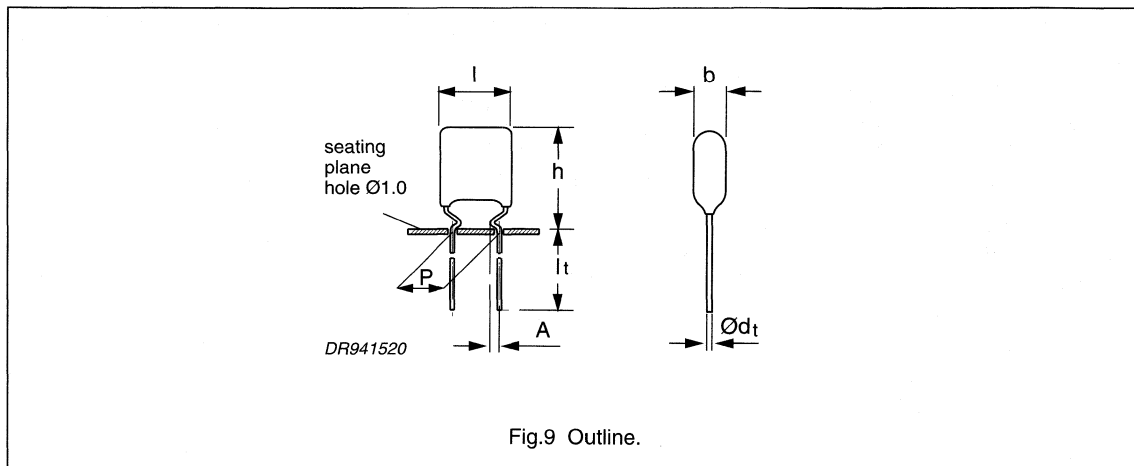
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 366 ..... AND PACKAGING		
			LOOSE IN BOX		
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 17.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>					
0.047	$3.5 \times 12.5 \times 7.3$	0.3	75473	1000	1000
0.056			75563		
0.068	$3.7 \times 12.5 \times 7.3$	0.3	75683	1000	1000
0.082			75823		
0.1			75104		
0.12			75124		
0.15	$3.7 \times 13.0 \times 7.3$	0.3	75154	1000	1000
0.18	$3.7 \times 13.5 \times 7.3$	0.4	75184	1000	1000
0.22	$4.2 \times 13.5 \times 7.3$	0.4	75224	1000	1000
0.27	$4.5 \times 14.0 \times 7.3$	0.4	75274	1000	1000
0.33	$4.5 \times 14.5 \times 7.3$	0.4	75334	1000	1000
0.39			75394		
0.47	$4.5 \times 15.5 \times 7.3$	0.4	75474	1000	1000
0.56	$5.0 \times 14.0 \times 7.3$	0.4	75564	1000	1000
0.68	$5.0 \times 14.5 \times 7.3$	0.4	75684	1000	1000
0.82	$5.5 \times 15.0 \times 7.3$	0.5	75824	1000	1000
1	$5.5 \times 15.5 \times 7.3$	0.5	75105	1000	1000

## Metallized polyester film capacitors

MKT 366

## MKT 366 GENERAL DATA

PITCH 5 mm



## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 20\%$	2222 366 84...	on request
		$\pm 10\%$	2222 366 85...	on request
		$\pm 5\%$	2222 366 86...	on request
	$l_t = 17.0 \pm 4.0 \text{ mm}$	$\pm 20\%$	2222 366 80...	on request
		$\pm 10\%$	2222 366 81...	on request
		$\pm 5\%$	2222 366 82...	on request



## Metallized polyester film capacitors

MKT 366

 $U_{Rdc} = 100 \text{ V}; U_{Rac} = 63 \text{ V}$ 

loose

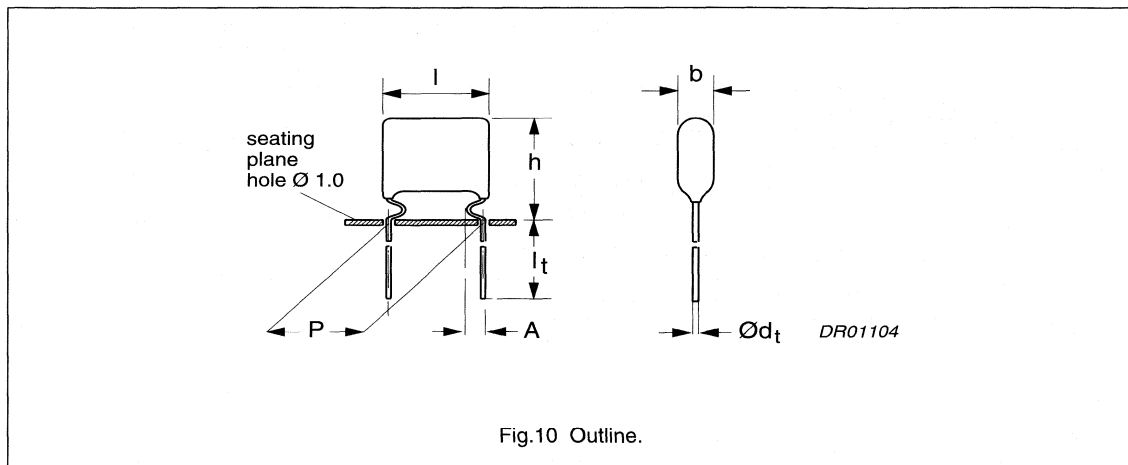
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 366 ..... AND PACKAGING		
			LOOSE IN BOX		
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 17.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number	SPQ	SPQ
C-tol = $\pm 10\%$					
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>					
0.01	$3.5 \times 12.5 \times 7.3$	0.3	85103	1000	1000
0.012			85123		
0.015			85153		
0.018			85183		
0.022			85223		
0.027			85273		
0.033			85333		
0.039			85393		
0.047			85473		
0.056			85563		
0.068	$3.7 \times 12.5 \times 7.3$	0.3	85683	1000	1000
0.082	$3.7 \times 13.0 \times 7.3$	0.3	85823	1000	1000
0.1	$3.7 \times 13.5 \times 7.3$	0.4	85104	1000	1000

## Metallized polyester film capacitors

MKT 366

## MKT 366 GENERAL DATA

PITCH 7.5 mm



## Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	18 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

## Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 366 15...	on request
		$\pm 5\%$	2222 366 16...	on request
	$l_t = 3.0 \pm 0.4$ mm	$\pm 10\%$	2222 366 18...	on request
		$\pm 5\%$	2222 366 19...	on request
	$l_t = 17.0 \pm 4.0$ mm	$\pm 10\%$	2222 366 11...	on request
		$\pm 5\%$	2222 366 12...	on request

## Metallized polyester film capacitors

MKT 366

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 366 ..... AND PACKAGING		
			LOOSE IN BOX		
			short leads		long leads
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$	SPQ	$l_t = 17.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number		SPQ
C-tol = $\pm 10\%$					
<b>Pitch = <math>7.62 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 \pm 0.5 \text{ mm}</math></b>					
0.12	$4.0 \times 12.0 \times 10.0$	0.4	15124	1000	1000
0.15			15154		
0.18			15184		
0.22			15224		
0.27	$4.5 \times 13.0 \times 10.5$	0.5	15274	1000	1000
0.33	$5.0 \times 13.5 \times 10.5$	0.6	15334	1000	1000
0.39		0.4	15394		
0.47	$5.5 \times 14.0 \times 10.5$	0.7	15474	1000	1000
0.56	$5.5 \times 14.5 \times 10.5$	0.8	15564	1000	1000
0.68			15684		
0.82			15824		
1			15105		

Metallized polyester film capacitors

MKT 366

MKT 366 GENERAL DATA

PITCH 7.5 mm

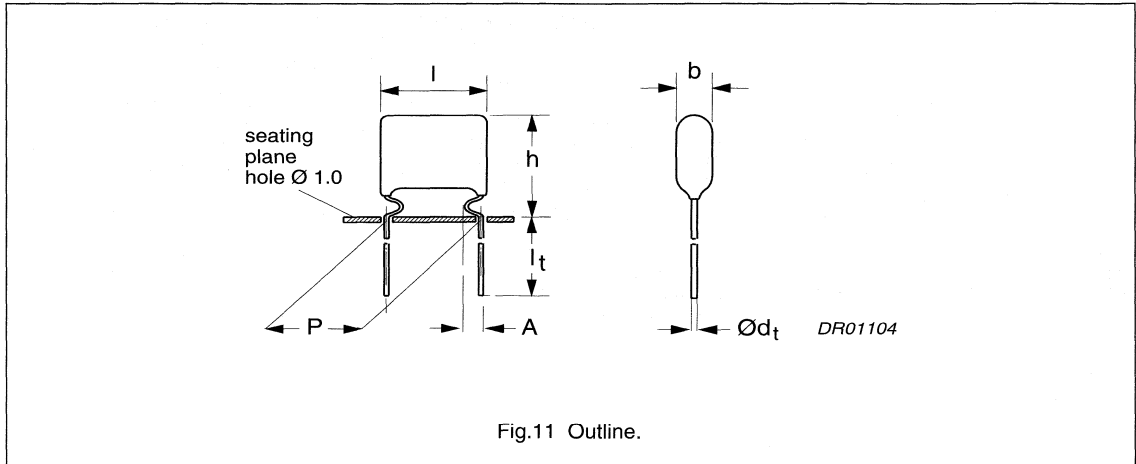


Fig.11 Outline.

Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$ $0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$ $\leq 300 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	36 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 15000 \text{ M}\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	$> 5000 \text{ s}$		

Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 366 25...	on request
		$\pm 5\%$	2222 366 26...	on request
	$l_t = 3.0 \pm 0.4 \text{ mm}$	$\pm 10\%$	2222 366 28...	on request
		$\pm 5\%$	2222 366 29...	on request
	$l_t = 17.0 \pm 4.0 \text{ mm}$	$\pm 10\%$	2222 366 21...	on request
		$\pm 5\%$	2222 366 22...	on request

## Metallized polyester film capacitors

MKT 366

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 366 ..... AND PACKAGING		
			LOOSE IN BOX		
			short leads		long leads
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$	SPQ	$l_t = 17.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number		SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>7.62 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 \pm 0.5 \text{ mm}</math></b>					
0.039	4.0 × 12.0 × 10.0	0.4	25393	1 000	1 000
0.047			25473		
0.056			25563		
0.068			25683		
0.082			25823		
0.1	4.0 × 13.0 × 10.0	0.4	25104	1 000	1 000
0.12	4.5 × 13.0 × 10.5	0.5	25124	1 000	1 000
0.15	5.0 × 13.0 × 10.5	0.5	25154	1 000	1 000
0.18	5.0 × 13.5 × 10.5	0.6	25184	1 000	1 000
0.22	5.5 × 13.5 × 10.5	0.7	25224	1 000	1 000
0.27	6.0 × 14.5 × 10.5	0.7	25274	1 000	1 000
0.33	6.0 × 15.0 × 10.5	0.7	25334	1 000	1 000
0.39			25394		
0.47			25474		

**Metallized polyester film capacitors**

**MKT 366**

**MKT 366 GENERAL DATA**

**PITCH 7.5 mm**

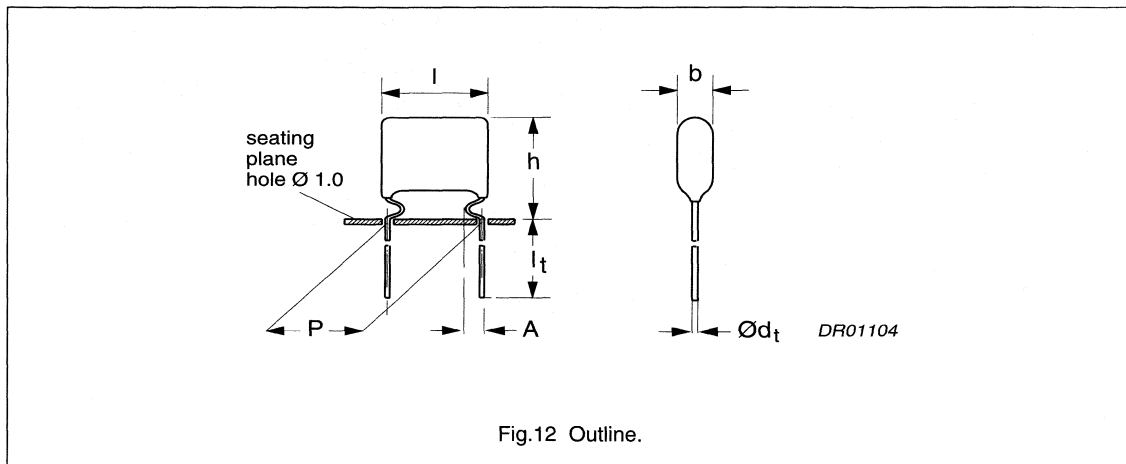


Fig.12 Outline.

**Specific reference data for the 250 V DC capacitors**

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	70 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$>30000 \text{ M}\Omega$		

**Available 250 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 366 45...	on request
		$\pm 5\%$	2222 366 46...	on request
	$l_t = 3.0 \pm 0.4 \text{ mm}$	$\pm 10\%$	2222 366 48...	on request
		$\pm 5\%$	2222 366 49...	on request
	$l_t = 17.0 \pm 4.0 \text{ mm}$	$\pm 10\%$	2222 366 41...	on request
		$\pm 5\%$	2222 366 42...	on request

## Metallized polyester film capacitors

MKT 366

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 366 ..... AND PACKAGING		
			LOOSE IN BOX		
			short leads		long leads
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$	SPQ	$l_t = 17.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number		SPQ
C-tol = $\pm 10\%$					
<b>Pitch = <math>7.62 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 \pm 0.5 \text{ mm}</math></b>					
0.018	4.0 × 13.0 × 10.0	0.4	45183	1000	1000
0.022			45223		
0.027			45273		
0.033			45333		
0.039			45393		
0.047			45473		

Metallized polyester film capacitors

MKT 366

MKT 366 GENERAL DATA

PITCH 7.5 mm

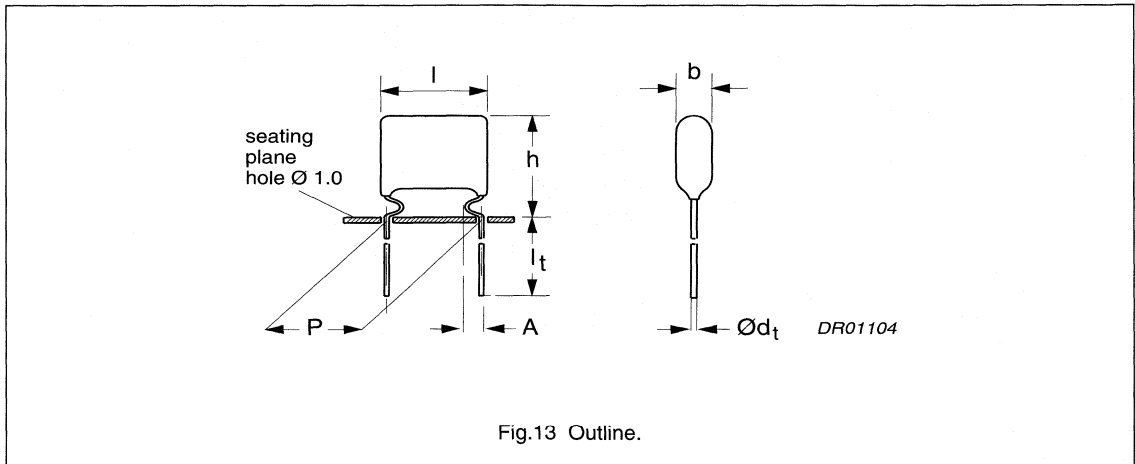


Fig.13 Outline.

Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		

Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 366 55...	on request
		$\pm 5\%$	2222 366 56...	on request
	$l_t = 3.0 \pm 0.4 \text{ mm}$	$\pm 10\%$	2222 366 58...	on request
		$\pm 5\%$	2222 366 59...	on request
	$l_t = 17.0 \pm 4.0 \text{ mm}$	$\pm 10\%$	2222 366 51...	on request
		$\pm 5\%$	2222 366 52...	on request



## Metallized polyester film capacitors

MKT 366

 $U_{Rdc} = 400 \text{ V}; U_{Rac} = 220 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 366 ..... AND PACKAGING		
			LOOSE IN BOX		
			short leads		long leads
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$	SPQ	$l_t = 17.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number		SPQ
C-tol = $\pm 10\%$					
<b>Pitch = <math>7.62 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 \pm 0.5 \text{ mm}</math></b>					
0.0033	$4.0 \times 12.0 \times 10.0$	0.4	55332	1000	1000
0.0039			55392		
0.0047			55472		
0.0056	$4.0 \times 13.0 \times 10.0$	0.4	55562	1000	1000
0.0068			55682		
0.0082			55822		
0.01			55103		
0.012			55123		
0.015			55153		

## Metallized polyester film capacitors

MKT 367

## MKT 367 GENERAL DATA

PITCH 5 mm

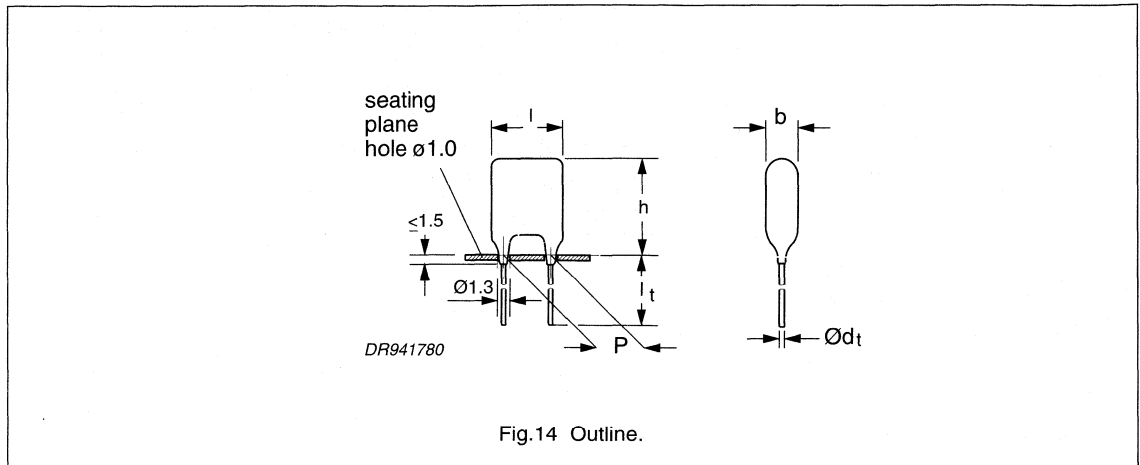


Fig.14 Outline.

## Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 15000 \text{ M}\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	$> 5000 \text{ s}$		

## Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 + 1.0/-0.5 \text{ mm}$	$\pm 20\%$	2222 367 74...	on request
		$\pm 10\%$	2222 367 75...	on request
		$\pm 5\%$	2222 367 76...	on request
	$l_t = 22.0 \pm 4.0 \text{ mm}$	$\pm 20\%$	2222 367 70...	on request
		$\pm 10\%$	2222 367 71...	on request
		$\pm 5\%$	2222 367 72...	on request

## Metallized polyester film capacitors

MKT 367

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 367 ..... AND PACKAGING		
			LOOSE IN BOX		
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 22.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number	SPQ	SPQ
C-tol = $\pm 10\%$					
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>					
0.047	$3.5 \times 7.5 \times 7.3$	0.3	75473	1000	1000
0.056			75563		
0.068	$3.7 \times 7.5 \times 7.3$	0.3	75683	1000	1000
0.082			75823		
0.1			75104		
0.12			75124		
0.15	$3.7 \times 8.0 \times 7.3$	0.3	75154	1000	1000
0.18	$3.7 \times 8.5 \times 7.3$	0.3	75184	1000	1000
0.22	$4.2 \times 8.5 \times 7.3$	0.3	75224	1000	1000
0.27	$4.5 \times 9.0 \times 7.3$	0.4	75274	1000	1000
0.33	$4.5 \times 9.5 \times 7.3$	0.4	75334	1000	1000
0.39	$4.5 \times 10.5 \times 7.3$	0.4	75394	1000	1000
0.47	$4.5 \times 11.5 \times 7.3$	0.4	75474	1000	1000
0.56	$5.0 \times 10.0 \times 7.3$	0.4	75564	1000	1000
0.68	$5.0 \times 10.5 \times 7.3$	0.4	75684	1000	1000
0.82	$5.5 \times 11.0 \times 7.3$	0.5	75824	1000	1000
1	$5.5 \times 11.5 \times 7.3$	0.5	75105	1000	1000

## Metallized polyester film capacitors

MKT 367

## MKT 367 GENERAL DATA

PITCH 5 mm

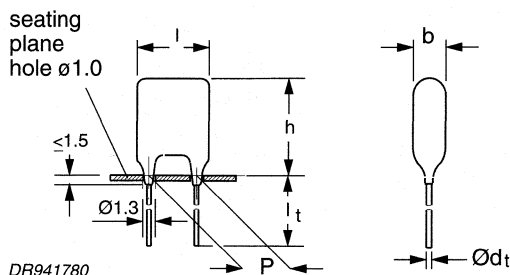


Fig.15 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 15000 \text{ M}\Omega$		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 20\%$	2222 367 84...	on request
		$\pm 10\%$	2222 367 85...	on request
		$\pm 5\%$	2222 367 86...	on request
	$l_t = 22.0 \pm 4.0 \text{ mm}$	$\pm 20\%$	2222 367 80...	on request
		$\pm 10\%$	2222 367 81...	on request
		$\pm 5\%$	2222 367 82...	on request

## Metallized polyester film capacitors

MKT 367

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose

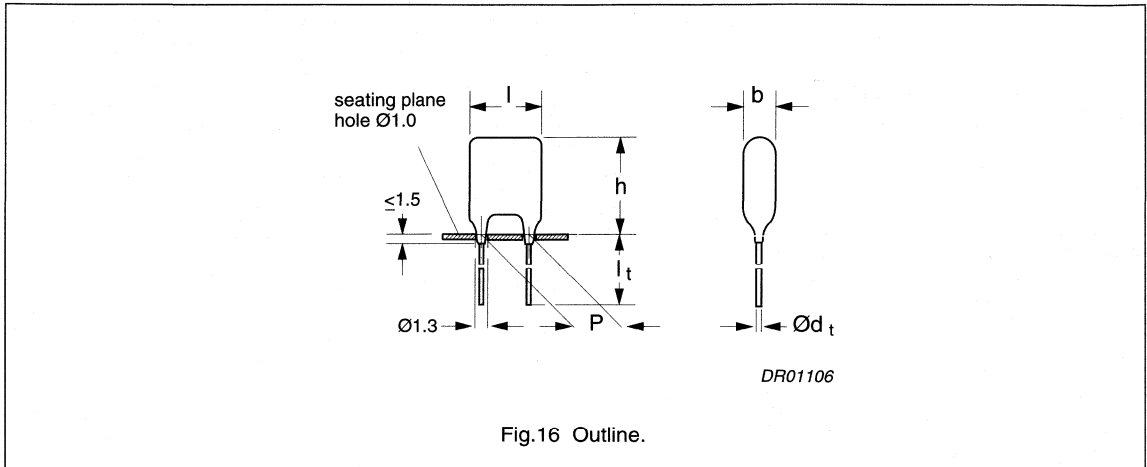
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 367 ..... AND PACKAGING		
			LOOSE IN BOX		
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 22.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>					
0.01	$3.5 \times 7.5 \times 7.3$	0.3	85103	1 000	1 000
0.012			85123		
0.015			85153		
0.018			85183		
0.022			85223		
0.027			85273		
0.033			85333		
0.039			85393		
0.047			85473		
0.056			85563		
0.068	$3.7 \times 7.5 \times 7.3$	0.3	85683	1 000	1 000
0.082	$3.7 \times 8.0 \times 7.3$	0.3	85823	1 000	1 000
0.1	$3.7 \times 8.5 \times 7.3$	0.4	85104	1 000	1 000

## Metallized polyester film capacitors

MKT 367

## MKT 367 GENERAL DATA

PITCH 7.5 mm



## Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: 0.1 $\mu\text{F}$ < C $\leq$ 0.47 $\mu\text{F}$ 0.47 $\mu\text{F}$ < C $\leq$ 1.0 $\mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$ –
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	18 V/ $\mu\text{s}$		
R between leads, for C $\leq$ 0.33 $\mu\text{F}$	>15000 M $\Omega$		
RC between leads, for C > 0.33 $\mu\text{F}$	>5000 s		

## Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 367 15...	on request
		$\pm 5\%$	2222 367 16...	on request
	$l_t = 22.0 \pm 4.0$ mm	$\pm 10\%$	2222 367 11...	on request
		$\pm 5\%$	2222 367 12...	on request

## Metallized polyester film capacitors

MKT 367

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 367 ..... AND PACKAGING		
			LOOSE IN BOX		
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 22.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number	SPQ	SPQ
C-tol = $\pm 10\%$					
<b>Pitch = <math>7.62 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.12	$4.0 \times 8.0 \times 10.0$	0.4	15124	1000	1000
0.15			15154		
0.18			15184		
0.22			15224		
0.27	$4.5 \times 8.5 \times 10.5$	0.5	15274	1000	1000
0.33	$5.0 \times 9.0 \times 10.5$	0.5	15334	1000	1000
0.39		0.6	15394		
0.47	$5.5 \times 9.5 \times 10.5$	0.7	15474	1000	1000
0.56	$5.5 \times 10.0 \times 10.5$	0.7	15564	1000	1000
0.68			15684		
0.82			15824		
1			15105		

Metallized polyester film capacitors

MKT 367

MKT 367 GENERAL DATA

PITCH 7.5 mm

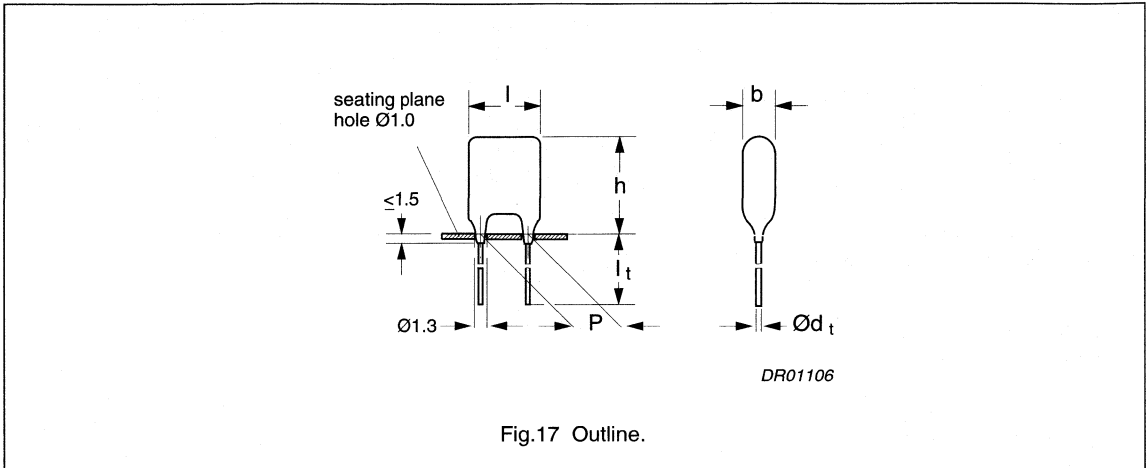


Fig.17 Outline.

Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	36 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 15000 \text{ M}\Omega$		

Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 367 25...	on request
		$\pm 5\%$	2222 367 26...	on request
	$l_t = 22.0 \pm 4.0 \text{ mm}$	$\pm 10\%$	2222 367 21...	on request
		$\pm 5\%$	2222 367 22...	on request



## Metallized polyester film capacitors

MKT 367

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 367 ..... AND PACKAGING		
			LOOSE IN BOX		
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 22.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>7.62 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.039	4.0 × 8.0 × 10.0	0.4	25393	1 000	1 000
0.047			25473		
0.056			25563		
0.068			25683		
0.082			25823		
0.1	4.0 × 8.5 × 10.0	0.4	25104	1 000	1 000
0.12	4.5 × 9.0 × 10.5	0.5	25124	1 000	1 000
0.15	5.0 × 9.5 × 10.5	0.5	25154	1 000	1 000
0.18		0.6	25184		
0.22	5.5 × 10.0 × 10.5	0.7	25224	1 000	1 000
0.27	6.0 × 10.5 × 10.5	0.7	25274	1 000	1 000
0.33			25334		
0.39			25394		
0.47			25474		

Metallized polyester film capacitors

MKT 367

MKT 367 GENERAL DATA

PITCH 7.5 mm

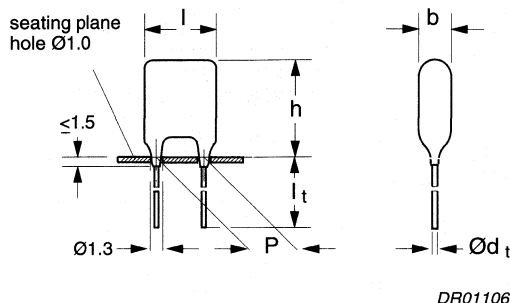


Fig.18 Outline.

Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	70 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$>30000 \text{ M}\Omega$		

Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 367 45...	on request
		$\pm 5\%$	2222 367 46...	on request
	$l_t = 22.0 \pm 4.0 \text{ mm}$	$\pm 10\%$	2222 367 41...	on request
		$\pm 5\%$	2222 367 42...	on request

## Metallized polyester film capacitors

MKT 367

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 367 ..... AND PACKAGING		
			LOOSE IN BOX		
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 22.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>7.62 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.018	4.0 $\times$ 8.5 $\times$ 10.0	0.4	45183	1000	1000
0.022			45223		
0.027			45273		
0.033			45333		
0.039			45393		
0.047			45473		

Metallized polyester film capacitors

MKT 367

MKT 367 GENERAL DATA

PITCH 7.5 mm

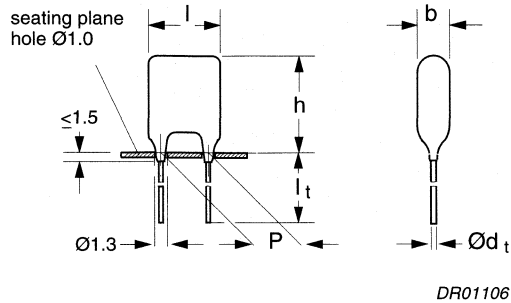


Fig.19 Outline.

Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		

Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 367 55...	on request
		$\pm 5\%$	2222 367 56...	on request
	$l_t = 22.0 \pm 4.0 \text{ mm}$	$\pm 10\%$	2222 367 51...	on request
		$\pm 5\%$	2222 367 52...	on request

## Metallized polyester film capacitors

MKT 367

 $U_{Rdc} = 400 \text{ V}; U_{Rac} = 220 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 367 ..... AND PACKAGING		
			LOOSE IN BOX		
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 22.0 \pm 4.0 \text{ mm}$
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
Pitch = $7.62 \pm 0.30 \text{ mm}; d_t = 0.60 \pm 0.06 \text{ mm}$					
0.0033	4.0 × 8.5 × 10.0	0.4	55332	1000	1000
0.0039			55392		
0.0047			55472		
0.0056			55562		
0.0068			55682		
0.0082			55822		
0.01			55103		
0.012			55123		
0.015			55153		

## Metallized polyester film capacitors

MKT 368

## MKT 368 GENERAL DATA

PITCH 10 mm

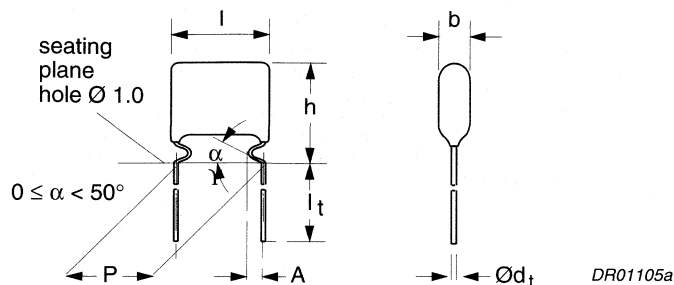


Fig.20 Outline.

## Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: 0.1 $\mu\text{F}$ < C $\leq$ 0.47 $\mu\text{F}$ 0.47 $\mu\text{F}$ < C $\leq$ 1.0 $\mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$ -
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	30 V/ $\mu\text{s}$		
R between leads, for C $\leq$ 0.33 $\mu\text{F}$	>15000 M $\Omega$		
R between leads, for C > 0.33 $\mu\text{F}$	>5000 s		

## Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 368 15...	on request
		$\pm 5\%$	2222 368 16...	on request
	$l_t = 3.0 \pm 0.4$ mm	$\pm 10\%$	2222 368 13...	on request
		$\pm 5\%$	2222 368 17...	on request
	$l_t = 19.0 \pm 4.0$ mm	$\pm 10\%$	2222 368 11...	on request
		$\pm 5\%$	2222 368 12...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 10\%$	2222 368 18...	on request
		$\pm 5\%$	2222 368 19...	on request

## Note

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

## Metallized polyester film capacitors

MKT 368

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose and taped

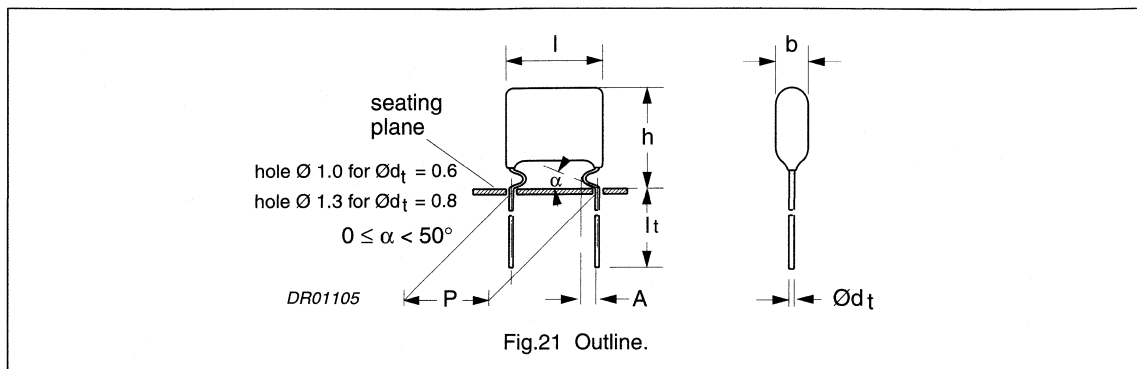
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 368 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			short leads		long leads		SPQ
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		SPQ	SPQ	
			last 5 digits of catalogue number				
C-tol = $\pm 10\%$							
<b>Pitch = <math>10.16 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>							
0.22	4.5 × 12.5 × 12.5	0.4	15224	2000	1000	1300	
0.27			15274				
0.33			15334				
0.39			15394				
0.47	5.0 × 13.0 × 12.5	0.5	15474	2000	1000	1200	
0.56			15564				
0.68	5.5 × 13.5 × 12.5	0.5	15684	2000	1000	1100	
0.82	6.0 × 14.0 × 12.5	0.6	15824	2000	1000	1000	
1	6.5 × 14.5 × 12.5	0.7	15105	2000	1000	900	

## Metallized polyester film capacitors

MKT 368

## MKT 368 GENERAL DATA

PITCH 10/15/22.5/27.5 mm



## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF 0.1 μF < C ≤ 0.47 μF 0.47 μF < C ≤ 1.0 μF C > 1.0 μF	≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup> ≤130 × 10 <sup>-4</sup> ≤130 × 10 <sup>-4</sup> ≤150 × 10 <sup>-4</sup>	≤250 × 10 <sup>-4</sup> ≤300 × 10 <sup>-4</sup> – –
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : P = 10 mm P = 15 mm P = 22.5 mm P = 27.5 mm	28 V/μs 20 V/μs 8 V/μs 7 V/μs		
R between leads, for C ≤ 0.33 μF	>15000 MΩ		
RC between leads, for C > 0.33 μF	>5000 s		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 4.0 +1.0/–0.5 mm	±10%	2222 368 25...	on request
		±5%	2222 368 26...	on request
	l <sub>t</sub> = 3.0 ±0.4 mm	±10%	2222 368 23...	on request
		±5%	2222 368 27...	on request
	long leads; note 1	±10%	2222 368 21...	on request
		±5%	2222 368 22...	on request
Taped on reel	H = 16.0 mm; note 2	±10%	2222 368 28...	on request
		±5%	2222 368 29...	on request

## Notes

- Length of long leads:
  - l<sub>t</sub> = 19.0 ±4.0 mm for lead pitches 10.16 mm and 15.24 mm.
  - l<sub>t</sub> = 25.0 ±4.0 mm for lead pitch 22.86 mm.
  - l<sub>t</sub> = 24.0 ±4.0 mm for lead pitch 27.94 mm.
- H = in-tape height; for detailed specifications refer to this handbook, Chapter "Packaging".



## Metallized polyester film capacitors

MKT 368

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

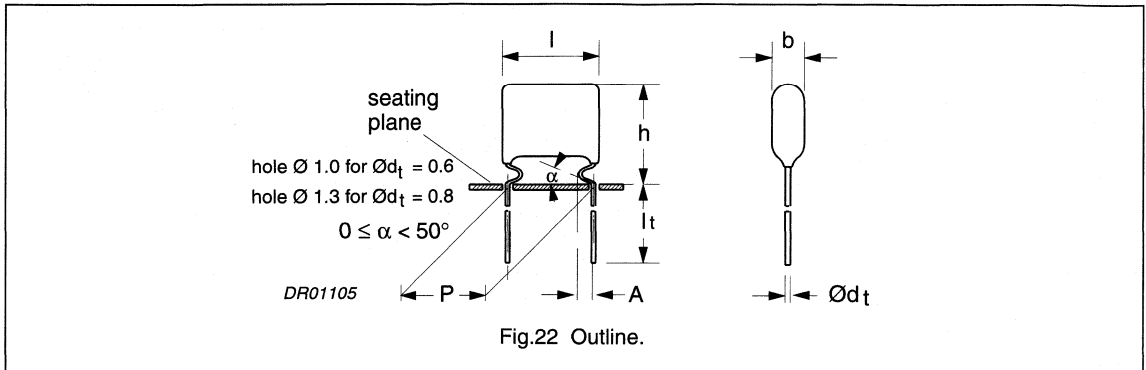
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 368 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			short leads		long leads		SPQ
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		SPQ	SPQ	
			last 5 digits of catalogue number				
C-tol = $\pm 10\%$							
<b>Pitch = <math>10.16 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>							
0.056	4.0 × 12.0 × 12.5	0.4	25563	2000	1000	1500	
0.068			25683				
0.082			25823				
0.1			25104				
0.12			25124				
0.15			25154				
0.18	4.5 × 12.5 × 12.5	0.4	25184	2000	1000	1300	
0.22	5.0 × 13.0 × 12.5	0.5	25224	2000	1000	1200	
<b>Pitch = <math>15.24 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.27	5.0 × 14.0 × 17.5	0.6	25274	2000	1000	1200	
0.33			25334				
0.39			25394				
0.47	5.5 × 14.5 × 17.5	0.7	25474	2000	1000	1100	
0.56		0.8	25564				
0.68	6.0 × 15.0 × 17.5	1.0	25684	2000	1000	1000	
0.82	6.5 × 15.5 × 17.5	1.1	25824	1000	1000	900	
1	7.5 × 16.5 × 17.5	1.3	25105	1000	1000	800	
<b>Pitch = <math>22.86 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
1.2	6.0 × 18.0 × 26.0	1.8	25125	1000	1000	650	
1.5		2.0	25155				
1.8		2.3	25185				
2.2	6.5 × 19.5 × 26.0	2.8	25225	1000	500	600	
2.7	7.5 × 20.0 × 26.0	3.2	25275	1000	500	500	
3.3	8.5 × 21.0 × 26.0	4.0	25335	1000	500	450	
<b>Pitch = <math>27.94 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
3.9	8.5 × 20.5 × 30.0	4.5	25395	500	500	450	
4.7	9.5 × 21.5 × 30.0	5.2	25475	500	500	400	
5.6	10.5 × 22.5 × 30.0	6.0	25565	500	250	350	
6.8	11.5 × 23.5 × 30.0	6.5	25685	500	250	350	

## Metallized polyester film capacitors

MKT 368

## MKT 368 GENERAL DATA

PITCH 10/15/22.5/27.5 mm



## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF 0.1 μF < C ≤ 0.47 μF 0.47 μF < C ≤ 1.0 μF C > 1.0 μF	≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup> ≤130 × 10 <sup>-4</sup> ≤130 × 10 <sup>-4</sup> ≤150 × 10 <sup>-4</sup>	≤225 × 10 <sup>-4</sup> ≤300 × 10 <sup>-4</sup> – –
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : P = 10 mm P = 15 mm P = 22.5 mm P = 27.5 mm		70 V/μs 28 V/μs 12 V/μs 10 V/μs	
R between leads, for C ≤ 0.33 μF		>30000 MΩ	
RC between leads, for C > 0.33 μF		>10000 s	

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 4.0 +1.0/–0.5 mm	±10%	2222 368 45...	on request
		±5%	2222 368 46...	on request
	l <sub>t</sub> = 3.0 ±0.4 mm	±10%	2222 368 43...	on request
		±5%	2222 368 47...	on request
	long leads; note 1	±10%	2222 368 41...	on request
		±5%	2222 368 42...	on request
Taped on reel	H = 16 mm; note 2	±10%	2222 368 48...	on request
		±5%	2222 368 49...	on request

## Notes

- Length of long leads:
  - l<sub>t</sub> = 19.0 ±4.0 mm (lead pitches 10.16 mm and 15.24 mm).
  - l<sub>t</sub> = 25.0 ±4.0 mm for lead pitch 22.86 mm.
  - l<sub>t</sub> = 24.0 ±4.0 mm for lead pitch 27.94 mm.
- H = in-tape height; for detailed specifications refer to this handbook, Chapter "Packaging".

## Metallized polyester film capacitors

MKT 368

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

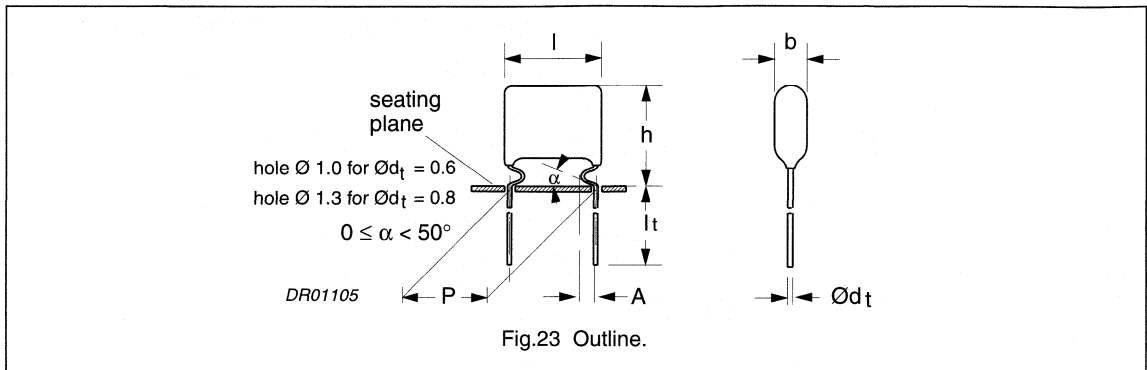
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 368 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			short leads		long leads		SPQ
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		SPQ	SPQ	
			last 5 digits of catalogue number				
C-tol = $\pm 10\%$							
<b>Pitch = <math>10.16 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>							
0.027 0.033 0.039 0.047	4.0 × 12.0 × 12.5	0.4	45273 45333 45393 45473	2000	1000	1500	
0.056 0.068	4.5 × 12.5 × 12.5	0.4	45563 45683	2000	1000	1300	
0.082 0.1	5.0 × 13.0 × 12.5	0.5	45823 45104	2000	1000	1200	
<b>Pitch = <math>15.24 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.12 0.15	5.0 × 14.0 × 17.5	0.6 0.7	45124 45154	2000	1000	1200	
0.18	5.5 × 14.5 × 17.5	0.8	45184	2000	1000	1100	
0.22	6.0 × 15.0 × 17.5	0.9	45224	2000	1000	1000	
0.27	6.5 × 15.5 × 17.5	1.1	45274	2000	1000	900	
0.33	7.0 × 16.0 × 17.5	1.3	45334	1000	1000	800	
<b>Pitch = <math>22.86 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.39	5.0 × 17.0 × 26.0	1.8	45394	1000	1000	800	
0.47	5.5 × 17.5 × 26.0	2.1	45474	1000	1000	750	
0.56	6.0 × 18.0 × 26.0	2.5	45564	1000	1000	650	
0.68	6.5 × 18.5 × 26.0	2.9	45684	1000	1000	600	
0.82	7.0 × 19.0 × 26.0	3.3	45824	1000	1000	550	
1	7.5 × 19.5 × 26.0	3.6	45105	1000	500	500	
<b>Pitch = <math>27.94 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
1.2	7.5 × 19.5 × 30.0	4.0	45125	500	500	500	
1.5	8.5 × 20.5 × 30.0	5.1	45155	500	500	450	
1.8	9.5 × 21.5 × 30.0	5.9	45185	500	500	400	
2.2	10.5 × 22.5 × 30.0	6.4	45225	500	250	350	

## Metallized polyester film capacitors

MKT 368

## MKT 368 GENERAL DATA

PITCH 10/15/22.5/27.5 mm



## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$ $0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$ $0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$ $\leq 300 \times 10^{-4}$ -
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : $P = 10 \text{ mm}$ $P = 15 \text{ mm}$ $P = 22.5 \text{ mm}$ $P = 27.5 \text{ mm}$	110 V/ $\mu\text{s}$ 44 V/ $\mu\text{s}$ 20 V/ $\mu\text{s}$ 16 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>30000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>10000 s		

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 368 55...	on request
		$\pm 5\%$	2222 368 56...	on request
	$l_t = 3.0 \pm 0.4 \text{ mm}$	$\pm 10\%$	2222 368 53...	on request
		$\pm 5\%$	2222 368 57...	on request
	long leads; note 1	$\pm 10\%$	2222 368 51...	on request
		$\pm 5\%$	2222 368 52...	on request
Taped on reel	$H = 16 \text{ mm}$ ; note 2	$\pm 10\%$	2222 368 58...	on request
		$\pm 5\%$	2222 368 59...	on request

## Notes

- Length of long leads:
  - $l_t = 19.0 \pm 4.0 \text{ mm}$  (lead pitches 10.16 mm and 15.24 mm).
  - $l_t = 25.0 \pm 4.0 \text{ mm}$  for lead pitch 22.86 mm.
  - $l_t = 24.0 \pm 4.0 \text{ mm}$  for lead pitch 27.94 mm.
- $H$  = in-tape height; for detailed specifications refer to this handbook, Chapter "Packaging".

## Metallized polyester film capacitors

MKT 368

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

loose and taped

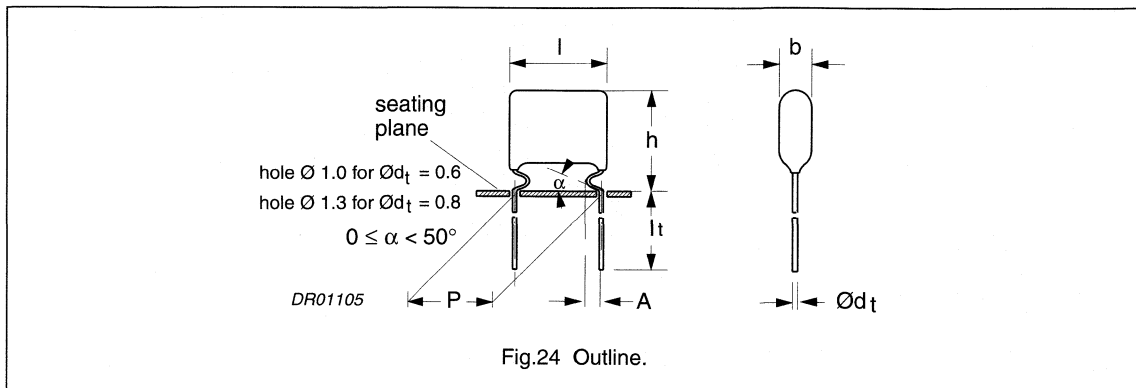
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 368 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			short leads		long leads		SPQ
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		SPQ	SPQ	
			last 5 digits of catalogue number				
C-tol = $\pm 10\%$							
<b>Pitch = <math>10.16 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>							
0.001	$4.0 \times 12.0 \times 12.5$	0.4	55102	2000	1000	1500	
0.0012			55122				
0.0015			55152				
0.0018			55182				
0.0022			55222				
0.0027			55272				
0.0033			55332				
0.0039			55392				
0.0047			55472				
0.0056			55562				
0.0068			55682				
0.0082			55822				
0.01			55103				
0.012			55123				
0.015			55153				
0.018	55183						
0.022	55223						
0.027	$4.5 \times 12.5 \times 12.5$	0.4	55273	2000	1000	1300	
0.033			55333				
<b>Pitch = <math>15.24 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.039	$4.5 \times 13.5 \times 17.5$	0.6	55393	2000	1000	1200	
0.047		0.6	55473				
0.056		0.6	55563				
0.068		0.7	55683				
0.082	$5.0 \times 14.0 \times 17.5$	0.8	55823	2000	1000	1100	
0.1	$5.5 \times 14.5 \times 17.5$	0.9	55104	2000	1000	1000	
0.12	$6.0 \times 15.0 \times 17.5$	1.1	55124	1000	1000	900	
0.15	$6.5 \times 15.5 \times 17.5$	1.3	55154	1000	1000	800	
<b>Pitch = <math>22.86 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.18	$5.5 \times 17.5 \times 26.0$	1.6	55184	1000	1000	800	
0.22		1.9	55224	1000	1000	650	
0.27	$6.0 \times 18.0 \times 26.0$	2.3	55274				
0.33		2.6	55334				
0.39	$6.5 \times 18.5 \times 26.0$	3.0	55394	1000	1000	550	
0.47	$7.5 \times 19.5 \times 26.0$	3.4	55474	1000	500	500	
<b>Pitch = <math>27.94 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.56	$7.5 \times 19.5 \times 30.0$	3.5	55564	500	500	500	
0.68	$8.5 \times 20.5 \times 30.0$	4.0	55684	500	500	450	
0.82	$9.0 \times 21.0 \times 30.0$	4.5	55824	500	500	400	
1	$10.0 \times 22.0 \times 30.0$	5.0	55105	500	250	350	

# Metallized polyester film capacitors

MKT 368

**MKT 368 GENERAL DATA**

**PITCH 10/15/22.5/27.5 mm**



**Specific reference data for the 630 V DC capacitors**

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 µF 0.1 µF < C ≤ 0.47 µF	≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup> ≤130 × 10 <sup>-4</sup>	≤250 × 10 <sup>-4</sup> ≤300 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : P = 10 mm P = 15 mm P = 22.5 mm P = 27.5 mm		70 V/µs 70 V/µs 28 V/µs 24 V/µs	
R between leads, for C ≤ 0.33 µF		>30000 MΩ	
RC between leads, for C > 0.33 µF		>10000 s	

**Available 630 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 4.0 +1.0/-0.5 mm	±10%	2222 368 65...	on request
		±5%	2222 368 66...	on request
	l <sub>t</sub> = 3.0 ±0.4 mm	±10%	2222 368 63...	on request
		±5%	2222 368 67...	on request
	long leads; note 1	±10%	2222 368 61...	on request
		±5%	2222 368 62...	on request
Taped on reel	H = 16 mm; note 2	±10%	2222 368 68...	on request
		±5%	2222 368 69...	on request

**Notes**

- Length of long leads:
  - l<sub>t</sub> = 19.0 ±4.0 mm (lead pitches 10.16 mm and 15.24 mm).
  - l<sub>t</sub> = 25.0 ±4.0 mm for lead pitch 22.86 mm.
  - l<sub>t</sub> = 24.0 ±4.0 mm for lead pitch 27.94 mm.
- H = in-tape height; for detailed specifications refer to this handbook, Chapter "Packaging".

## Metallized polyester film capacitors

MKT 368

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 250 \text{ V}$ 

loose and taped

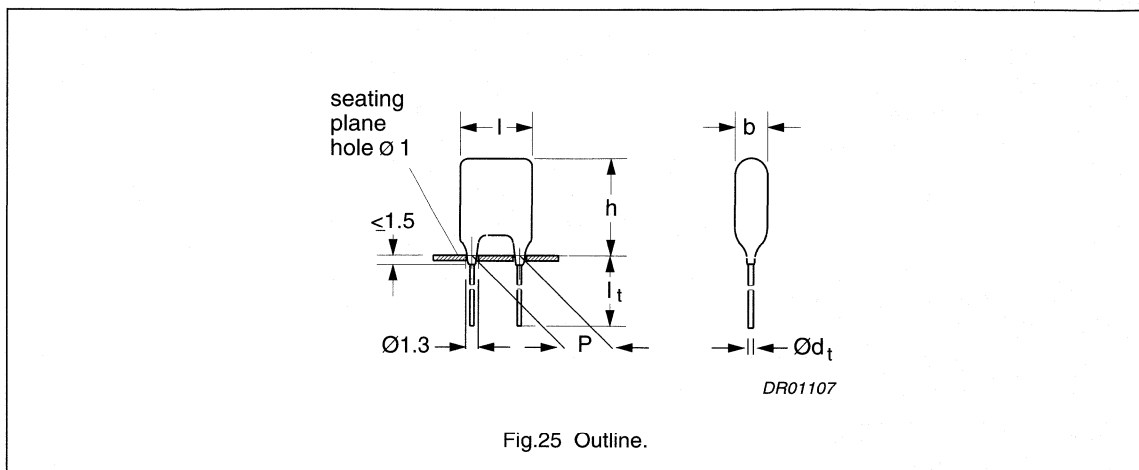
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 368 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			short leads		long leads		SPQ
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		SPQ	SPQ	
			last 5 digits of catalogue number				
C-tol = $\pm 10\%$							
<b>Pitch = <math>10.16 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>							
0.01	$4.5 \times 12.5 \times 12.5$	0.4	65103	2000	1000	1300	
0.012	$5.0 \times 13.0 \times 12.5$	0.5	65123	2000	1000	1200	
0.015	$5.5 \times 13.5 \times 12.5$	0.6	65153	2000	1000	1100	
0.018	$6.0 \times 14.0 \times 12.5$	0.6	65183	2000	1000	1000	
0.022	$6.5 \times 14.5 \times 12.5$	0.7	65223	2000	1000	900	
<b>Pitch = <math>15.24 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.027	$5.5 \times 14.5 \times 17.5$	0.9	65273	2000	1000	1100	
0.033	$6.0 \times 15.0 \times 17.5$	1.0	65333	2000	1000	1000	
0.039	$6.5 \times 15.5 \times 17.5$	1.1	65393	2000	1000	900	
0.047	$7.0 \times 16.0 \times 17.5$	1.2	65473	2000	1000	800	
0.056	$7.5 \times 16.5 \times 17.5$	1.3	65563	1000	1000	800	
0.068	$8.0 \times 17.0 \times 17.5$	1.4	65683	1000	1000	750	
<b>Pitch = <math>22.86 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.082	$5.5 \times 17.5 \times 26.0$	1.8	65823	1000	1000	750	
0.1	$6.0 \times 18.0 \times 26.0$	2.1	65104	1000	1000	650	
0.12	$7.0 \times 19.0 \times 26.0$	2.5	65124	1000	1000	550	
0.15	$7.5 \times 19.5 \times 26.0$	2.9	65154	1000	500	500	
0.18	$8.5 \times 20.5 \times 26.0$	3.2	65184	1000	500	450	
0.22	$9.5 \times 21.5 \times 26.0$	3.5	65224	1000	500	400	
<b>Pitch = <math>27.94 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>							
0.27	$9.0 \times 21.0 \times 30.0$	4.3	65274	500	500	450	
0.33	$10.0 \times 22.0 \times 30.0$	5.0	65334	500	250	400	
0.39	$11.0 \times 23.0 \times 30.0$	5.6	65394	500	250	350	
0.47	$12.0 \times 24.0 \times 30.0$	6.5	65474	250	250	350	

Metallized polyester film capacitors

MKT 369

MKT 369 GENERAL DATA

PITCH 10 mm



Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: 0.1 $\mu$ F < C $\le$ 0.47 $\mu$ F	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
0.47 $\mu$ F < C $\le$ 1.0 $\mu$ F	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	–
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	30 V/ $\mu$ s		
R between leads, for C $\le$ 0.33 $\mu$ F	>15000 M $\Omega$		
RC between leads, for C > 0.33 $\mu$ F	>5000 s		

Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 369 15...	on request
		$\pm 5\%$	2222 369 16...	on request
	$l_t = 22.0 \pm 4.0$ mm	$\pm 10\%$	2222 369 11...	on request
		$\pm 5\%$	2222 369 12...	on request
Taped on reel	H = 16 mm; note 1	$\pm 10\%$	2222 369 18...	on request
		$\pm 5\%$	2222 369 19...	on request

Note

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



## Metallized polyester film capacitors

MKT 369

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 369 ..... AND PACKAGING			
			LOOSE IN BOX			REEL
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 22.0 \pm 4.0 \text{ mm}$	
			last 5 digits of catalogue number	SPQ	SPQ	SPQ
C-tol = $\pm 10\%$						
Pitch = $10.16 \pm 0.30 \text{ mm}$ ; $d_t = 0.60 \pm 0.06 \text{ mm}$						
0.22	$4.5 \times 10.0 \times 12.5$	0.4	15224	2000	1000	1300
0.27			15274			
0.33			15334			
0.39			15394			
0.47	$5.0 \times 10.5 \times 12.5$	0.5	15474	2000	1000	1200
0.56			15564			
0.68	$5.5 \times 11.0 \times 12.5$	0.5	15684	2000	1000	1100
0.82	$6.0 \times 11.5 \times 12.5$	0.6	15824	2000	1000	1000
1	$6.5 \times 12.0 \times 12.5$	0.7	15105	2000	1000	900

## Metallized polyester film capacitors

MKT 369

## MKT 369 GENERAL DATA

PITCH 10 mm

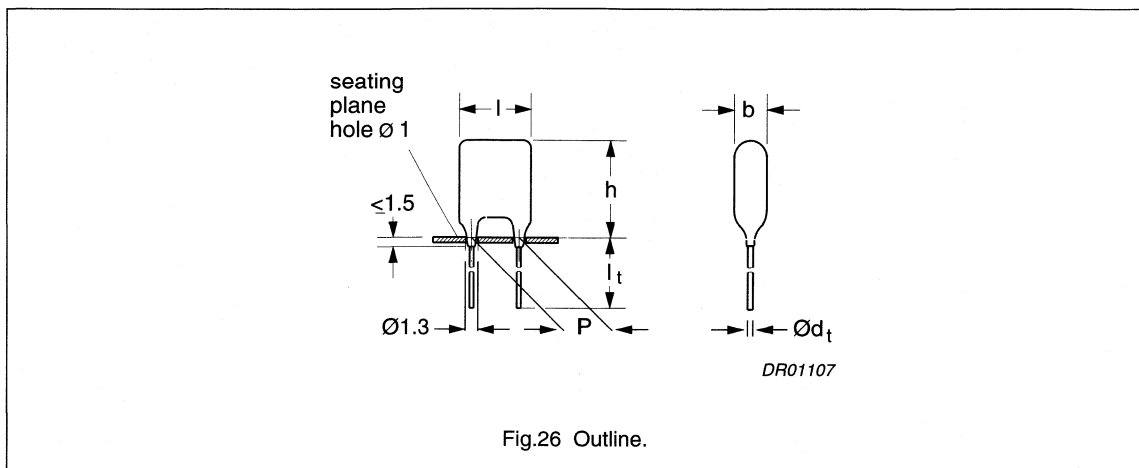


Fig.26 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C $\leq$ 0.1 $\mu$ F C > 0.1 $\mu$ F	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$ $\leq 300 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	28 V/ $\mu$ s		
R between leads, for C $\leq$ 0.33 $\mu$ F	>15000 M $\Omega$		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 369 25...	on request
		$\pm 5\%$	2222 369 26...	on request
	$l_t = 22.0 \pm 4.0$ mm	$\pm 10\%$	2222 369 21...	on request
		$\pm 5\%$	2222 369 22...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 369 28...	on request
		$\pm 5\%$	2222 369 29...	on request

## Note

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

## Metallized polyester film capacitors

MKT 369

 $U_{Rdc} = 100 \text{ V}; U_{Rac} = 63 \text{ V}$ 

loose and taped

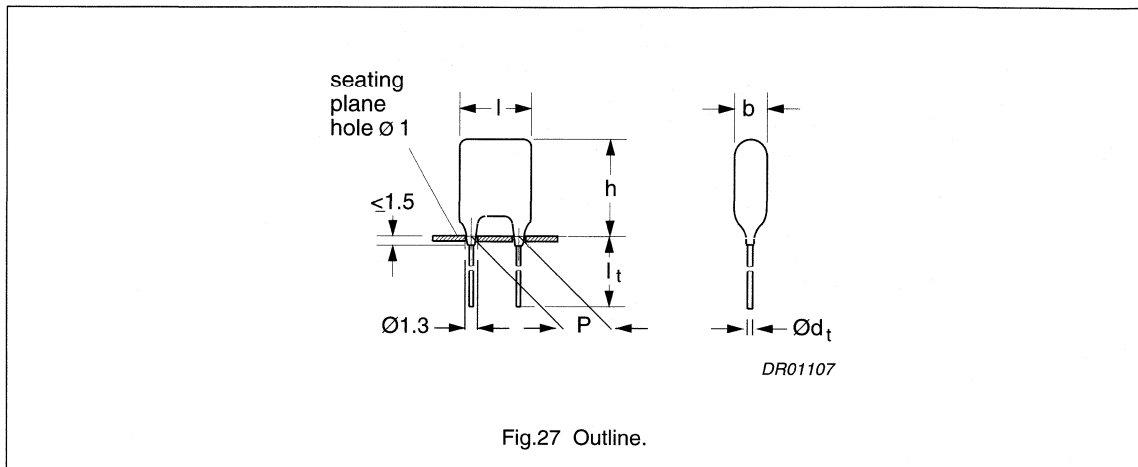
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 369 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			$l_t =$ 4.0 +1.0/-0.5 mm		$l_t =$ 22.0 $\pm$ 4.0 mm		SPQ
			last 5 digits of catalogue number	SPQ	SPQ		
C-tol = $\pm$ 10%							
<b>Pitch = 10.16 <math>\pm</math>0.30 mm; <math>d_t = 0.60 \pm 0.06</math> mm</b>							
0.056	4.0 $\times$ 9.5 $\times$ 12.5	0.4	25563	2000	1000	1500	
0.068			25683				
0.082			25823				
0.1			25104				
0.12			25124				
0.15	25154						
0.18	4.5 $\times$ 10.0 $\times$ 12.5	0.5	25184	2000	1000	1300	
0.22	5.0 $\times$ 10.5 $\times$ 12.5	0.5	25224	2000	1000	1200	

## Metallized polyester film capacitors

MKT 369

## MKT 369 GENERAL DATA

PITCH 10 mm



## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	70 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 369 45...	on request
		$\pm 5\%$	2222 369 46...	on request
	$l_t = 22.0 \pm 4.0 \text{ mm}$	$\pm 10\%$	2222 369 41...	on request
		$\pm 5\%$	2222 369 42...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 10\%$	2222 369 48...	on request
		$\pm 5\%$	2222 369 49...	on request

## Note

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

## Metallized polyester film capacitors

MKT 369

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

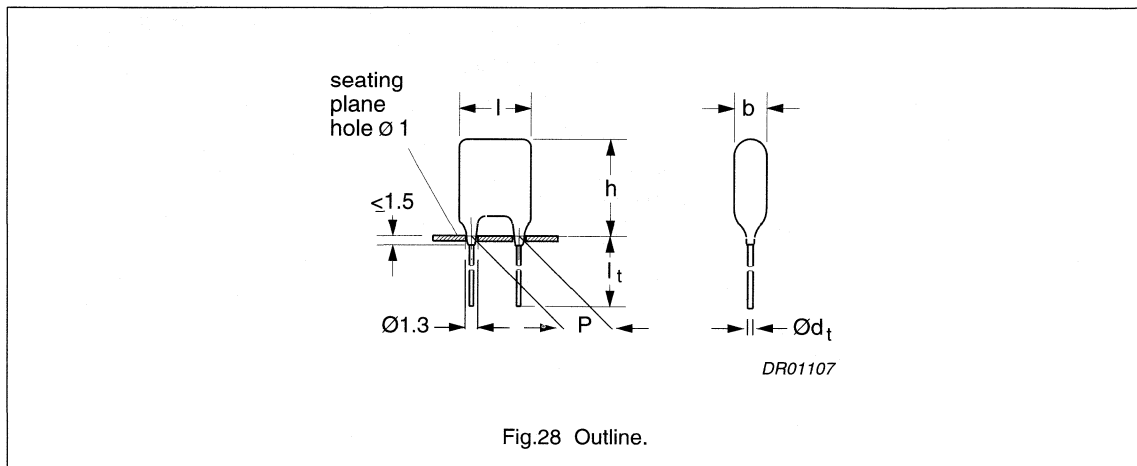
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 369 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			$l_t =$ 4.0 +1.0/-0.5 mm		$l_t =$ 22.0 $\pm$ 4.0 mm		SPQ
			last 5 digits of catalogue number	SPQ	SPQ		
C-tol = $\pm$ 10%							
<b>Pitch = 10.16 <math>\pm</math>0.30 mm; <math>d_t = 0.60 \pm 0.06</math> mm</b>							
0.027	4.0 $\times$ 9.5 $\times$ 12.5	0.4	45273	2000	1000	1500	
0.033			45333				
0.039			45393				
0.047			45473				
0.056	4.5 $\times$ 10.0 $\times$ 12.5	0.4	45563	2000	1000	1300	
0.068			45683				
0.082	5.0 $\times$ 10.5 $\times$ 12.5	0.5	45823	2000	1000	1200	
0.1			45104				

## Metallized polyester film capacitors

MKT 369

## MKT 369 GENERAL DATA

PITCH 10 mm



## Specific reference data for the 400 V DC capacitors:

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>30000 M $\Omega$		

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 369 55...	on request
		$\pm 5\%$	2222 369 56...	on request
	$l_t = 22.0 \pm 4.0$ mm	$\pm 10\%$	2222 369 51...	on request
		$\pm 5\%$	2222 369 52...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 369 58...	on request
		$\pm 5\%$	2222 369 59...	on request

## Note

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

## Metallized polyester film capacitors

MKT 369

 $U_{Rdc} = 400 \text{ V}; U_{Rac} = 220 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 369 ..... AND PACKAGING			
			LOOSE IN BOX			REEL
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 22.0 \pm 4.0 \text{ mm}$	
			last 5 digits of catalogue number	SPQ	SPQ	SPQ
			C-tol = $\pm 10\%$			
Pitch = $10.16 \pm 0.30 \text{ mm}; d_t = 0.60 \pm 0.06 \text{ mm}$						
0.001	$4.0 \times 9.5 \times 12.5$	0.4	55102	2000	1000	1500
0.0012			55122			
0.0015			55152			
0.0018			55182			
0.0022			55222			
0.0027			55272			
0.0033			55332			
0.0039			55392			
0.0047			55472			
0.0056			55562			
0.0068			55682			
0.0082			55822			
0.01			55103			
0.012			55123			
0.015			55153			
0.018	55183					
0.022	55223					
0.027	$4.5 \times 10.0 \times 12.5$	0.4	55273	2000	1000	1300
0.033			55333			

Metallized polyester film capacitors

MKT 369

MKT 369 GENERAL DATA

PITCH 10 mm

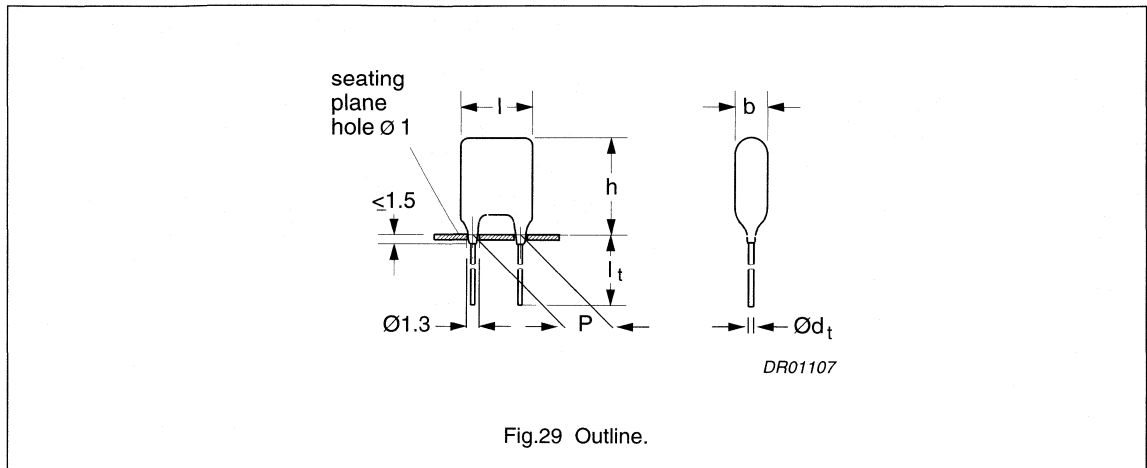


Fig.29 Outline.

Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	70 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	$> 10000 \text{ s}$		

Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 369 65...	on request
		$\pm 5\%$	2222 369 66...	on request
	$l_t = 22.0 \pm 4.0 \text{ mm}$	$\pm 10\%$	2222 369 61...	on request
		$\pm 5\%$	2222 369 62...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 10\%$	2222 369 68...	on request
		$\pm 5\%$	2222 369 69...	on request

Note

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



## Metallized polyester film capacitors

MKT 369

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 250 \text{ V}$ 

loose and taped

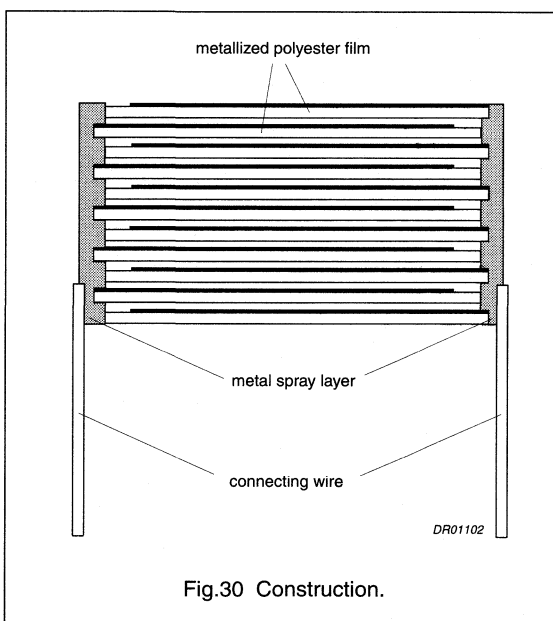
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 369 ..... AND PACKAGING				
			LOOSE IN BOX			REEL	
			$l_t =$ 4.0 +1.0/-0.5 mm		$l_t =$ 22.0 $\pm$ 4.0 mm		SPQ
			C-tol = $\pm 10\%$	SPQ	SPQ	SPQ	
last 5 digits of catalogue number							
<b>Pitch = 10.16 <math>\pm</math>0.30 mm; <math>d_t = 0.60 \pm 0.06</math> mm</b>							
0.01	4.5 $\times$ 10.0 $\times$ 12.5	0.4	65103	2000	1000	1300	
0.012	5.0 $\times$ 10.5 $\times$ 12.5	0.5	65123	2000	1000	1200	
0.015	5.5 $\times$ 11.0 $\times$ 12.5	0.5	65153	2000	1000	1100	
0.018	6.0 $\times$ 11.5 $\times$ 12.5	0.6	65183	2000	1000	1000	
0.022	6.5 $\times$ 12.0 $\times$ 12.5	0.7	65223	2000	1000	900	

## Metallized polyester film capacitors

MKT 365/366/367/368/369

**CONSTRUCTION****Description**

- Low-inductive wound cell of metallized polyethylene terephthalate film
- Protected by a hard, water repellent, solvent resistant epoxy lacquer
- Radial leads, solder coated:
  - Copper clad steel wire ( $l_{max} = 7.3$  mm)
  - Copper ( $l_{max} > 7.3$  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 means of automatic insertion machines. For detailed tape specifications refer to this handbook, Chapter "Packaging".

**SPECIFIED METHOD OF MOUNTING TO WITHSTAND VIBRATION AND SHOCK.**

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

- For pitches  $\leq 15$  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.

## Metallized polyester film capacitors

MKT 365/366/367/368/369

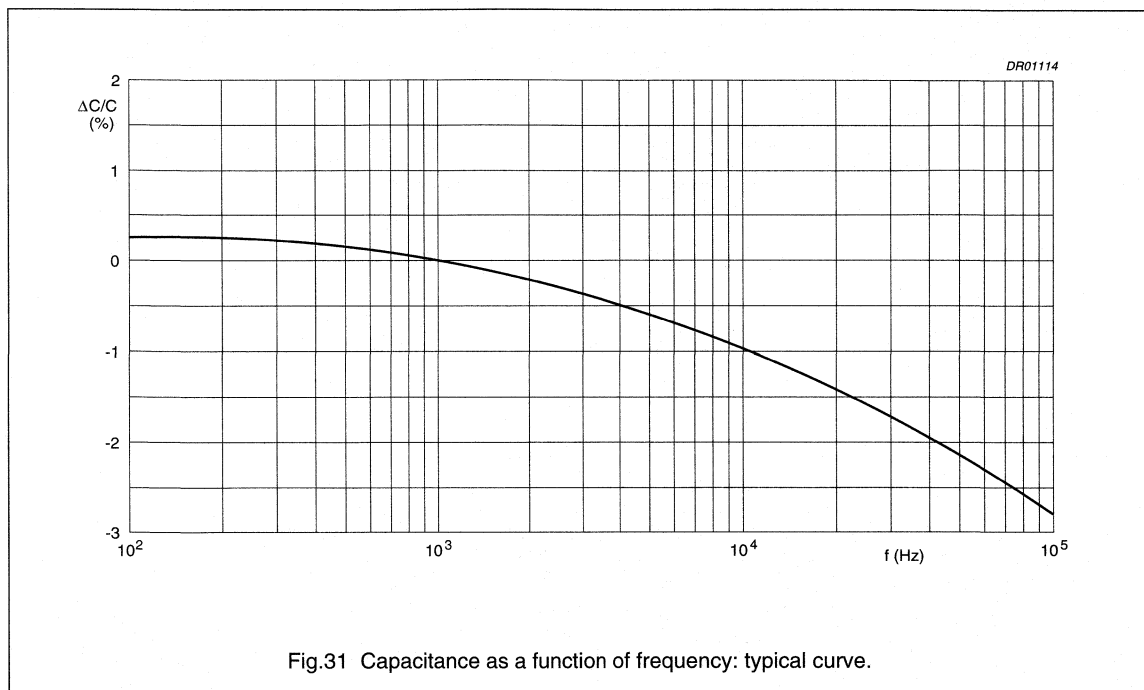
**RATINGS AND CHARACTERISTICS**

Unless otherwise specified all electrical values apply at an ambient free air temperature of  $23 \pm 1$  °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 of  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

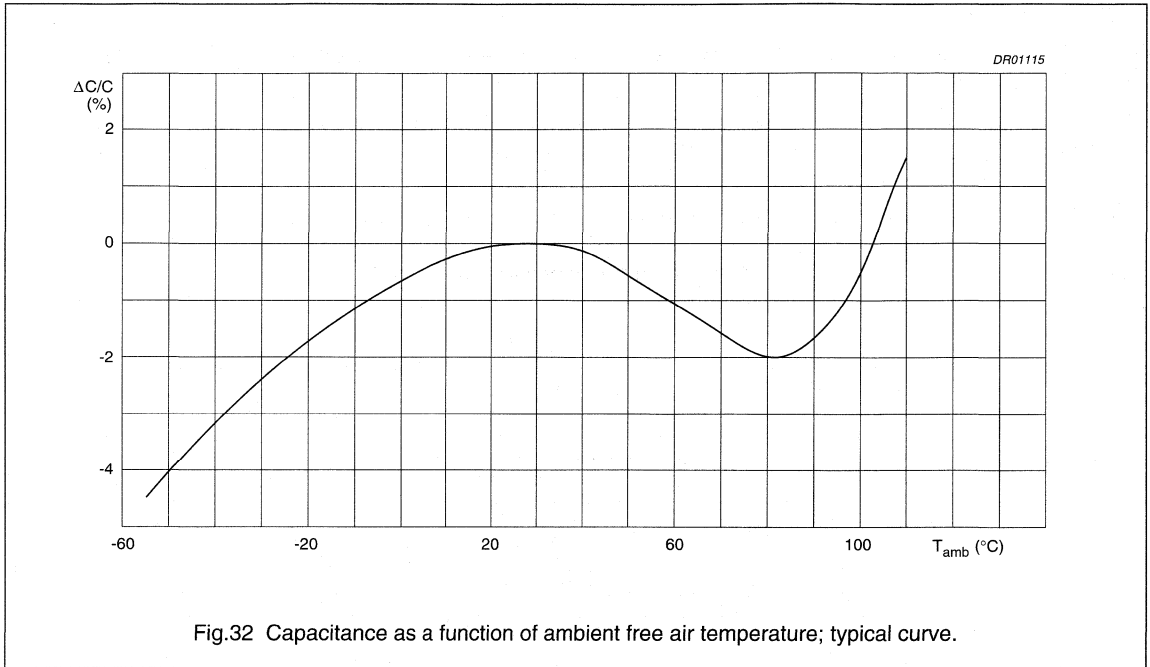
**Capacitance**

All capacitance values are specified at 1 kHz.

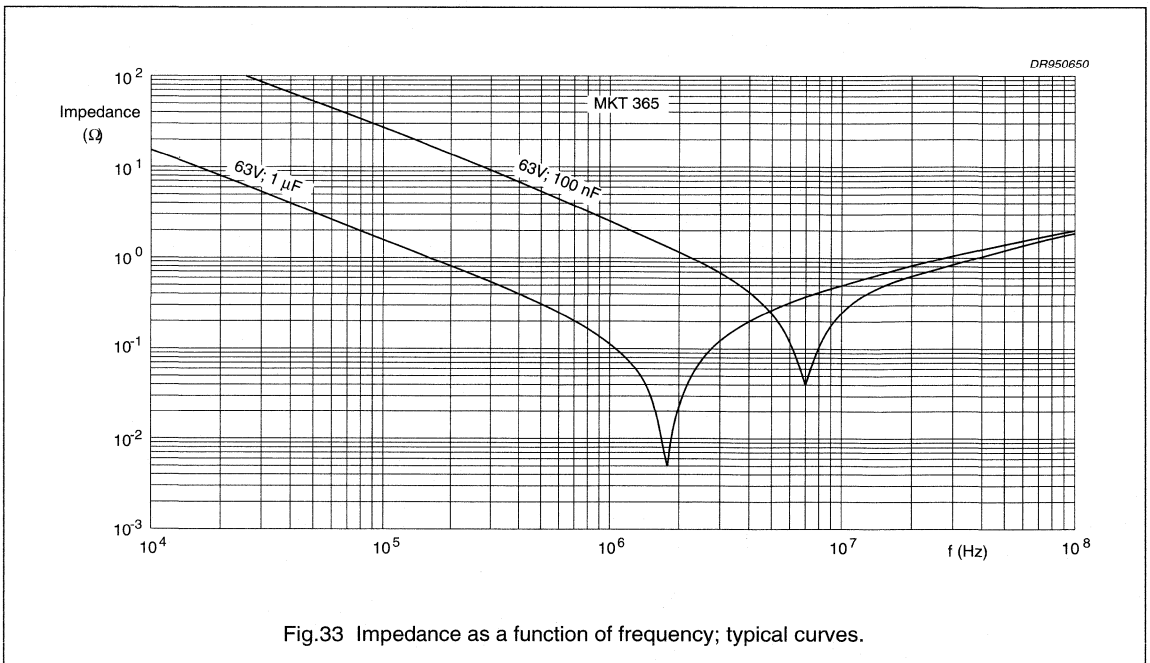


Metallized polyester film capacitors

MKT 365/366/367/368/369



Impedance



## Metallized polyester film capacitors

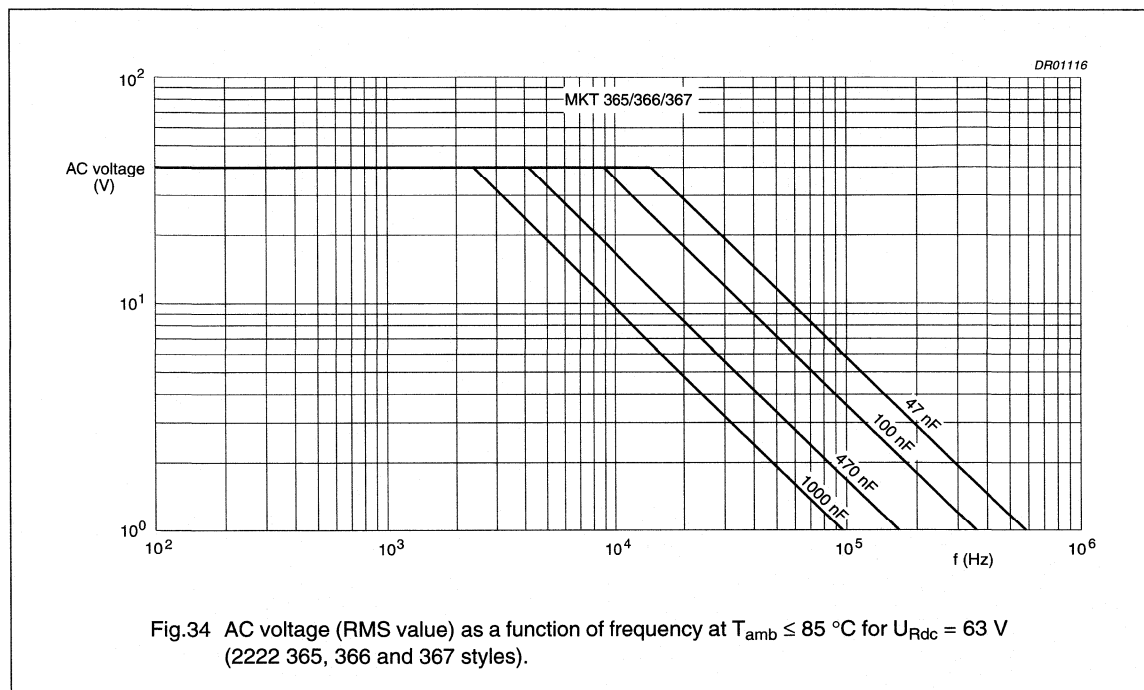
## MKT 365/366/367/368/369

**Temperature**

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

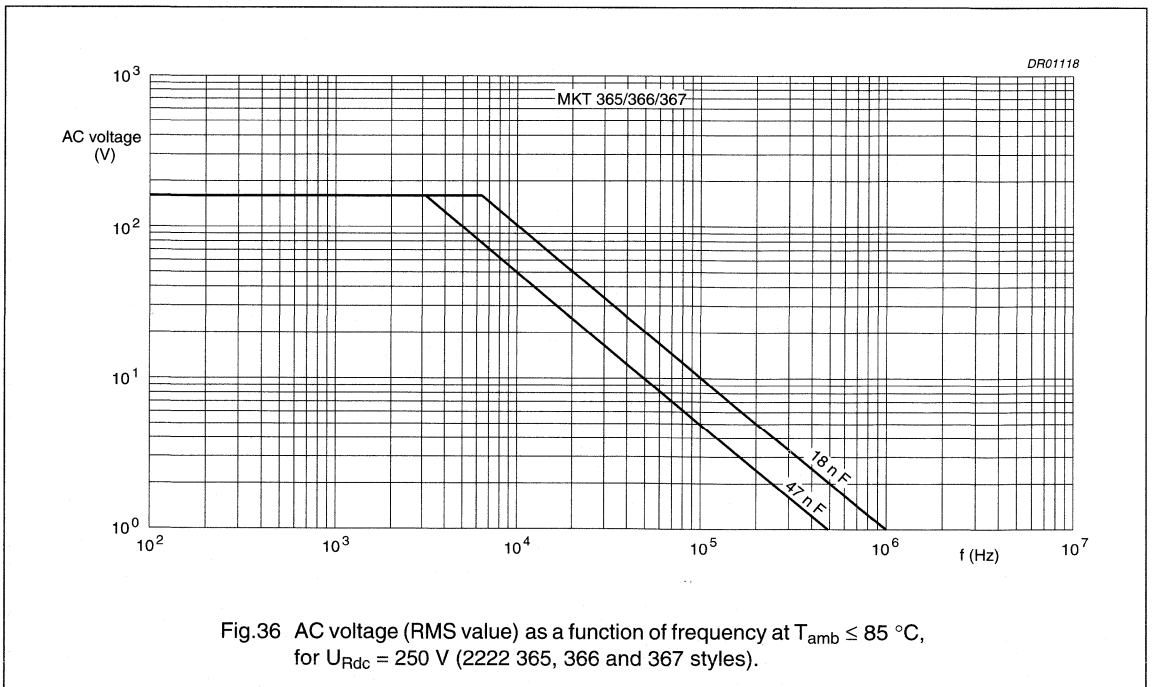
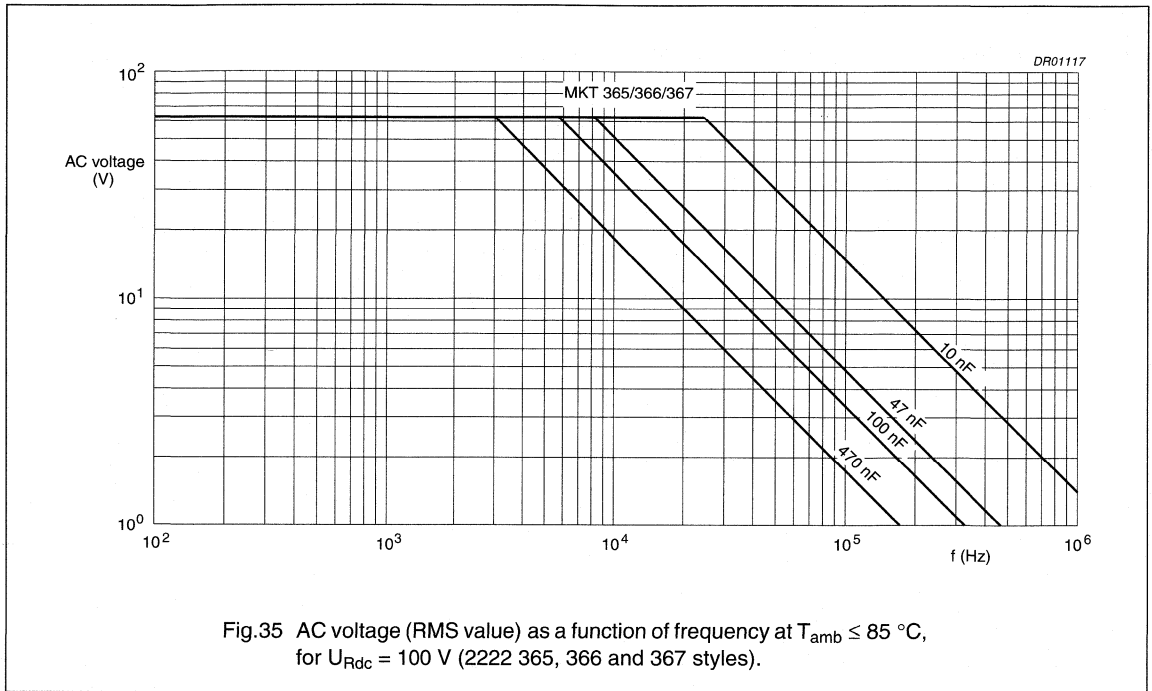
**Voltage**

- Category voltage:  $U_c = 0.8 \times U_{Rdc}$
- Test voltage between leads:  $1.6 \times U_{Rdc}$
- Test voltage between interconnected leads and case (foil method):  $2 \times U_{Rdc}$  (minimum 200 V).

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

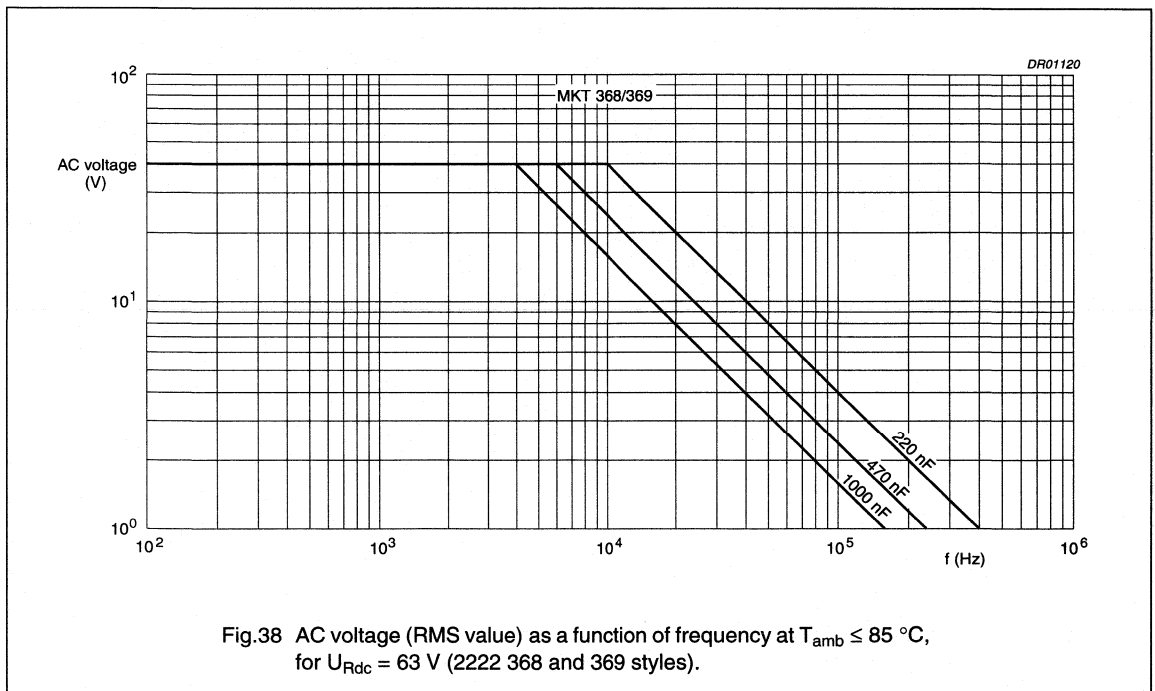
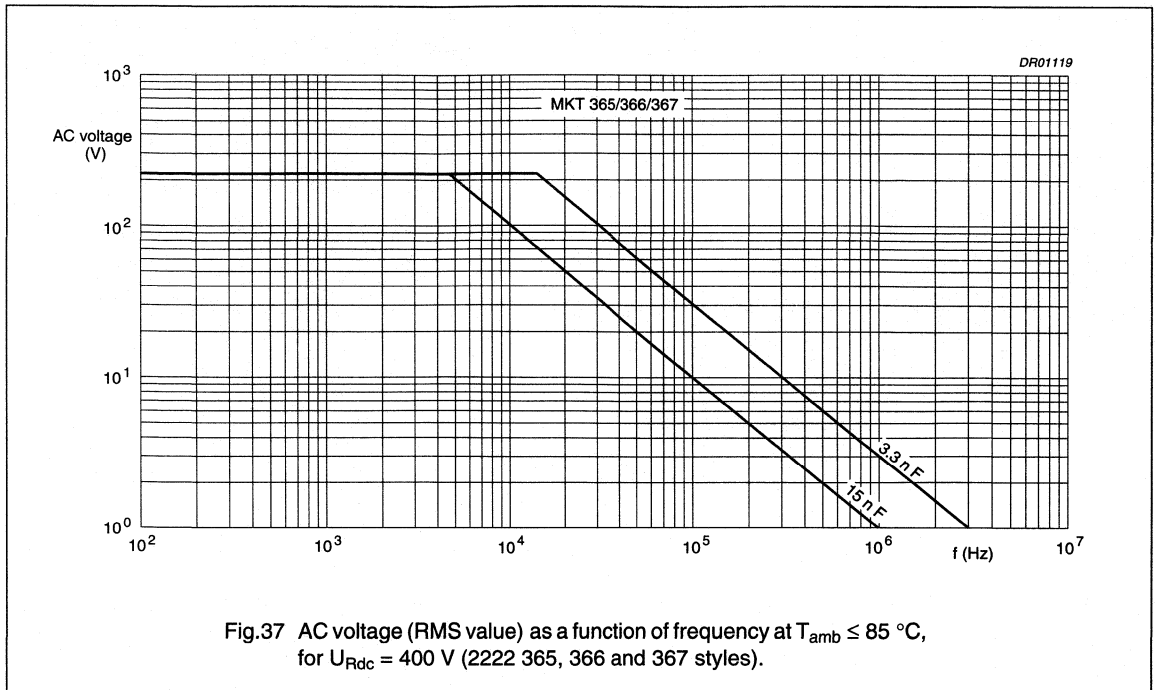
Metallized polyester film capacitors

MKT 365/366/367/368/369



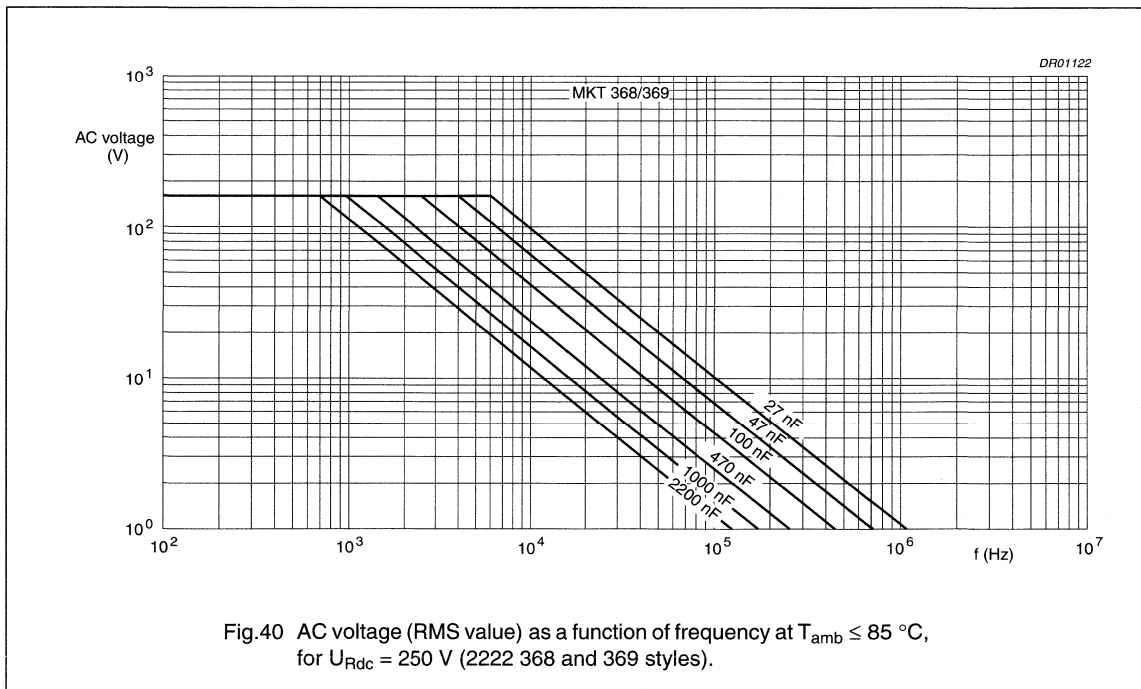
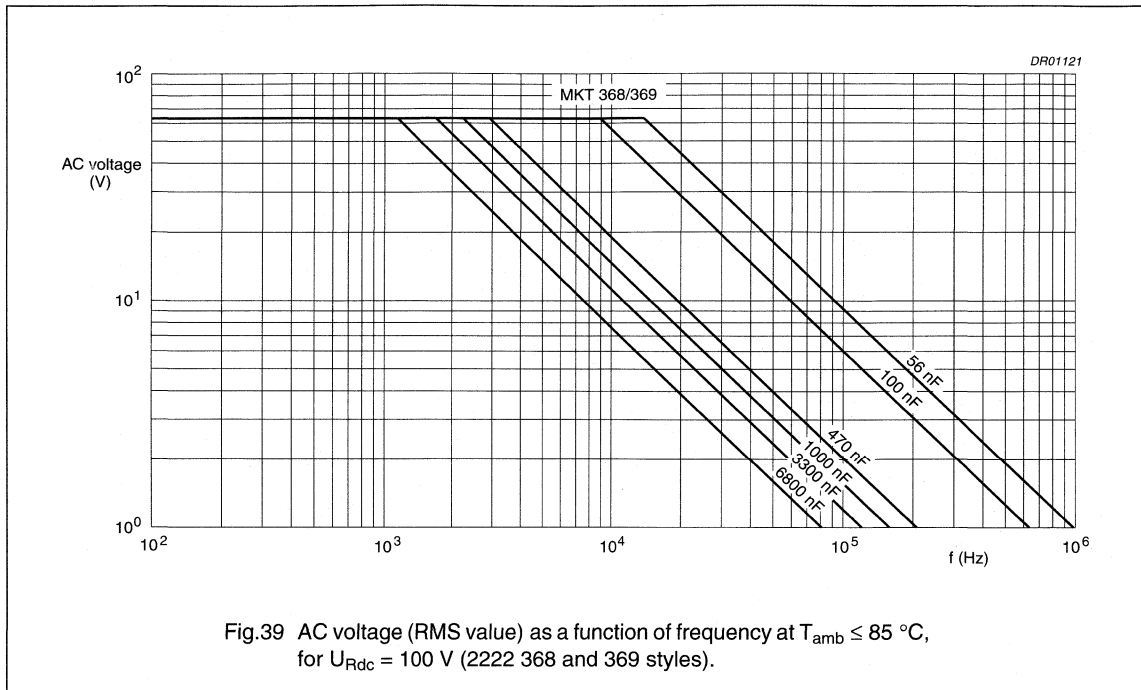
Metallized polyester film capacitors

MKT 365/366/367/368/369



Metallized polyester film capacitors

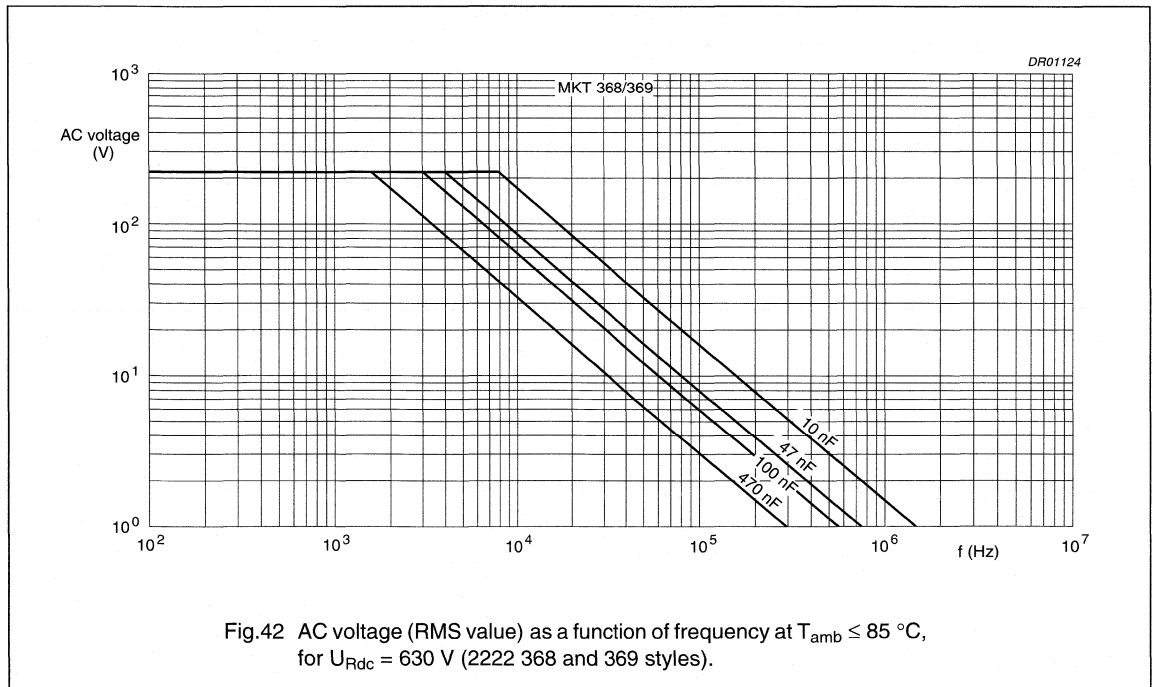
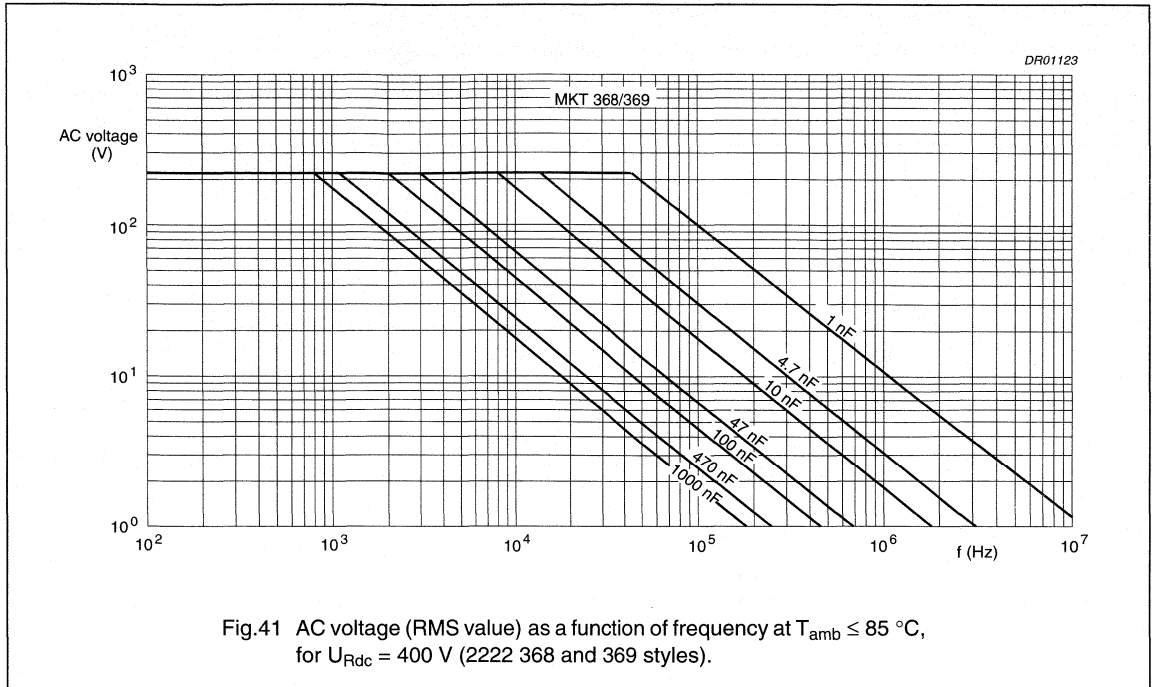
MKT 365/366/367/368/369





Metallized polyester film capacitors

MKT 365/366/367/368/369



## Metallized polyester film capacitors

## MKT 365/366/367/368/369

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

The maximum RMS voltage in Figs 34 to 42 has to be multiplied by a factor given in Fig.43.

The power dissipation has to be checked, and must not exceed the maximum allowed power as shown in Figs 46 and 47.

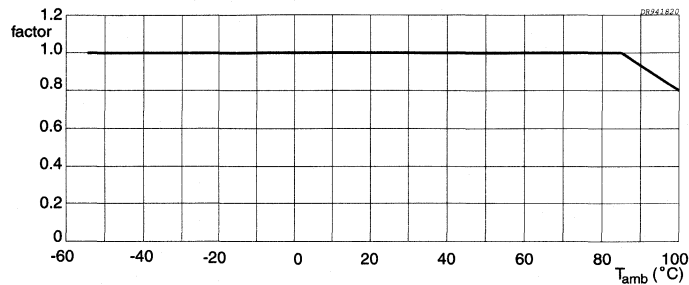


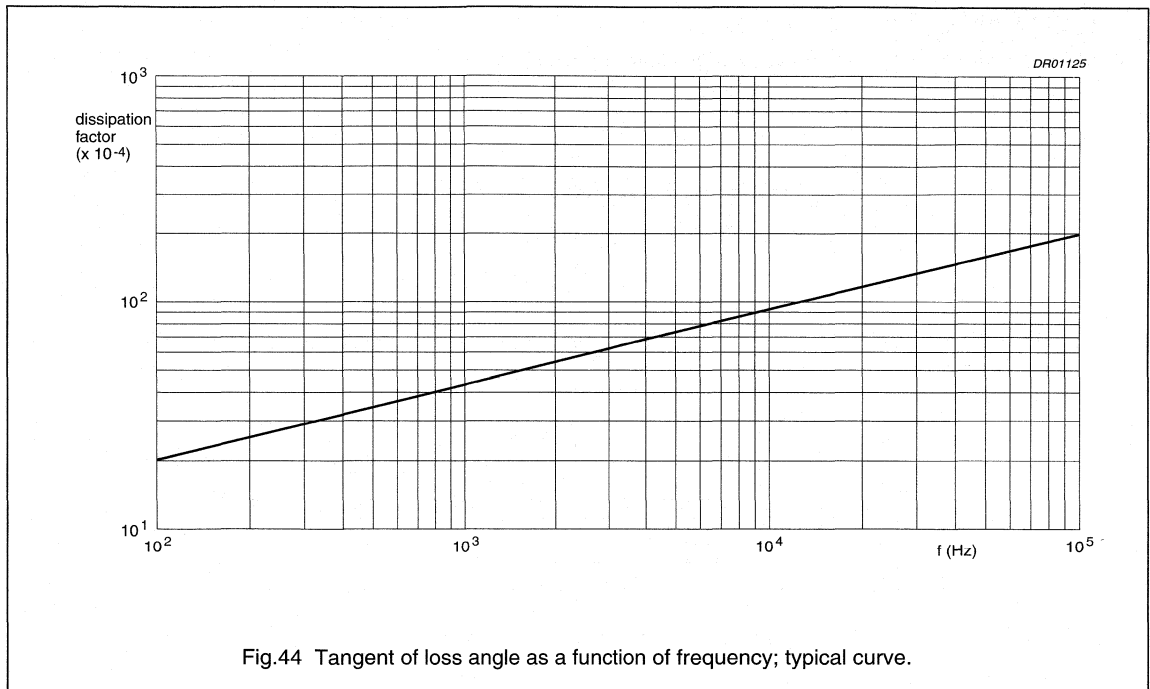
Fig.43 Multiplying factor as a function of temperature.

## Metallized polyester film capacitors

MKT 365/366/367/368/369

## Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE		
	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	–
$C > 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 150 \times 10^{-4}$	–

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

RATED VOLTAGE (V)	MAXIMUM PULSE LOAD (V/μs) AS A FUNCTION OF PRODUCT LENGTH <sup>(1)(2)</sup>					
	$I_{\max} = 7.3$ (mm)	$I_{\max} = 10$ and 10.5 (mm)	$I_{\max} = 12.5$ (mm)	$I_{\max} = 17.5$ (mm)	$I_{\max} = 26.0$ (mm)	$I_{\max} = 31.0$ (mm)
63	110	18	30	–	–	–
100	110	36	28	20	8	7
250	–	70	70	28	12	10
400	–	110	110	44	20	16
630	–	–	70	70	28	24

## Notes

1. The maximum pulse load values are valid for pulse voltages equal to the rated voltage. For lower voltages the given values may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.
2. If the pulse requirement is satisfied, a check must be made to ensure that the maximum dissipation is not exceeded.

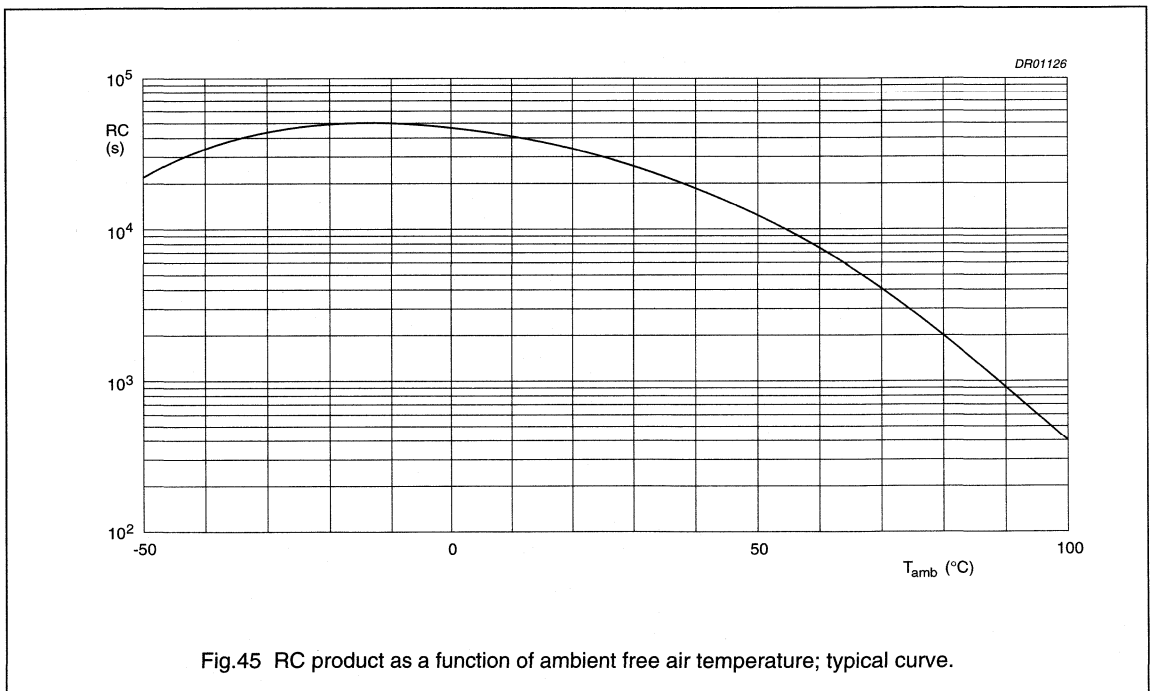
## Metallized polyester film capacitors

MKT 365/366/367/368/369

**Insulation resistance**

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $10 \pm 1$  V for the 63 V version,  $100 \pm 15$  V for the 100, 250 and 400 V versions and  $500 \pm 50$  V for the 630 V version:

- R between leads for  $C \leq 0.33 \mu\text{F}$ :
  - 63 and 100 V versions:  $>15000 \text{ M}\Omega$
  - 250, 400 and 630 V versions:  $>30000 \text{ M}\Omega$
- RC between leads for  $C > 0.33 \mu\text{F}$ :
  - 63 V and 100 V versions:  $>5000 \text{ s}$
  - 250 V, 400 V and 630 V versions:  $>10000 \text{ s}$
- R between interconnected leads and case (foil method):  $>30000 \text{ M}\Omega$ .



# Metalized polyester film capacitors

# MKT 365/366/367/368/369

## Maximum dissipation

Power dissipation curves as a function of capacitor body length and thickness (see Figs 46 and 47)

$b_{max}$ (mm)	$l_{max}$ (mm)					
	7.3	10.0 and 10.5	12.5	17.5	26.0	30.0
3.5	1	5	-	-	-	-
4	2	6	7	9	-	-
4.5	3	6	8	10	-	-
5	4	7	9	10	15	16
5.5	5	7	10	11	16	17
6	6	8	10	11	16	17
6.5	-	9	11	12	17	18
7	-	-	-	12	17	18
7.5	-	-	-	13	18	19
8	-	-	-	13	18	20
8.5	-	-	-	14	19	20
9	-	-	-	14	19	21
9.5	-	-	-	15	20	21
10	-	-	-	15	20	22
10.5	-	-	-	-	-	23
11	-	-	-	-	-	23
11.5	-	-	-	-	-	24
12	-	-	-	-	-	24
12.5	-	-	-	-	-	25
13	-	-	-	-	-	25
13.5	-	-	-	-	-	25
14	-	-	-	-	-	25
14.5	-	-	-	-	-	26
15	-	-	-	-	-	26
15.5	-	-	-	-	-	27
16	-	-	-	-	-	27

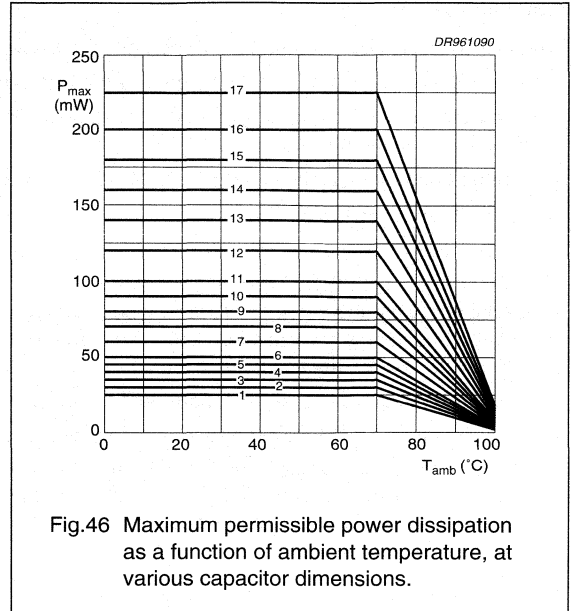


Fig.46 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

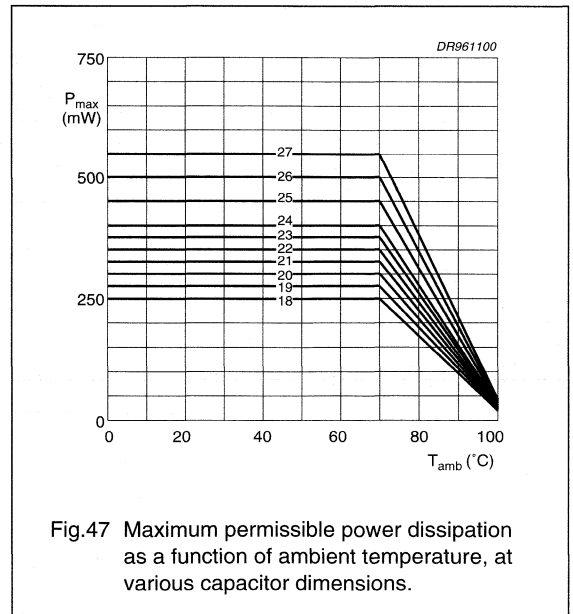


Fig.47 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

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## Metallized polyester film capacitors

## MKT 365/366/367/368/369

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### Application note

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance:

$$I_{p,max} = C \left( \frac{dU}{dt} \right)_{max}$$

Or the voltage pulse slope shall not exceed the rated voltage pulse slope. If the pulse voltage is lower than the rated voltage, the values (see Section "Rated voltage pulse slope ( $dU/dt$ )R" for more details) may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation shown in Figs 46 and 47.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.
6. Since all metallized polyethylene terephthalate film capacitors have an intrinsically active flammability risk after a capacitor breakdown (short circuit), it is recommended that for MKT styles, the power to the component is limited to 10 times the maximum allowed power dissipation ( $P_{max}$ ) during the short circuit failure mode of the capacitor.

# Metallized polyester film capacitors

# MKT 365/366/367/368/369

## MARKING

### Product marking

CAPACITORS WITH A BODY LENGTH  $\leq 7.5$  mm

The capacitors are marked on the top in black ink with the following information:

1. Rated capacitance code in nF or  $\mu$ F.
2. Tolerance on rated capacitance: M =  $\pm 20\%$ ; K =  $\pm 10\%$ ; J =  $\pm 5\%$ .
3. Rated (DC) voltage.

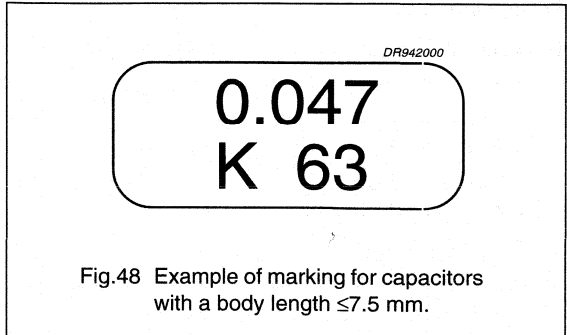


Fig.48 Example of marking for capacitors with a body length  $\leq 7.5$  mm.

CAPACITORS WITH A BODY LENGTH 10, 10.5 OR 12.5 mm

The capacitors are marked on the top in black ink with the following information:

1. Rated capacitance code in nF or  $\mu$ F.
2. Tolerance on rated capacitance: K =  $\pm 10\%$ ; J =  $\pm 5\%$ .
3. Rated (DC) voltage.

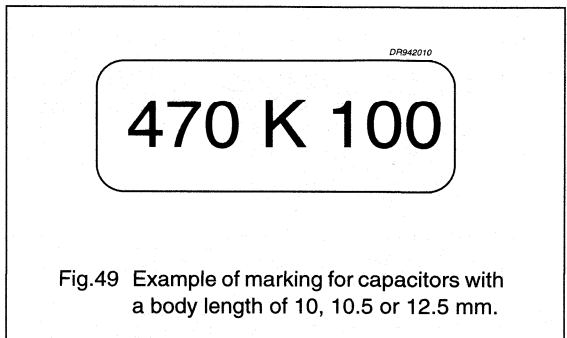


Fig.49 Example of marking for capacitors with a body length of 10, 10.5 or 12.5 mm.

CAPACITORS WITH A BODY LENGTH  $> 12.5$  mm

The capacitors are marked on the top in black ink with the following information:

1. Rated capacitance code in nF or  $\mu$ F.
2. Tolerance on rated capacitance: K =  $\pm 10\%$ ; J =  $\pm 5\%$ .
3. Rated (DC) voltage.
4. Manufacturer's logo.

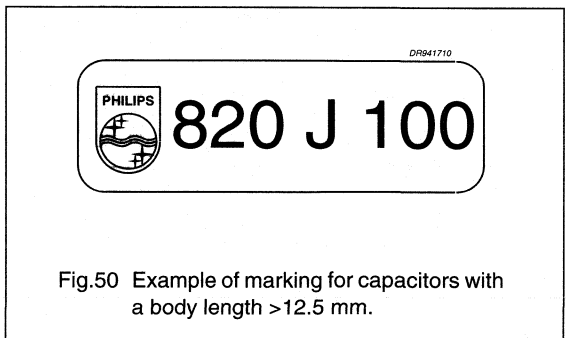






Fig.50 Example of marking for capacitors with a body length  $> 12.5$  mm.

Metallized polyester film capacitors

MKT 365/366/367/368/369

Package marking

The package containing the capacitors is marked as shown in Fig.51.

<ol style="list-style-type: none"> <li>1. PHILIPS COMPONENTS</li> <li>2. MADE IN BELGIUM</li> <li>3. METAL PETP FILM CAPACITOR</li> <li>4. MKT RADIAL EPOXY LACQUERED TYPE</li> <li>5. 0.39<math>\mu</math>F <math>\pm</math>10% 100V= 55/100/56 ULC=0.8 X ULR</li> <li>6.</li> <li>7.  WO: 12345678 ORIG R170 RPC HQ 1111 </li> <li>8. TYPE MKT 368</li> <li>9.  GTY 1000 DATE 9625 </li> <li>10. CODENO 2222 368 21394</li> </ol>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description</td> </tr> <tr> <td>5</td> <td>Capacitance value in <math>\mu</math>F, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>-</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO</td> </tr> <tr> <td>8</td> <td>Product type description</td> </tr> <tr> <td>9</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>10</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description	5	Capacitance value in $\mu$ F, tolerance, voltage and climatic category ("IEC 68-1")	6	-	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO	8	Product type description	9	Quantity and production period, year and week code	10	Product code (12NC)
LINE	MARKING EXPLANATION																						
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CCA337

Fig.51 Barcode label.



## Metallized polyester film capacitors

MKT 365/366/367/368/369

## 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  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 2\%$
Component solvent resistance		$\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 3\%$
Shock: "IEC 68-2-27"		$\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 100 °C	$ \Delta C/C  \leq 5\%$
Damp heat cyclic, first cycle: "IEC 68-2-30":		$\Delta \tan \delta \leq 50 \times 10^{-4}$ ; note 2
Cold: "IEC 68-2-1"	2 hours; -55 °C	$R_{ins} \geq 50\%$ of specified value
Damp heat, remaining cycles: "IEC 68-2-30"		
<b>Other applicable tests</b>		
Damp heat steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-2"	2000 hours: 1.25 × U <sub>Rdc</sub> ; 85 °C 1.25 × U <sub>Cdc</sub> ; 100 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-2"	2000 hours; 100 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
Resistance to soldering heat with preheating: "IEC 384-2"	body temperature: 100 °C; bath temperature: 260 °C; dwell time: 5 s	$ \Delta C/C  \leq 2\%$ (C ≤ 10 nF) $ \Delta C/C  \leq 1\%$ (C > 10 nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2

## Notes

- For detailed information, see "Type specification".
- Measuring frequency 10 kHz.

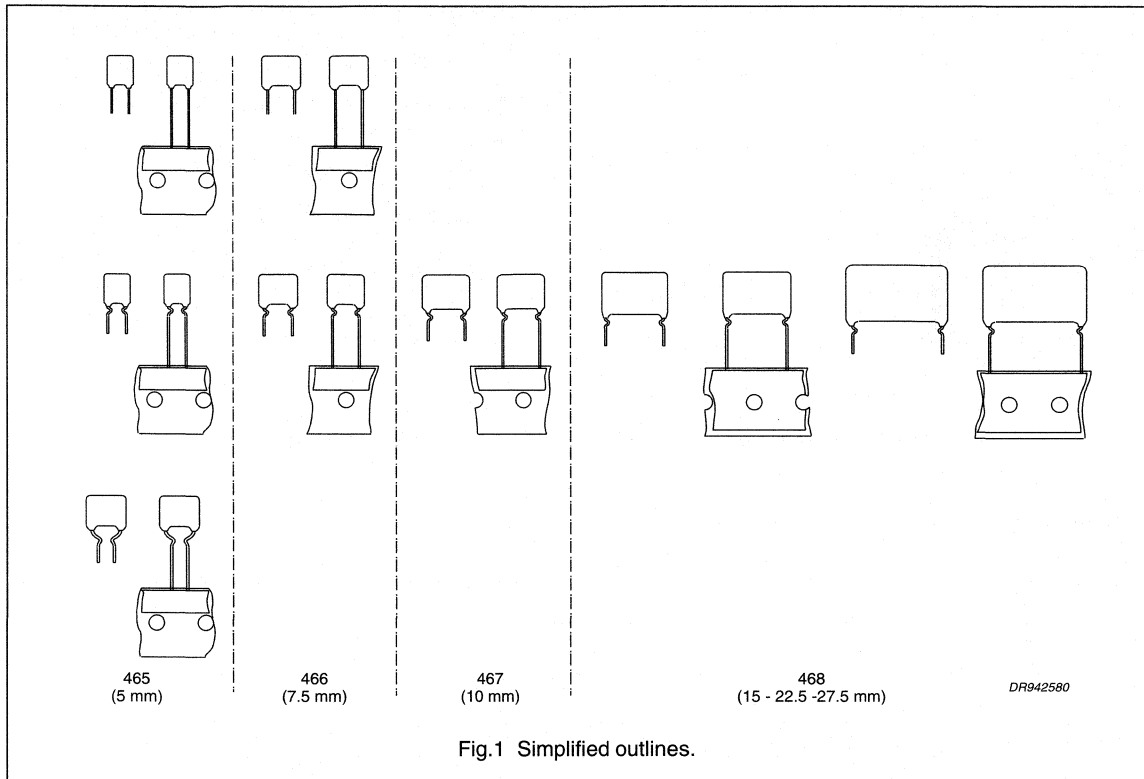


## Metallized polyester film capacitors

## MKT 465/466/467/468

MKT RADIAL EPOXY LACQUERED CAPACITORS

PITCH 5/7.5/10/15/22.5/27.5 mm



## FEATURES

- Low-inductive wound cell of metallized (PETP) film
- Cell protected by epoxy lacquer
- Radial leads of solder-coated wire
- Withstands solvents and rinsing liquids
- Small stand-off pips allow removal of solder flux.

## APPLICATIONS

- Blocking and coupling
- Bypass and energy reservoir.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series)	0.01 to 10 $\mu$ F
Capacitance tolerance	$\pm 10\%$ ; $\pm 5\%$
Rated voltage $U_{Rdc}$	100 V; 250 V; 400 V; 630 V
Climatic category	55/100/56
Rated temperature	85 °C
Maximum application temperature	100 °C
Tangent of loss angle at 10 kHz	$100 \times 10^{-4}$
Reference specifications	IEC 384-2
Performance grade	grade 1 (long life)

## Metallized polyester film capacitors

MKT 465

## MKT 465 GENERAL DATA

PITCH 5 mm

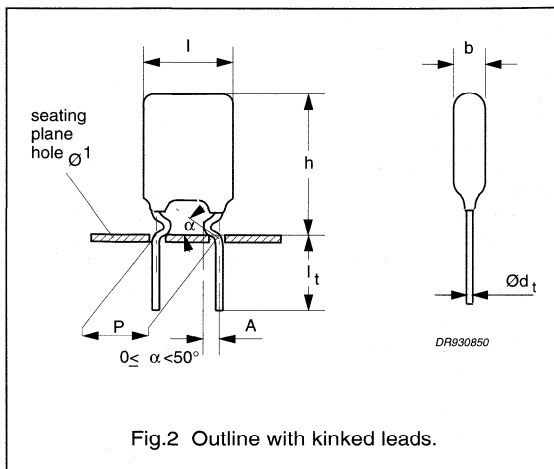


Fig.2 Outline with kinked leads.

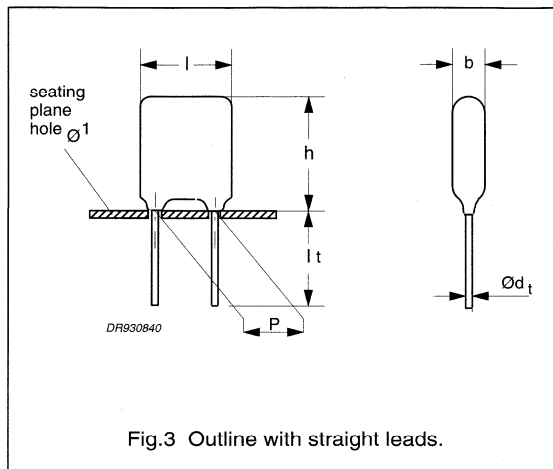


Fig.3 Outline with straight leads.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$ $0.1 \mu\text{F} < C \leq 0.27 \mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$ $\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$ $\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	120 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 15000 \text{ M}\Omega$		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	LEAD CONFIGURATION	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	kinked	$\pm 10\%$	2222 465 06...	on request
			$\pm 5\%$	2222 465 07...	on request
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$		$\pm 10\%$	2222 465 04...	on request
			$\pm 5\%$	2222 465 05...	on request
Ammopack	H = 18.5 mm; note 1	straight	$\pm 10\%$	2222 465 02...	on request
			$\pm 5\%$	2222 465 03...	on request
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$		$\pm 10\%$	2222 465 00...	on request
			$\pm 5\%$	2222 465 01...	on request

## Note

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

## Metallized polyester film capacitors

MKT 465

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS <sup>(2)</sup> $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 465 ..... AND PACKAGING			
			AMMOPACK; H = 16 mm <sup>(1)</sup>			LOOSE IN BOX
			kinked leads		SPQ	SPQ <sup>(2)</sup>
			last 5 digits of catalogue number			
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math>; A = <math>1.7 \pm 0.3 \text{ mm}</math></b>						
0.01	$3.5 \times 12.5 (7.5) \times 7.3$	0.3	06103	07103	1500	1000 (1000)
0.012			06123	07123		
0.015			06153	07153		
0.018			06183	07183		
0.022			06223	07223		
0.027			06273	07273		
0.033			06333	07333		
0.039			06393	07393		
0.047			06473	07473		
0.056			06563	07563		
0.068	$3.7 \times 12.5 (7.5) \times 7.3$	0.3	06683	07683	1500	1000 (1000)
0.082			06823	07823		
0.1			06104	07104		
0.12			06124	07124		
0.15	$3.7 \times 13.0 (8.0) \times 7.3$	0.3	06154	07154	1500	1000 (1000)
0.18	$3.7 \times 13.5 (8.5) \times 7.3$	0.4	06184	07184	1500	1000 (1000)
0.22	$4.2 \times 13.5 (8.5) \times 7.3$	0.4	06224	07224	1250	1000 (1000)
0.27	$4.5 \times 14.0 (9.0) \times 7.3$	0.4	06274	07274	1250	1000 (1000)

## Notes

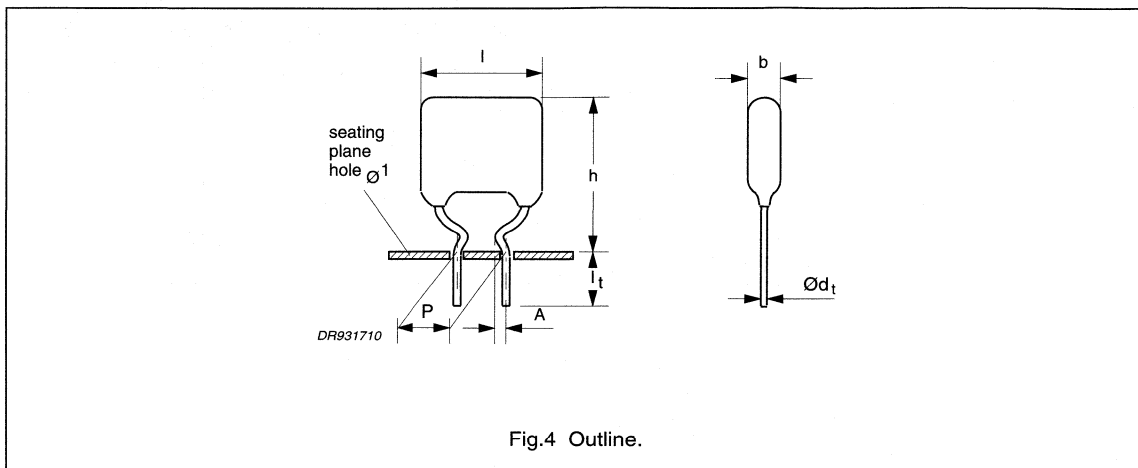
- H = in-tape height; 16.0 mm for kinked- and 18.5 mm for straight leads.
- Dimensions and SPQ in brackets for straight leads.

## Metallized polyester film capacitors

MKT 465

## MKT 465 GENERAL DATA

PITCH 5 mm (bent back leads)



## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $0.12 \mu\text{F} \leq C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	40 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	$\pm 10\%$	2222 465 10...	on request
		$\pm 5\%$	2222 465 11...	on request
Loose in box	$l_t = 3.5 \pm 0.5$ mm	$\pm 10\%$	2222 465 08...	on request
		$\pm 5\%$	2222 465 09...	on request

## Note

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

## Metallized polyester film capacitors

MKT 465

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 465 ..... AND PACKAGING			
			AMMOPACK; H = 16 mm			LOOSE IN BOX
			last 5 digits of catalogue number		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>1.7 \pm 0.3 \text{ mm}</math></b>						
0.12	$4.5 \times 13.5 \times 10.0$	0.5	10124	11124	1250	1500
0.15	$5.0 \times 13.5 \times 10.0$	0.5	10154	11154	1000	1500
0.18	$4.0 \times 13.0 \times 10.0$	0.4	10184	11184	1500	2000
0.22		0.5	10224	11224		
0.27	$4.5 \times 13.5 \times 10.0$	0.5	10274	11274	1250	1500
0.33		0.5	10334	11334		
0.39	$4.5 \times 14.0 \times 10.0$	0.7	10394	11394	1250	1500
0.47	$5.5 \times 14.5 \times 10.0$	0.8	10474	11474	1000	1500

## Metallized polyester film capacitors

MKT 465

## MKT 465 GENERAL DATA

PITCH 5 mm (bent back leads)

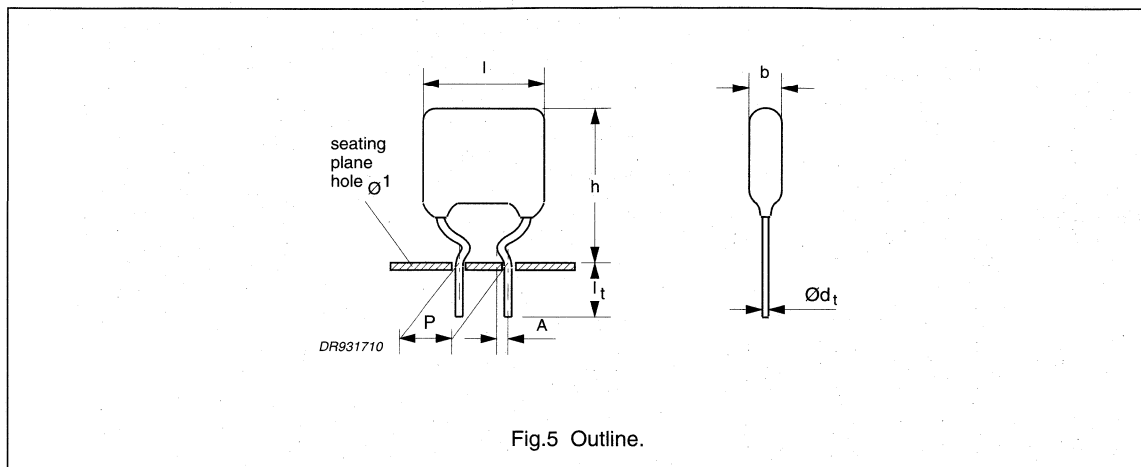


Fig.5 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$ $0.1 \mu\text{F} < C \leq 0.15 \mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$ $\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$ $\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	120 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	$H = 16.0 \text{ mm}$ ; note 1	$\pm 10\%$	2222 465 22...	on request
		$\pm 5\%$	2222 465 23...	on request
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 465 20...	on request
		$\pm 5\%$	2222 465 21...	on request

## Note

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



## Metallized polyester film capacitors

MKT 465

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

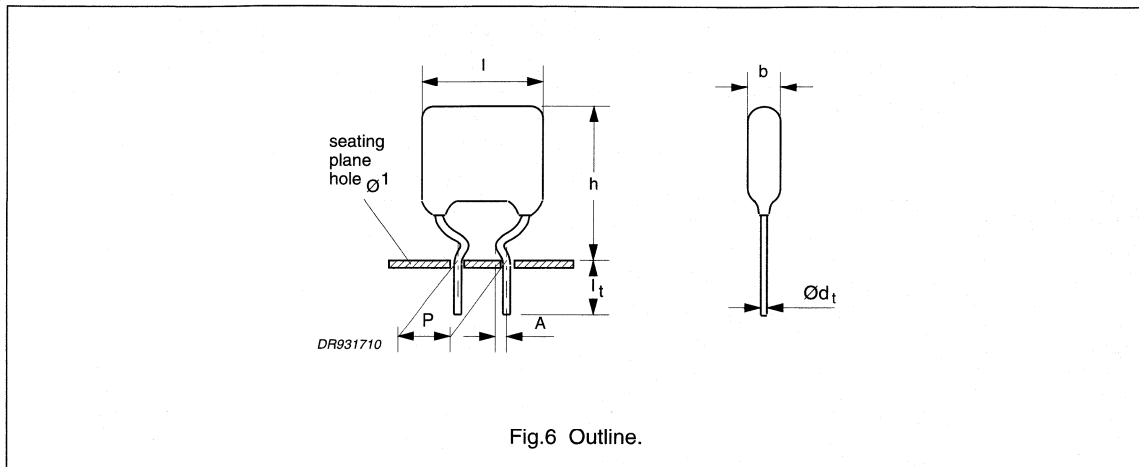
C ( $\mu\text{F}$ )	DIMENSIONS $d_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 465 ..... AND PACKAGING			
			AMMOPACK; H = 16 mm		LOOSE IN BOX	
			last 5 digits of catalogue number		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>1.7 \pm 0.3 \text{ mm}</math></b>						
0.01	$5.5 \times 13.5 \times 10.0$	0.7	22103	23103	1000	1500
0.012	$4.0 \times 12.5 \times 10.0$	0.4	22123	23123	1500	2000
0.015	$4.5 \times 13.0 \times 10.0$	0.5	22153	23153	1250	1500
0.018	$4.5 \times 13.5 \times 10.0$	0.6	22183	23183	1250	1500
0.022	$5.0 \times 13.5 \times 10.0$	0.7	22223	23223	1000	1500
0.027	$5.5 \times 14.0 \times 10.0$	0.7	22273	23273	1000	1250
0.033	$4.0 \times 13.0 \times 10.0$	0.4	22333	23333	1500	2000
0.039	$4.5 \times 13.0 \times 10.0$	0.5	22393	23393	1250	1500
0.047	$4.5 \times 13.5 \times 10.0$	0.6	22473	23473	1250	1500
0.056	$5.0 \times 13.5 \times 10.0$	0.7	22563	23563	1000	1500
0.068	$5.5 \times 14.0 \times 10.0$	0.7	22683	23683	1000	1250
0.082	$4.5 \times 13.0 \times 10.0$	0.5	22823	23823	1250	1500
0.1	$5.0 \times 13.5 \times 10.0$	0.6	22104	23104	1000	1500
0.12	$5.5 \times 14.0 \times 10.0$	0.6	22124	23124	1000	1250
0.15	$5.5 \times 15.5 \times 10.0$	0.7	22154	23154	1000	1250

Metallized polyester film capacitors

MKT 465

MKT 465 GENERAL DATA

PITCH 5 mm (bent back leads)



Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.056 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	170 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		

Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	$\pm 10\%$	2222 465 34...	on request
		$\pm 5\%$	2222 465 35...	on request
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 465 32...	on request
		$\pm 5\%$	2222 465 33...	on request

Note

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

## Metallized polyester film capacitors

MKT 465

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 465 ..... AND PACKAGING			
			AMMOPACK; H = = 16 mm			LOOSE IN BOX
			last 5 digits of catalogue number		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>5.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>						
0.01	$5.5 \times 13.5 \times 10.0$	0.7	34103	35103	1000	1500
0.012	$4.0 \times 12.5 \times 10.0$	0.4	34123	35123	1500	2000
0.015	$4.0 \times 13.0 \times 10.0$	0.5	34153	35153	1500	2000
0.018	$4.5 \times 13.0 \times 10.0$	0.6	34183	35183	1250	1500
0.022	$5.0 \times 13.5 \times 10.0$	0.7	34223	35223	1000	1500
0.027	$4.0 \times 12.5 \times 10.0$	0.4	34273	35273	1500	2000
0.033	$4.5 \times 13.0 \times 10.0$	0.5	34333	35333	1250	1500
0.039	$5.0 \times 13.5 \times 10.0$	0.6	34393	35393	1000	1500
0.047			34473	35473	1000	1500
0.056	$5.5 \times 14.0 \times 10.0$	0.7	34563	35563	1000	1250

# Metallized polyester film capacitors

# MKT 466

## MKT 466 GENERAL DATA

PITCH 7.5 mm

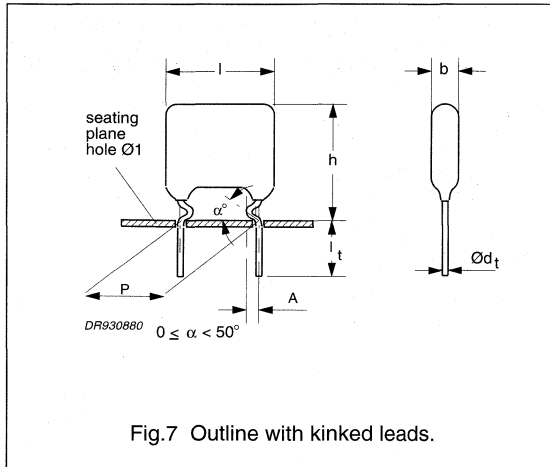


Fig.7 Outline with kinked leads.

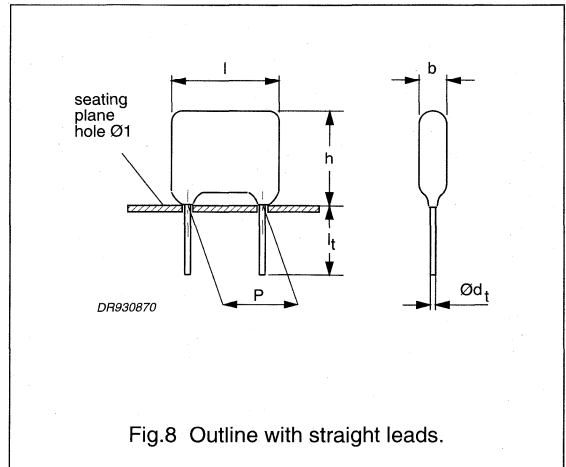


Fig.8 Outline with straight leads.

### Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $0.12 \mu\text{F} \leq C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	40 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 15000 \text{ M}\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	$> 5000 \text{ s}$		

### Available 100 V DC versions

PACKAGING	DIMENSIONS	LEAD CONFIGURATION	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	kinked	$\pm 10\%$	2222 466 06...	on request
			$\pm 5\%$	2222 466 07...	on request
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$		$\pm 10\%$	2222 466 04...	on request
			$\pm 5\%$	2222 466 05...	on request
Ammopack	H = 18.5 mm; note 1	straight	$\pm 10\%$	2222 466 02...	on request
			$\pm 5\%$	2222 466 03...	on request
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$		$\pm 10\%$	2222 466 00...	on request
			$\pm 5\%$	2222 466 01...	on request

### Note

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

## Metallized polyester film capacitors

MKT 466

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS <sup>(2)</sup> $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 466 ..... AND PACKAGING			
			AMMOPACK; H = 16 mm <sup>(1)</sup>			LOOSE IN BOX
			kinked leads		SPQ	SPQ <sup>(2)</sup>
			last 5 digits of catalogue number			
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>7.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>2.0 \pm 0.5 \text{ mm}</math></b>						
0.12	$4.5 \times 13.0 (9.0) \times 10.0$	0.5	06124	07124	1250	1500 (1000)
0.15	$5.0 \times 13.0 (9.0) \times 10.0$	0.5	06154	07154	1000	1500 (1000)
0.18	$4.0 \times 13.0 (9.0) \times 10.0$	0.4	06184	07184	1500	2000 (1000)
0.22	$4.0 \times 13.5 (9.5) \times 10.0$	0.5	06224	07224	1500	2000 (1000)
0.27	$4.5 \times 13.5 (9.5) \times 10.0$	0.5	06274	07274	1250	1500 (1000)
0.33	$4.5 \times 13.5 (9.5) \times 10.0$	0.5	06334	07334	1250	1500 (1000)
0.39	$5.0 \times 14.0 (10.0) \times 10.0$	0.7	06394	07394	1000	1500 (1500)
0.47	$5.5 \times 14.5 (10.5) \times 10.0$	0.8	06474	07474	1000	1250 (1500)

## Notes

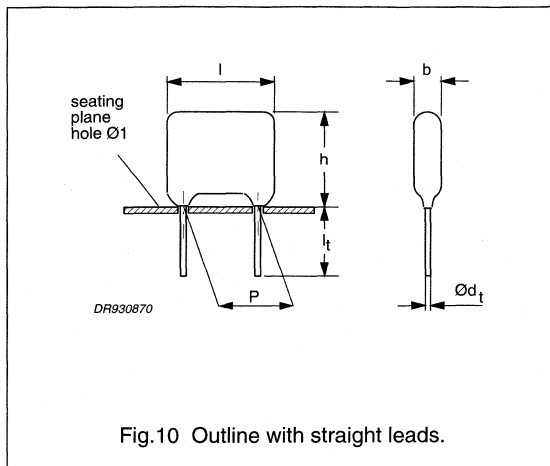
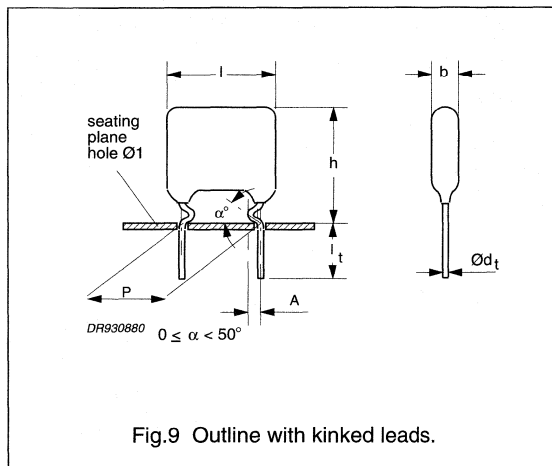
- H = in-tape height; 16.0 mm for kinked and 18.5 mm for straight leads.
- Dimensions and SPQ in brackets for straight leads.

# Metallized polyester film capacitors

MKT 466

## MKT 466 GENERAL DATA

PITCH 7.5 mm



### Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF	≤75 × 10 <sup>-4</sup>	≤120 × 10 <sup>-4</sup>	≤200 × 10 <sup>-4</sup>
0.1 μF < C ≤ 0.15 μF	≤75 × 10 <sup>-4</sup>	≤120 × 10 <sup>-4</sup>	≤225 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	120 V/μs		
R between leads, for C ≤ 0.33 μF	>30000 MΩ		

### Available 250 V DC versions

PACKAGING	DIMENSIONS	LEAD CONFIGURATION	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	kinked	±10%	2222 466 18...	on request
			±5%	2222 466 19...	on request
Loose in box	l <sub>t</sub> = 3.5 ±0.5 mm		±10%	2222 466 16...	on request
			±5%	2222 466 17...	on request
Ammopack	H = 18.5 mm; note 1	straight	±10%	2222 466 14...	on request
			±5%	2222 466 15...	on request
Loose in box	l <sub>t</sub> = 3.5 ±0.5 mm		±10%	2222 466 12...	on request
			±5%	2222 466 13...	on request

**Note**

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

## Metallized polyester film capacitors

MKT 466

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS <sup>(2)</sup> $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 466 ..... AND PACKAGING			
			AMMOPACK; H = 16 mm <sup>(1)</sup>			LOOSE IN BOX
			kinked leads		SPQ	SPQ <sup>(2)</sup>
			last 5 digits of catalogue number			
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>7.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>2.0 \pm 0.5 \text{ mm}</math></b>						
0.01	$5.5 \times 13.5 (9.5) \times 10.0$	0.7	18103	19103	1000	1500 (1500)
0.012	$4.0 \times 13.0 (9.0) \times 10.0$	0.4	18123	19123	1500	2000 (1000)
0.015	$4.5 \times 13.0 (9.0) \times 10.0$	0.5	18153	19153	1250	1500 (1000)
0.018	$4.5 \times 13.5 (9.5) \times 10.0$	0.6	18183	19183	1250	1500 (1000)
0.022	$5.0 \times 14.0 (10.0) \times 10.0$	0.7	18223	19223	1000	1500 (1500)
0.027	$5.5 \times 14.0 (10.0) \times 10.0$	0.7	18273	19273	1000	1250 (1500)
0.033	$4.0 \times 13.0 (9.0) \times 10.0$	0.4	18333	19333	1500	2000 (1000)
0.039	$4.5 \times 13.0 (9.0) \times 10.0$	0.5	18393	19393	1250	1500 (1000)
0.047	$4.5 \times 13.5 (9.5) \times 10.0$	0.6	18473	19473	1250	1500 (1000)
0.056	$5.0 \times 14.0 (10.0) \times 10.0$	0.7	18563	19563	1000	1500 (1500)
0.068	$5.5 \times 14.0 (10.0) \times 10.0$	0.7	18683	19683	1000	1250 (1500)
0.082	$4.5 \times 13.0 (9.0) \times 10.0$	0.5	18823	19823	1250	1500 (1000)
0.1	$5.0 \times 13.5 (9.5) \times 10.0$	0.6	18104	19104	1000	1500 (1000)
0.12	$5.5 \times 14.0 (10.0) \times 10.0$	0.6	18124	19124	1000	1250 (1500)
0.15	$5.5 \times 15.5 (11.5) \times 10.0$	0.7	18154	19154	1000	1250 (1500)

## Notes

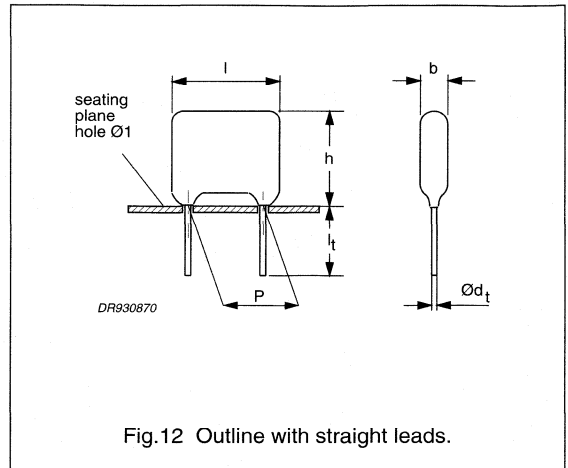
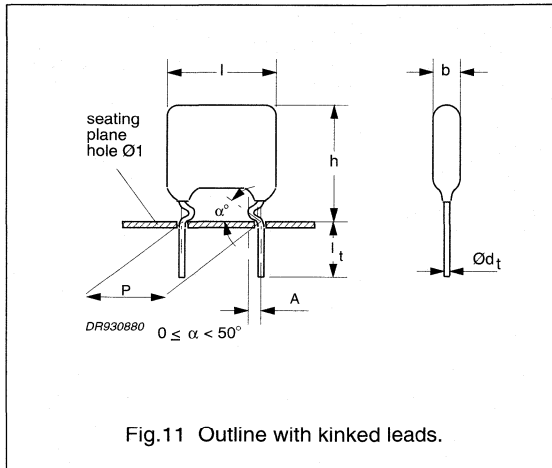
- H = in-tape height; 16.0 mm for kinked and 18.5 mm for straight leads.
- Dimensions and SPQ in brackets for straight leads.

# Metallized polyester film capacitors

MKT 466

## MKT 466 GENERAL DATA

PITCH 7.5 mm



### Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.056 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	170 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		

### Available 400 V DC versions

PACKAGING	DIMENSIONS	LEAD CONFIGURATION	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	kinked	$\pm 10\%$	2222 466 30...	on request
			$\pm 5\%$	2222 466 31...	on request
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$		$\pm 10\%$	2222 466 28...	on request
			$\pm 5\%$	2222 466 29...	on request
Ammopack	H = 18.5 mm; note 1	straight	$\pm 10\%$	2222 466 26...	on request
			$\pm 5\%$	2222 466 27...	on request
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$		$\pm 10\%$	2222 466 24...	on request
			$\pm 5\%$	2222 466 25...	on request

### Note

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



## Metallized polyester film capacitors

MKT 466

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS <sup>(2)</sup> $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 466 ..... AND PACKAGING			
			AMMOPACK; H = 16 mm <sup>(1)</sup>			LOOSE IN BOX
			kinked leads		SPQ	SPQ <sup>(2)</sup>
			last 5 digits of catalogue number			
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>7.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>2.0 \pm 0.5 \text{ mm}</math></b>						
0.01	$5.5 \times 13.5 (9.5) \times 10.0$	0.7	30103	31103	1000	1500 (1500)
0.012	$4.0 \times 13.0 (9.0) \times 10.0$	0.4	30123	31123	1500	2000 (1000)
0.015		0.5	30153	31153		
0.018	$4.5 \times 13.5 (9.5) \times 10.0$	0.6	30183	31183	1250	1500 (1000)
0.022	$5.0 \times 14.0 (10.0) \times 10.0$	0.7	30223	31223	1000	1500 (1500)
0.027	$4.0 \times 12.5 (8.5) \times 10.0$	0.4	30273	31273	1500	2000 (1000)
0.033	$4.0 \times 13.0 (9.0) \times 10.0$	0.5	30333	31333	1500	2000 (1000)
0.039	$4.5 \times 13.5 (9.5) \times 10.0$	0.5	30393	31393	1250	1500 (1000)
0.047	$5.0 \times 13.5 (9.5) \times 10.0$	0.6	30473	31473	1000	1500 (1000)
0.056	$5.5 \times 14.0 (10.0) \times 10.0$	0.7	30563	31563	1000	1250 (1500)

## Notes

- H = in-tape height; 16.0 mm for kinked- and 18.5 mm for straight leads.
- Dimensions and SPQ in brackets for straight leads.

## Metallized polyester film capacitors

MKT 467

## MKT 467 GENERAL DATA

PITCH 10 mm (kinked leads)

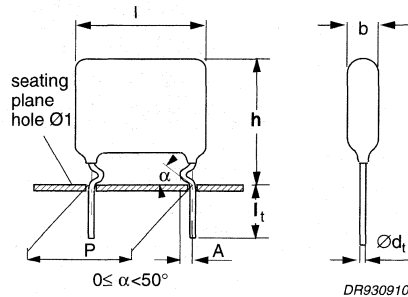


Fig.13 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $0.56 \mu\text{F} \leq C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	30 V/ $\mu\text{s}$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 467 04...	preferred
		$\pm 5\%$	2222 467 05...	preferred
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 10\%$	2222 467 06...	on request
		$\pm 5\%$	2222 467 07...	on request

## Note

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

## Metallized polyester film capacitors

MKT 467

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 467 ..... AND PACKAGING			
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>						
0.56	$4.5 \times 13.5 \times 12.5$	0.5	04564	05564	2000	1300
0.68	$5.0 \times 14.0 \times 12.5$	0.6	04684	05684	1500	1200
0.82	$5.5 \times 14.5 \times 12.5$	0.7	04824	05824	1500	1100
1.0	$5.0 \times 17.0 \times 12.5$	0.7	04105	05105	1250	1200

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 467

## MKT 467 GENERAL DATA

PITCH 10 mm (kinked leads)

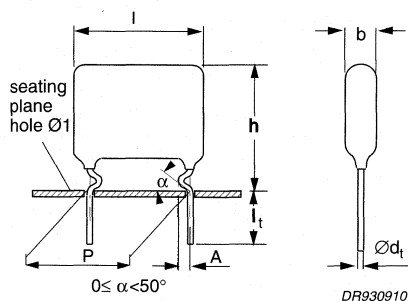


Fig.14 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $0.18 \mu\text{F} \leq C \leq 0.33 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	120 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 467 16...	preferred
		$\pm 5\%$	2222 467 17...	preferred
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 10\%$	2222 467 18...	on request
		$\pm 5\%$	2222 467 19...	on request

## Note

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

## Metallized polyester film capacitors

MKT 467

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 467 ..... AND PACKAGING			
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>						
0.18	$5.0 \times 13.5 \times 12.5$	0.5	16184	17184	1500	1200
0.22	$5.5 \times 14.0 \times 12.5$	0.6	16224	17224	1500	1100
0.27	$5.0 \times 17.0 \times 12.5$	0.7	16274	17274	1250	1200
0.33	$5.5 \times 17.5 \times 12.5$	0.7	16334	17334	1250	1100

**Note**

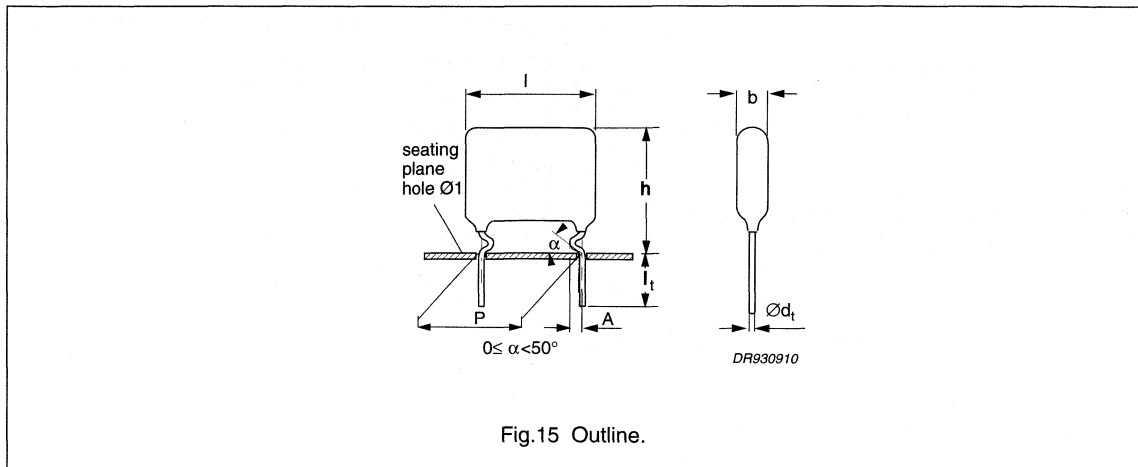
1. The shading indicates preferred types.

Metallized polyester film capacitors

MKT 467

MKT 467 GENERAL DATA

PITCH 10 mm (kinked leads)



Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF	≤ 75 × 10 <sup>-4</sup>	≤ 120 × 10 <sup>-4</sup>	≤ 200 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	170 V/μs		
R between leads, for C ≤ 0.33 μF	> 30000 MΩ		

Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ± 0.5 mm	±10%	2222 467 28...	preferred
		±5%	2222 467 29...	preferred
Taped on reel	H = 16.0 mm; note 1	±10%	2222 467 30...	on request
		±5%	2222 467 31...	on request

Note

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

## Metallized polyester film capacitors

MKT 467

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 467 ..... AND PACKAGING			
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>						
0.039	$5.0 \times 13.5 \times 12.5$	0.5	28393	29393	1500	1200
0.047	$5.5 \times 14.0 \times 12.5$	0.6	28473	29473	1500	1100
0.056	$4.0 \times 13.0 \times 12.5$	0.4	28563	29563	2000	1500
0.068	$4.5 \times 13.0 \times 12.5$	0.5	28683	29683	2000	1300
0.082	$5.0 \times 13.5 \times 12.5$	0.6	28823	29823	1500	1200
0.1	$5.5 \times 14.0 \times 12.5$	0.7	28104	29104	1500	1100

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 467

## MKT 467 GENERAL DATA

PITCH 10 mm (kinked leads)

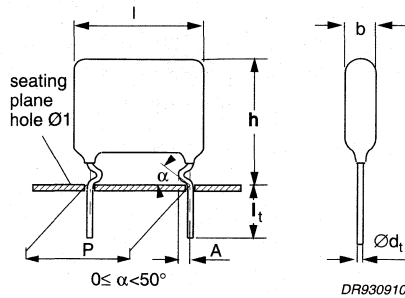


Fig.16 Outline.

## Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.047 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	90 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		

## Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 467 40...	preferred
		$\pm 5\%$	2222 467 41...	preferred
Taped on reel	H = 16.0 mm; note 1	$\pm 10\%$	2222 467 42...	on request
		$\pm 5\%$	2222 467 43...	on request

## Note

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



## Metallized polyester film capacitors

MKT 467

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 250 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 467 ..... AND PACKAGING			
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>						
0.01	$4.0 \times 12.5 \times 12.5$	0.4	40103	41103	2000	1500
0.012	$4.5 \times 13.0 \times 12.5$	0.5	40123	41123	2000	1300
0.015	$5.0 \times 13.0 \times 12.5$	0.5	40153	41153	2000	1200
0.018	$5.5 \times 13.0 \times 12.5$	0.5	40183	41183	1500	1100
0.022	$4.5 \times 13.0 \times 12.5$	0.5	40223	41223	2000	1300
0.027	$5.0 \times 13.0 \times 12.5$	0.5	40273	41273	2000	1200
0.033	$5.5 \times 13.5 \times 12.5$	0.6	40333	41333	1500	1100
0.039	$5.0 \times 16.5 \times 12.5$	0.7	40393	41393	1250	1200
0.047	$5.5 \times 16.5 \times 12.5$	0.7	40473	41473	1250	1100

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 468

## MKT 468 GENERAL DATA

PITCH 15/22.5 mm (kinked leads)

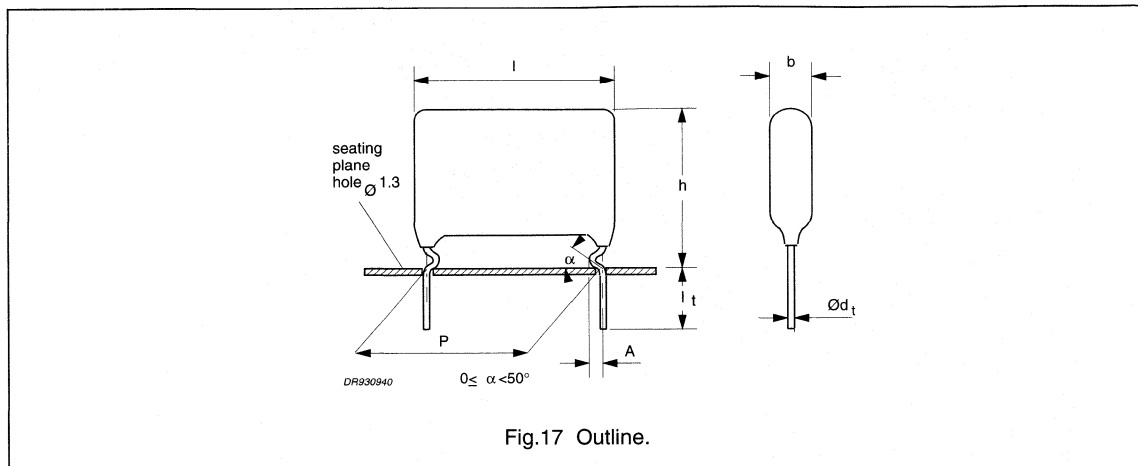


Fig.17 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 10 kHz
Tangent of loss angle: $C > 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	20 V/ $\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$	>5000 s	

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 468 04...	preferred
		$\pm 5\%$	2222 468 05...	preferred
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 10\%$	2222 468 06...	on request
		$\pm 5\%$	2222 468 07...	on request

## Note

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

## Metallized polyester film capacitors

MKT 468

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 468 ..... AND PACKAGING			
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>						
1.2	$5.0 \times 14.5 \times 17.5$	0.8	04125	05125	2000	1200
1.5	$5.5 \times 15.0 \times 17.5$	0.9	04155	05155	2000	1100
1.8	$6.0 \times 15.5 \times 17.5$	1.2	04185	05185	1500	1000
2.2	$6.5 \times 16.0 \times 17.5$	1.3	04225	05225	1500	900
2.7	$7.5 \times 17.0 \times 17.5$	1.5	04275	05275	1250	800
3.3	$8.0 \times 17.5 \times 17.5$	1.7	04335	05335	1000	700
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>						
3.9	$6.0 \times 18.5 \times 26.0$	2.1	04395	05395	1000	650
4.7	$6.5 \times 19.5 \times 26.0$	3.2	04475	05475	1000	600
5.6	$7.5 \times 20.0 \times 26.0$	3.8	04565	05565	750	500
6.8	$8.0 \times 21.0 \times 26.0$	3.9	04685	05685	750	500
8.2	$9.0 \times 21.5 \times 26.0$	4.0	04825	05825	750	450
10.0	$10.0 \times 22.5 \times 26.0$	4.5	04106	05106	500	400

**Note**

1. The shading indicates preferred types.

Metallized polyester film capacitors

MKT 468

MKT 468 GENERAL DATA

PITCH 15/22.5/27.5 mm (kinked leads)

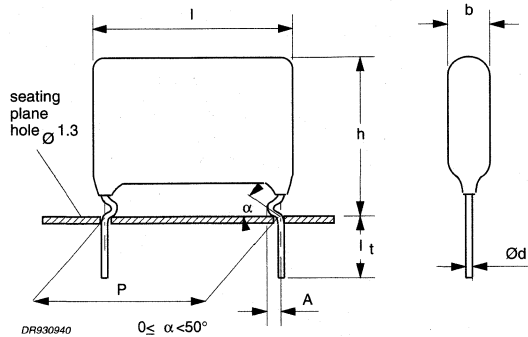


Fig.18 Outline.

Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.47 μF C > 0.47 μF	≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup>	≤120 × 10 <sup>-4</sup> ≤120 × 10 <sup>-4</sup>	≤225 × 10 <sup>-4</sup> -
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : I <sub>max</sub> = 17.5 mm I <sub>max</sub> = 26.0 mm I <sub>max</sub> = 30.0 mm		45 V/μs 20 V/μs 15 V/μs	
RC between leads, for C > 0.33 μF		>10000 s	

Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ±0.5 mm	±10%	2222 468 16...	preferred
		±5%	2222 468 17...	preferred
Taped on reel	H = 16.0 mm; note 1	±10%	2222 468 18...	on request
		±5%	2222 468 19...	on request

Note

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

## Metallized polyester film capacitors

MKT 468

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $d_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 468 ..... AND PACKAGING			
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>						
0.39	$5.5 \times 15.0 \times 17.5$	0.9	16394	17394	2000	1100
0.47	$6.0 \times 15.0 \times 17.5$	1.1	16474	17474	1500	1000
0.56	$6.5 \times 15.5 \times 17.5$	1.3	16564	17564	1500	900
0.68	$7.0 \times 16.5 \times 17.5$	1.4	16684	17684	1250	800
0.82	$8.0 \times 17.0 \times 17.5$	1.5	16824	17824	1250	700
1.0	$7.5 \times 19.5 \times 17.5$	1.7	16105	17105	1000	800
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>						
1.2	$6.5 \times 19.0 \times 26.0$	3.1	16125	17125	1000	600
1.5	$7.5 \times 19.5 \times 26.0$	3.6	16155	17155	750	500
1.8	$8.5 \times 20.5 \times 26.0$	3.9	16185	17185	750	450
2.2	$9.5 \times 21.0 \times 26.0$	4.1	16225	17225	750	400
2.7	$10.5 \times 22.0 \times 26.0$	4.3	16275	17275	500	350
3.3	$11.5 \times 23.5 \times 26.0$	4.5	16335	17335	500	350
3.9	$13.0 \times 24.5 \times 26.0$	6.4	16395	17395	300	300
4.7	$14.5 \times 25.5 \times 26.0$	7.4	16475	17475	250	250
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>						
5.6	$14.5 \times 25.5 \times 30.0$	9.1	16565	17565	300	250

**Note**

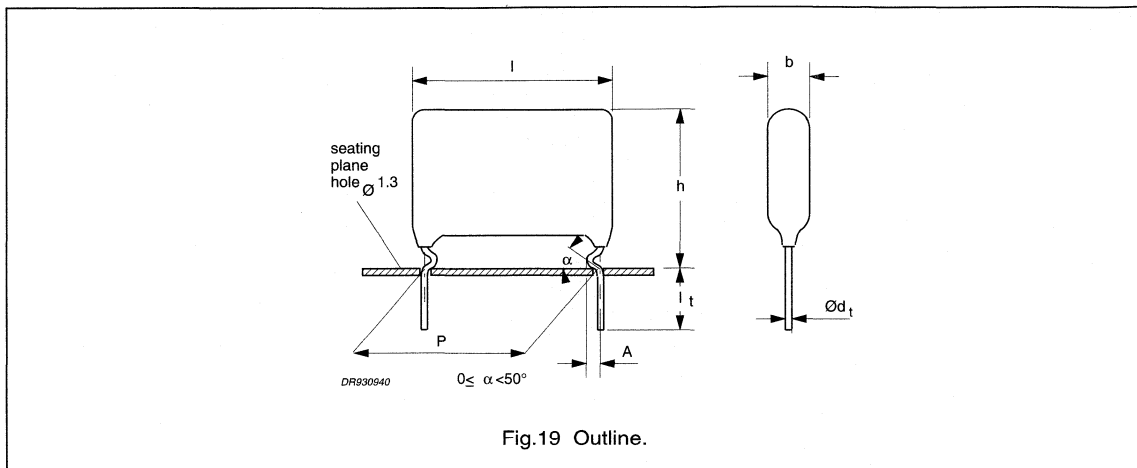
- The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 468

## MKT 468 GENERAL DATA

PITCH 15/22.5/27.5 mm (kinked leads)



## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $0.12 \leq C \leq 0.47 \mu\text{F}$ $C > 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$ $\leq 120 \times 10^{-4}$	$\leq 225 \times 10^{-4}$ -
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : $I_{max} = 17.5 \text{ mm}$ $I_{max} = 26.0 \text{ mm}$ $I_{max} = 30.0 \text{ mm}$	65 V/ $\mu\text{s}$ 30 V/ $\mu\text{s}$ 25 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>30000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>10000 s		

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 468 28...	preferred
		$\pm 5\%$	2222 468 29...	preferred
Taped on reel	H = 16.0 mm; note 1	$\pm 10\%$	2222 468 30...	on request
		$\pm 5\%$	2222 468 31...	on request

## Note

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

## Metallized polyester film capacitors

MKT 468

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 468 ..... AND PACKAGING			
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 + 1.4/-0.5 \text{ mm}</math></b>						
0.12	$4.5 \times 14.0 \times 17.5$	0.6	28124	29124	2000	1300
0.15	$5.0 \times 14.0 \times 17.5$	0.8	28154	29154	2000	1200
0.18	$5.5 \times 14.5 \times 17.5$	0.9	28184	29184	2000	1100
0.22	$6.0 \times 15.0 \times 17.5$	1.1	28224	29224	1500	1000
0.27	$7.0 \times 16.0 \times 17.5$	1.4	28274	29274	1250	800
0.33	$7.5 \times 16.5 \times 17.5$	1.5	28334	29334	1250	800
0.39	$7.0 \times 19.0 \times 17.5$	1.5	28394	29394	1000	800
0.47	$7.5 \times 20.0 \times 17.5$	1.7	28474	29474	1000	800
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 + 1.4/-0.5 \text{ mm}</math></b>						
0.56	$6.5 \times 19.0 \times 26.0$	3.1	28564	29564	1000	600
0.68	$7.5 \times 19.5 \times 26.0$	3.6	28684	29684	750	500
0.82	$8.5 \times 20.5 \times 26.0$	3.9	28824	29824	750	450
1.0	$9.5 \times 21.0 \times 26.0$	4.0	28105	29105	750	400
1.2	$10.5 \times 22.0 \times 26.0$	4.6	28125	29125	500	350
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 + 1.4/-0.5 \text{ mm}</math></b>						
1.5	$10.5 \times 22.5 \times 30.0$	6.7	28155	29155	450	350
1.8	$12.0 \times 23.5 \times 30.0$	7.6	28185	29185	400	300
2.2	$13.5 \times 24.5 \times 30.0$	9.0	28225	29225	350	300

**Note**

- The shading indicates preferred types.

# Metallized polyester film capacitors

MKT 468

**MKT 468 GENERAL DATA**

**PITCH 15/22.5/27.5 mm (kinked leads)**

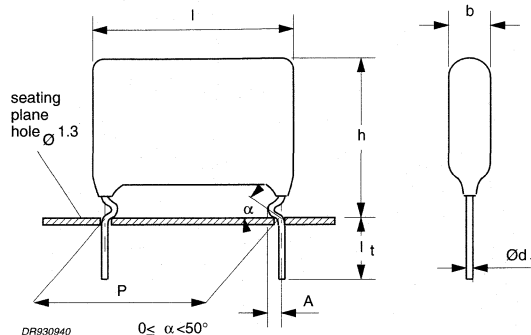


Fig.20 Outline.

**Specific reference data for the 630 V DC capacitors**

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
$C > 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	-
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :			
$I_{max} = 17.5 \text{ mm}$		90 V/ $\mu\text{s}$	
$I_{max} = 26.0 \text{ mm}$		35 V/ $\mu\text{s}$	
$I_{max} = 30.0 \text{ mm}$		30 V/ $\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$		>30000 M $\Omega$	
RC between leads, for $C > 0.33 \mu\text{F}$		>10000 s	

**Available 630 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 468 40...	preferred
		$\pm 5\%$	2222 468 41...	preferred
Taped on reel	H = 16.0 mm; note 1	$\pm 10\%$	2222 468 42...	on request
		$\pm 5\%$	2222 468 43...	on request

**Note**

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



## Metallized polyester film capacitors

MKT 468

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 250 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $d_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 468 ..... AND PACKAGING			
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$			REEL
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>						
0.056	$5.5 \times 14.0 \times 17.5$	0.9	40563	41563	2000	1100
0.068	$6.0 \times 14.5 \times 17.5$	1.1	40683	41683	1500	1000
0.082	$6.5 \times 15.0 \times 17.5$	1.3	40823	41823	1500	900
0.1	$7.5 \times 15.5 \times 17.5$	1.5	40104	41104	1250	800
0.12	$7.0 \times 18.0 \times 17.5$	1.7	40124	41124	1250	800
0.15	$7.5 \times 19.0 \times 17.5$	2.0	40154	41154	1000	800
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>						
0.18	$6.5 \times 18.0 \times 26.0$	2.9	40184	41184	1000	600
0.22	$7.5 \times 19.0 \times 26.0$	3.5	40224	41224	750	500
0.27	$8.5 \times 19.5 \times 26.0$	3.7	40274	41274	750	450
0.33	$9.5 \times 20.5 \times 26.0$	4.3	40334	41334	750	400
0.39	$10.5 \times 21.0 \times 26.0$	4.9	40394	41394	600	350
0.47	$11.5 \times 22.0 \times 26.0$	5.7	40474	41474	500	350
0.56	$13.0 \times 23.0 \times 26.0$	6.7	40564	41564	500	300
0.68	$14.5 \times 23.5 \times 26.0$	7.6	40684	41684	250	250
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>						
0.82	$14.5 \times 24.0 \times 30.0$	7.8	40824	41824	300	250

**Note**

1. The shading indicates preferred types.

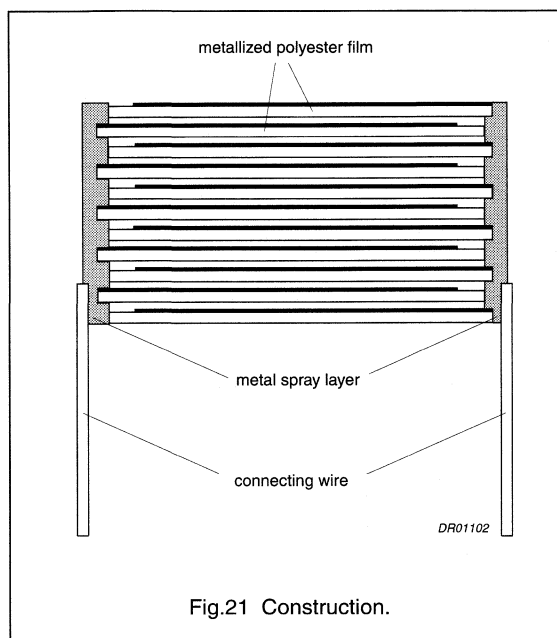
# Metallized polyester film capacitors

# MKT 465/466/467/468

## CONSTRUCTION

### Description

- Low-inductive wound cell of metallized polyethylene terephthalate film
- Protected by a hard, water repellent, solvent resistant epoxy lacquer
- Radial leads, solder coated:
  - Copper clad steel wire ( $I_{\max} = 7.3 \text{ mm}$ )
  - Copper wire ( $I_{\max} > 7.3 \text{ mm}$ ) .



## 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 means of automatic insertion machines.

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

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

In order to withstand vibration and shock tests, it must be ensured that the underside of the crimps 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  $50 \pm 2\%$ .

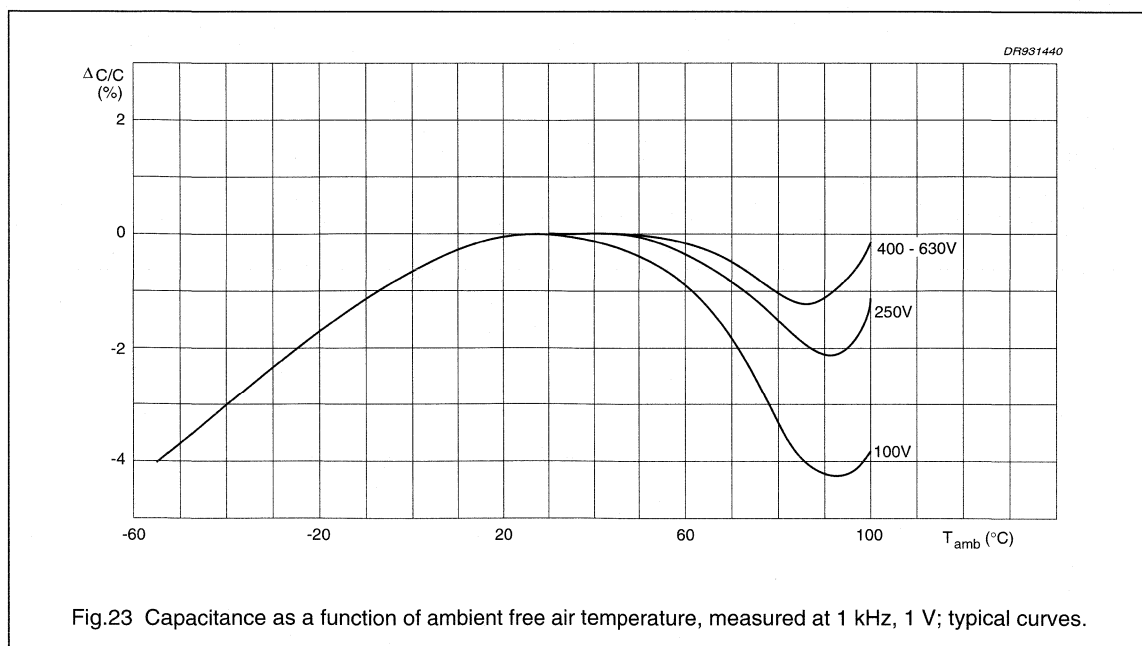
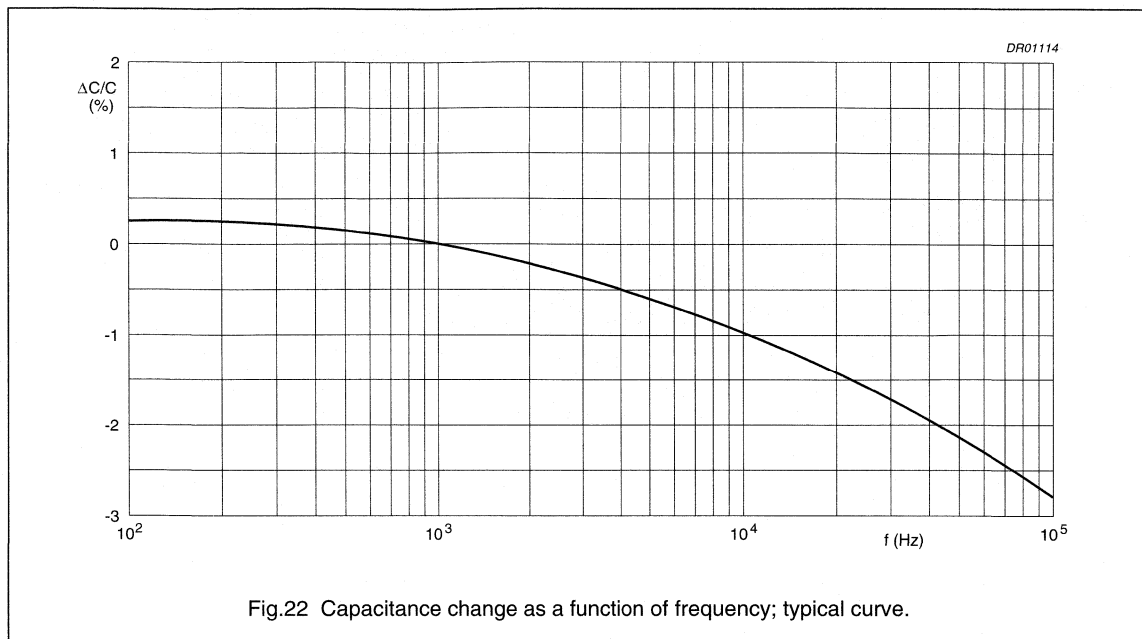
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

## Metallized polyester film capacitors

MKT 465/466/467/468

## Capacitance

All capacitance values are specified at 1 kHz.



## Metallized polyester film capacitors

MKT 465/466/467/468

## Impedance

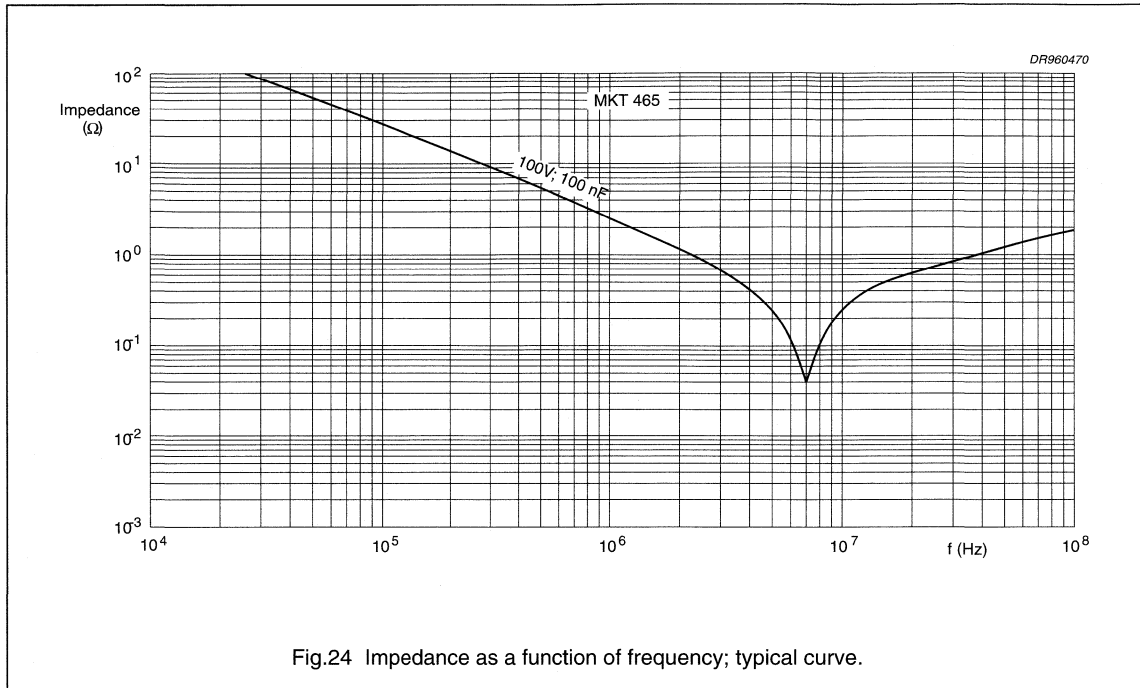


Fig.24 Impedance as a function of frequency; typical curve.

## Temperature

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

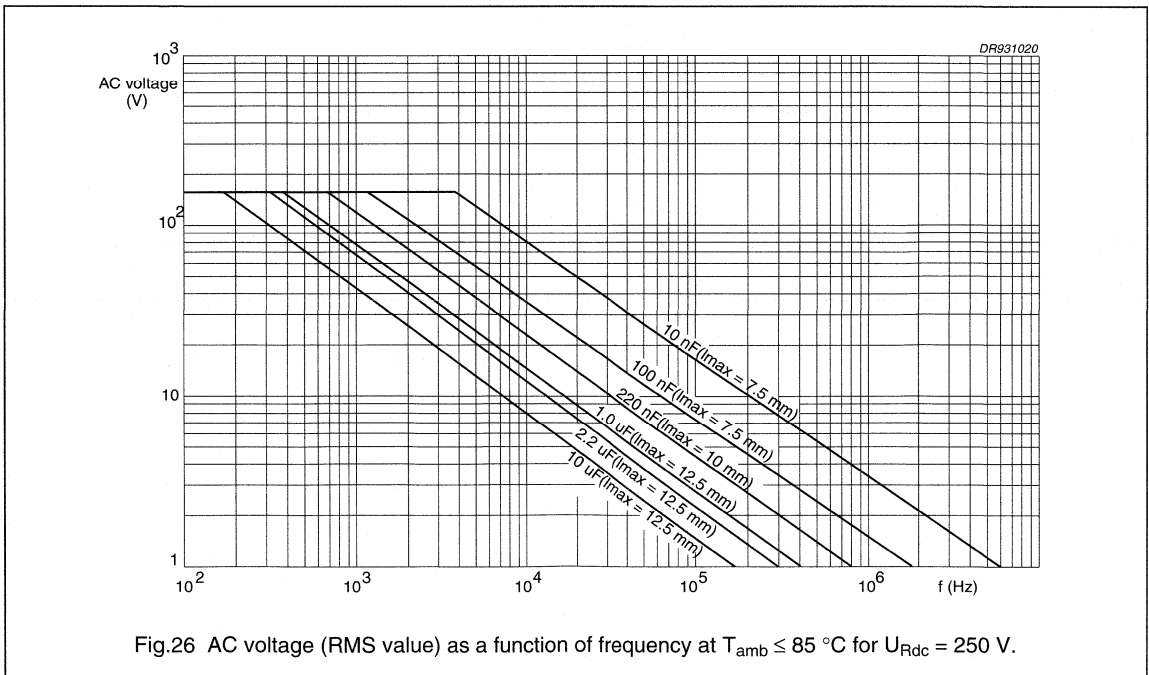
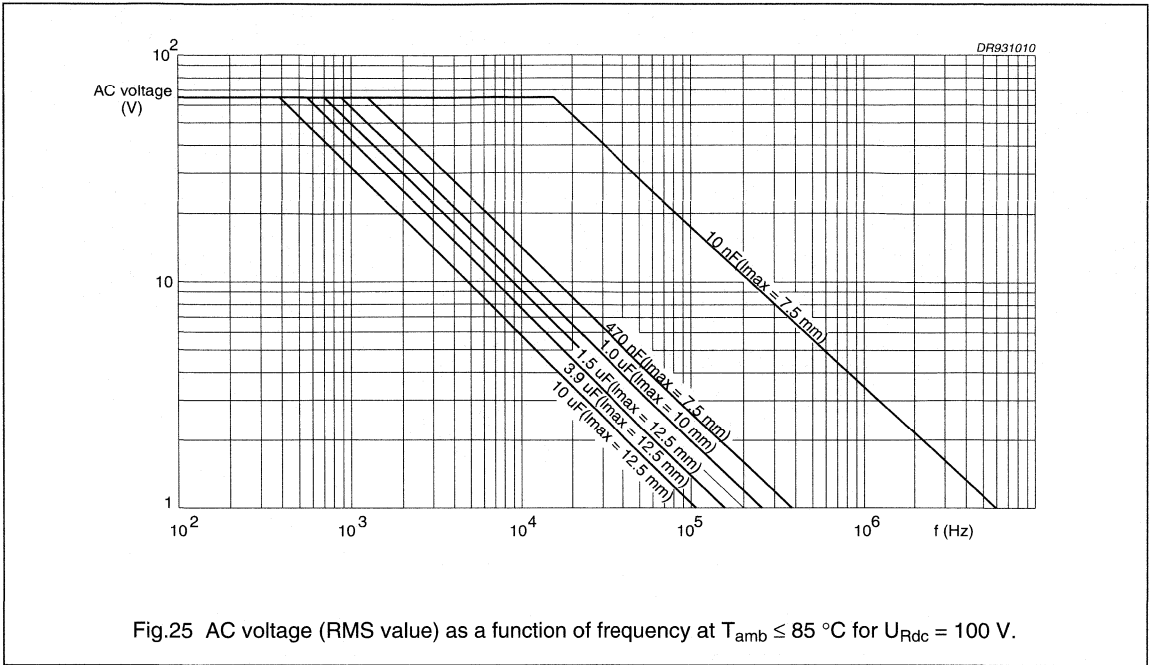
## Voltage

- Category voltage:  $U_c = 0.8 \times U_{Rdc}$
- Test voltage between leads:  $1.6 \times U_{Rdc}$
- Test voltage between interconnected leads and case (foil method):  $2 \times U_{Rdc}$  (min. 200 V).

Metallized polyester film capacitors

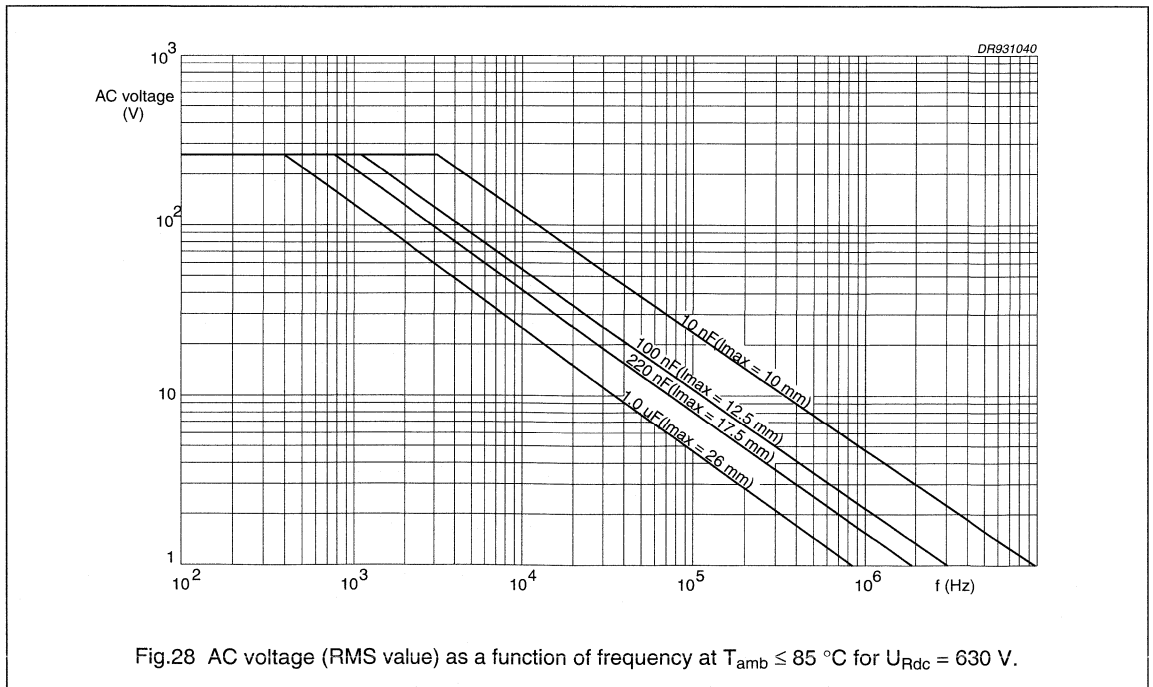
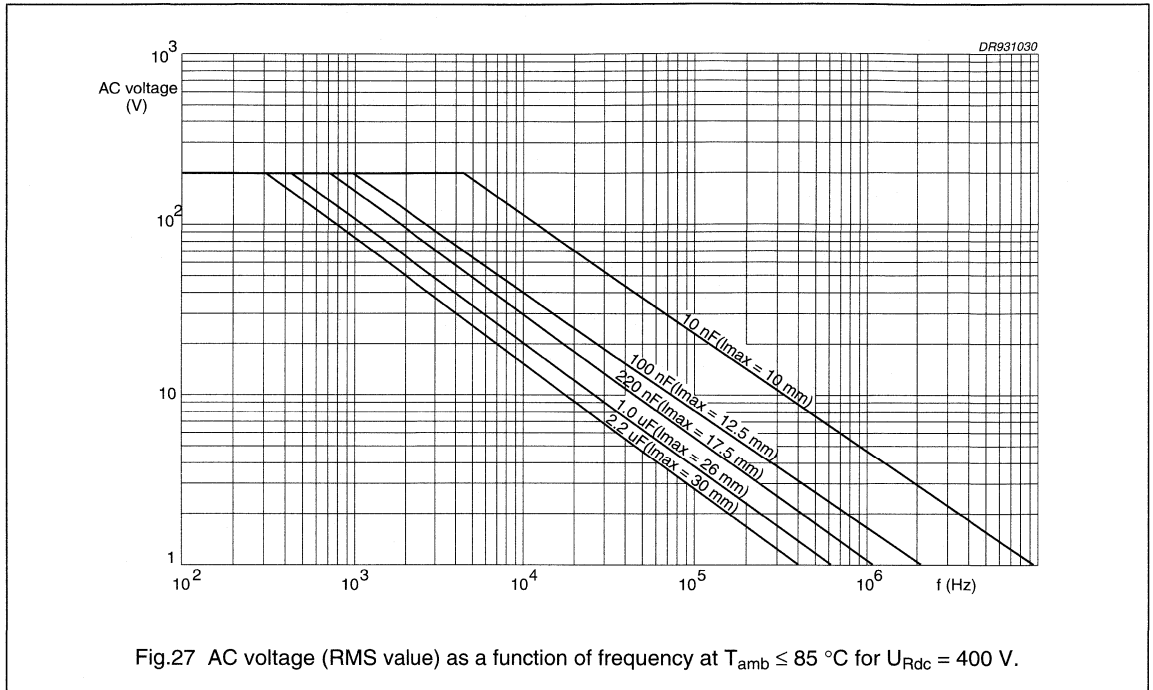
MKT 465/466/467/468

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



Metallized polyester film capacitors

MKT 465/466/467/468



## Metallized polyester film capacitors

MKT 465/466/467/468

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

The maximum RMS voltage in Figs 25 to 28 has to be multiplied by a factor given in Fig.29.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 32 and 33.

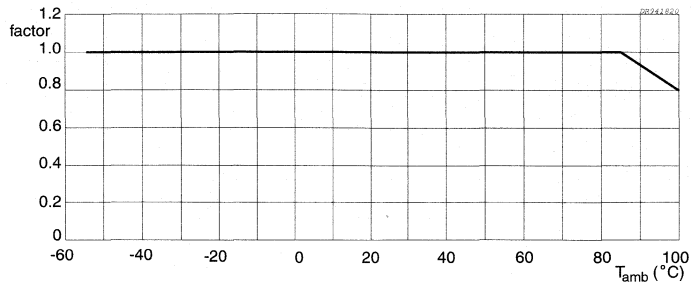


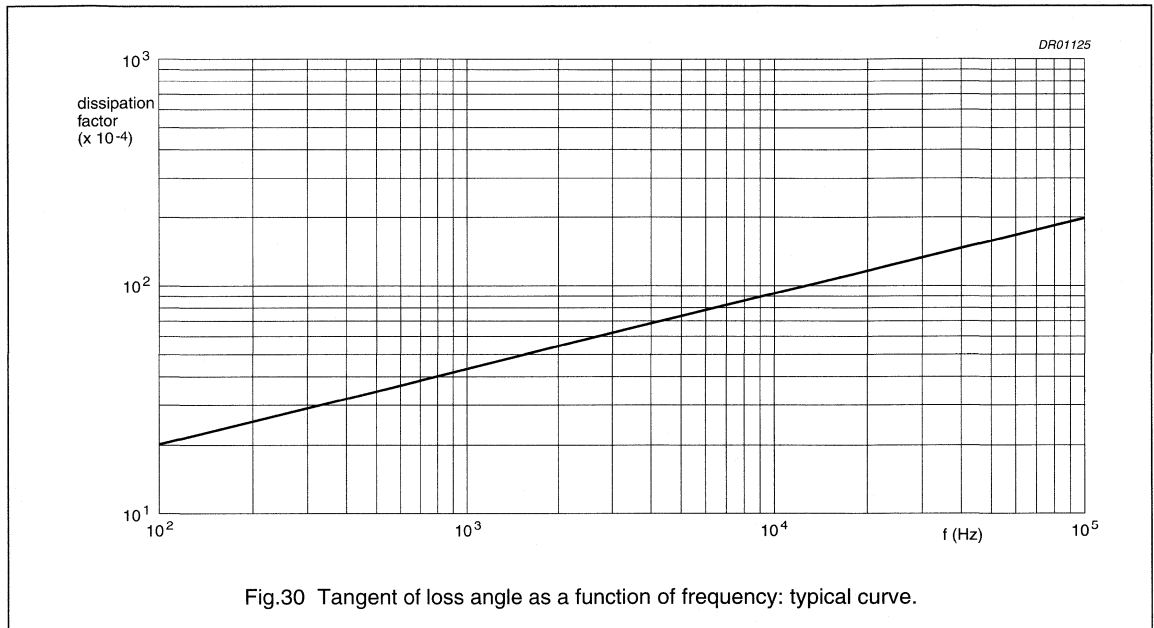
Fig.29 Multiplying factor as a function of temperature.

## Metallized polyester film capacitors

MKT 465/466/467/468

## Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE		
	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 225 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	–
$C > 1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	–

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

RATED VOLTAGE $U_R$ (V)	MAXIMUM RATED PULSE LOAD (V/μs) AS A FUNCTION OF $I_{\text{max}}^{(1)(2)}$					
	$I_{\text{max}} = 7.5 \text{ mm}$	$I_{\text{max}} = 10.0 \text{ mm}$	$I_{\text{max}} = 12.5 \text{ mm}$	$I_{\text{max}} = 17.5 \text{ mm}$	$I_{\text{max}} = 26.0 \text{ mm}$	$I_{\text{max}} = 30.0 \text{ mm}$
100	120	40	30	20	10	–
250	–	120	120	45	20	15
400	–	170	170	65	30	25
630	–	–	90	90	35	30

## Notes

1. The maximum pulse load values are valid for voltages equal to the rated voltage. For lower voltages the given values may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.
2. If the pulse requirement is satisfied, a check must be made to ensure that the maximum dissipation is not exceeded.



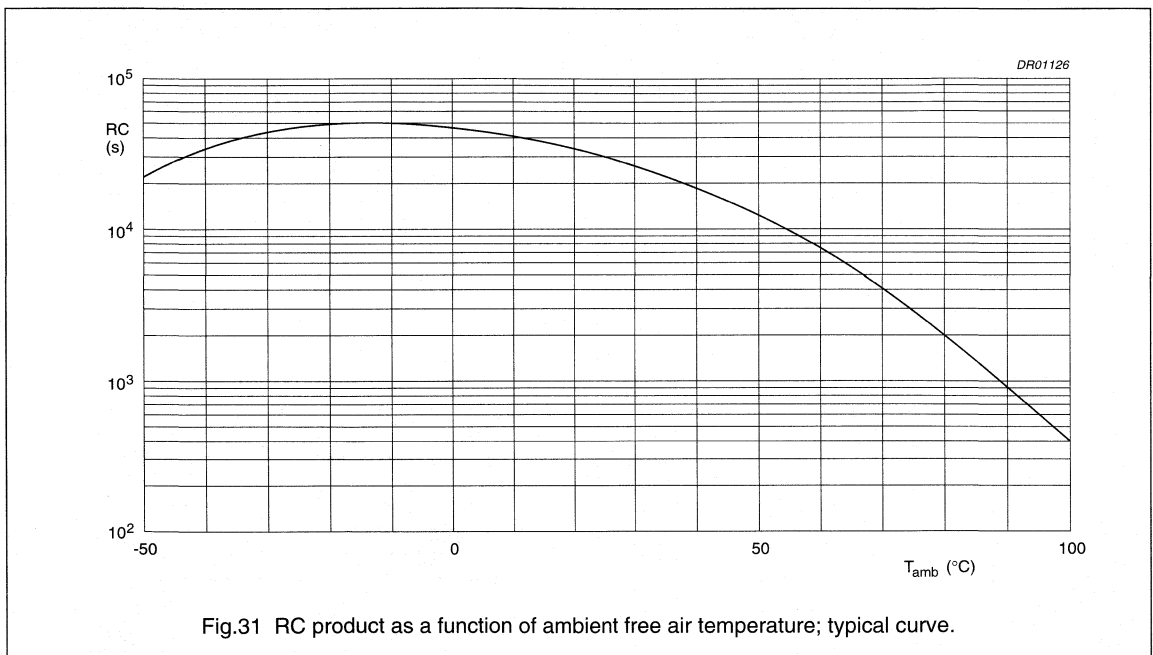
## Metallized polyester film capacitors

MKT 465/466/467/468

**Insulation resistance**

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $100 \pm 15$  V for the 100, 250 and 400 V versions and  $500 \pm 50$  V for the 630 V versions:

- Resistance between leads, for  $C \leq 0.33 \mu\text{F}$ :
  - 100 V versions:  $>15000 \text{ M}\Omega$
  - 250, 400 and 630 V versions:  $>30000 \text{ M}\Omega$
- RC between leads, for  $C > 0.33 \mu\text{F}$ :
  - 100 V versions:  $>5000 \text{ s}$
  - 250, 400 and 630 V versions:  $>10000 \text{ s}$
- Resistance between interconnected leads and case (foil method):  $>30000 \text{ M}\Omega$ .



# Metallized polyester film capacitors

# MKT 465/466/467/468

## Maximum dissipation

Power dissipation curves as a function of capacitor body length and thickness (see Figs 32 and 33)

b <sub>max</sub> (mm)	l <sub>max</sub> (mm)					
	7.3	10.0	12.5	17.5	26.0	30.0
3.5	1	5	—	—	—	—
4	2	6	7	9	—	—
4.5	3	6	8	10	—	—
5	4	7	9	10	15	16
5.5	5	7	10	11	16	17
6	6	8	10	11	16	17
6.5	—	9	11	12	17	18
7	—	—	—	12	17	18
7.5	—	—	—	13	18	19
8	—	—	—	13	18	20
8.5	—	—	—	14	19	20
9	—	—	—	14	19	21
9.5	—	—	—	15	20	21
10	—	—	—	15	20	22
10.5	—	—	—	—	—	23
11	—	—	—	—	—	23
11.5	—	—	—	—	—	24
12	—	—	—	—	—	24
12.5	—	—	—	—	—	25
13	—	—	—	—	—	25
13.5	—	—	—	—	—	25
14	—	—	—	—	—	25
14.5	—	—	—	—	—	26
15	—	—	—	—	—	26
15.5	—	—	—	—	—	27
16	—	—	—	—	—	27

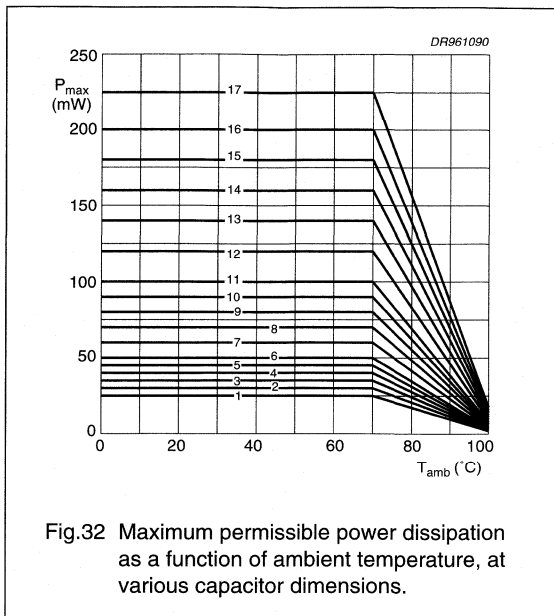


Fig.32 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

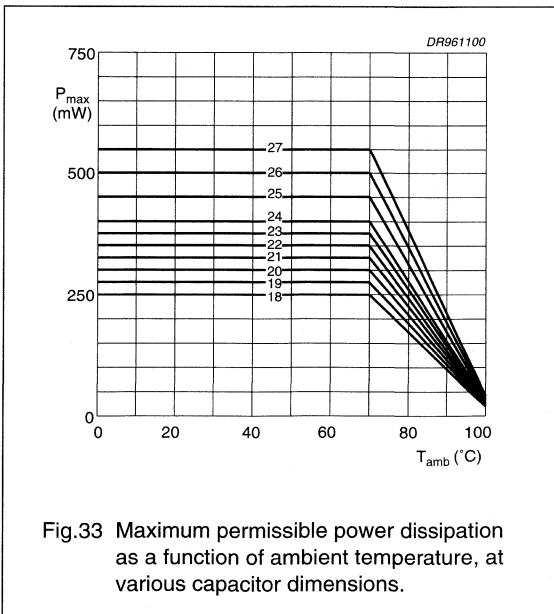


Fig.33 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

## Metallized polyester film capacitors

MKT 465/466/467/468

### Application note

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance:

$$I_{p\max} = C \left( \frac{dU}{dt} \right)_{\max}$$

Or the voltage pulse slope shall not exceed the rated voltage pulse slope. If the pulse voltage is lower than the rated voltage, the values (see Section "Rated voltage pulse slope ( $dU/dt$ )R" for more details) may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation shown in Figs 32 and 33.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.
6. Since all metallized polyethylene terephthalate film capacitors have an intrinsically active flammability risk after a capacitor breakdown (short circuit), it is recommended that for MKT styles the power to the component is limited to 10 times the maximum allowed power dissipation ( $P_{\max}$ ) during the short circuit failure mode of the capacitor.

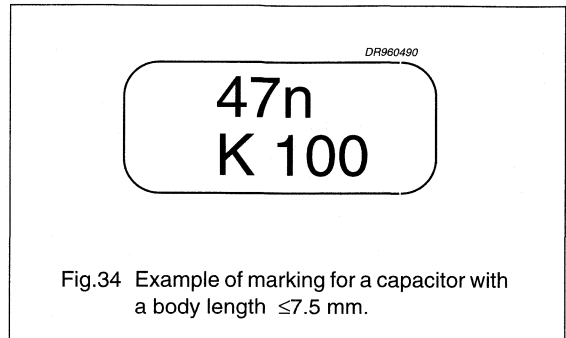
## Metallized polyester film capacitors

MKT 465/466/467/468

**MARKING****Product marking**CAPACITORS WITH A BODY LENGTH  $\leq 7.5$  mm

The capacitors are marked on the top in black ink with the following information:

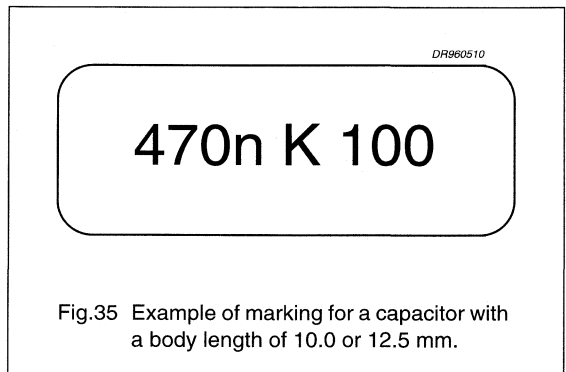
1. Capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: K =  $\pm 10\%$ ; J =  $\pm 5\%$
3. Rated voltage (DC).



CAPACITORS WITH A BODY LENGTH OF 10.0 OR 12.5 mm

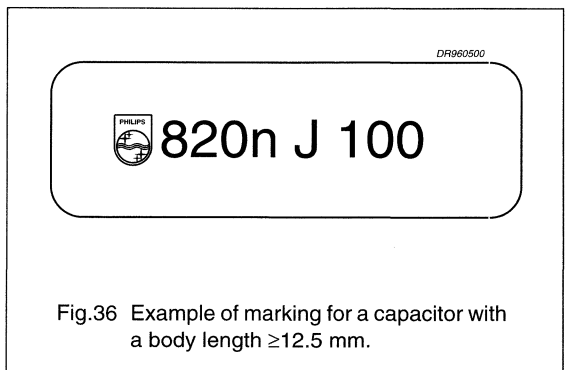
The capacitors are marked on the top in black ink with the following information:

1. Capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: K =  $\pm 10\%$ ; J =  $\pm 5\%$
3. Rated voltage (DC).

CAPACITORS WITH A BODY LENGTH  $\geq 12.5$  mm

The capacitors are marked on the top in black ink with the following information:

1. Capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: K =  $\pm 10\%$ ; J =  $\pm 5\%$
3. Rated voltage (DC)
4. Manufacturer's symbol.

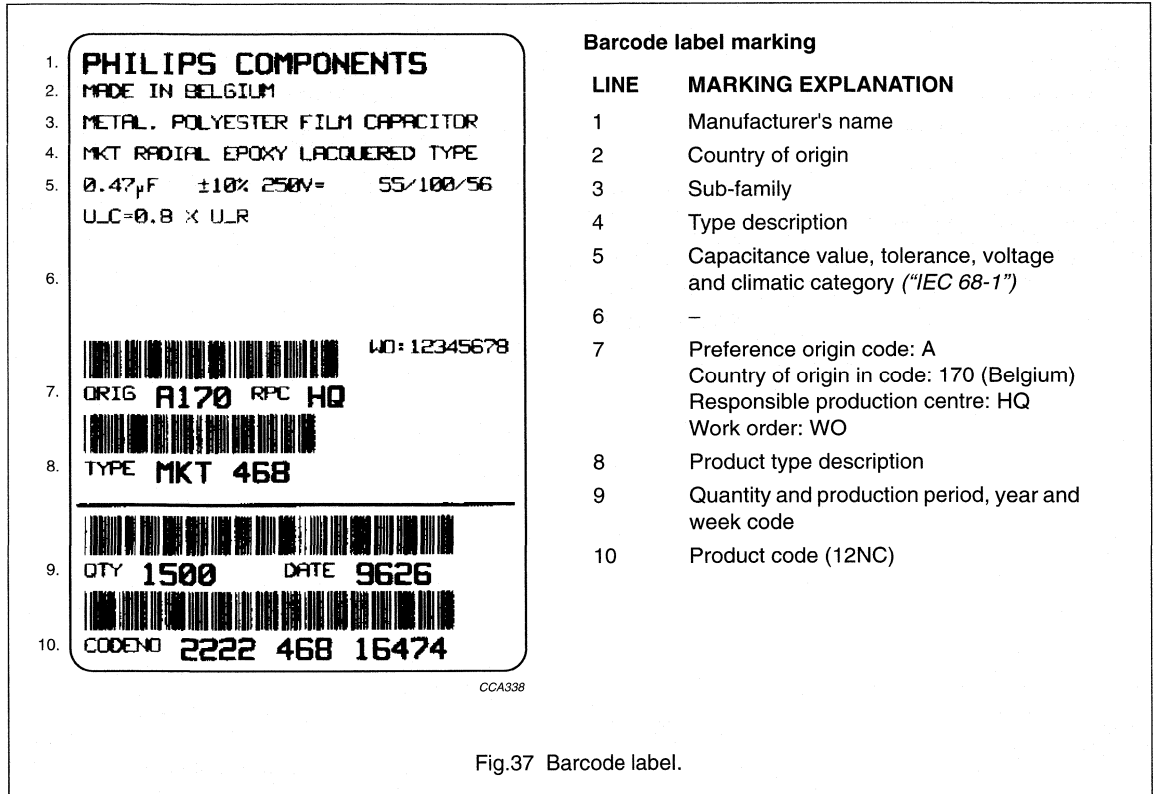


Metallized polyester film capacitors

MKT 465/466/467/468

Package marking

The package containing the capacitors is marked as shown in Fig.37.



## Metallized polyester film capacitors

MKT 465/466/467/468

## 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  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat "IEC 68-2-20"		$ \Delta C/C  \leq 2\%$
Resistance to solvents		$\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 3\%$
Shock: "IEC 68-2-27"		$\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 100 °C	$ \Delta C/C  \leq 5\%$
Damp heat cyclic, test Db, first cycle: "IEC 68-2-30"		$\Delta \tan \delta \leq 50 \times 10^{-4}$ ; note 2
Cold: "IEC 68-2-1"	2 hours; -55 °C	$R_{ins} \geq 50\%$ of specified value
Damp heat cyclic, test Db, remaining cycles: "IEC 68-2-30"		
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-2"	2000 hours: 1.25 × U <sub>Rdc</sub> ; 85 °C 1.25 × U <sub>Cdc</sub> ; 100 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-2"	2000 hours; 100 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
Resistance to soldering heat with preheating: "IEC 384-2"	body temperature: 100 °C; bath temperature: 260 °C; dwell time: 10 s	$ \Delta C/C  \leq 2\%$ (C ≤ 10 nF) $ \Delta C/C  \leq 1\%$ (C > 10 nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2

## Notes

- For detailed information, see "Type specification".
- Measuring frequency 10 kHz.

## Metallized polyester film capacitors

## MKT 370/371/372/373

## MKT RADIAL POTTED CAPACITORS

PITCH 5/7.5/10/15/22.5/27.5 mm

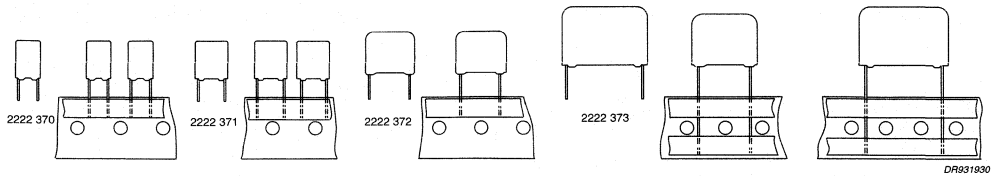


Fig.1 Simplified outlines.

## FEATURES

- Low-inductive wound cell of metallized (PETP) film
- Potted with epoxy resin in a blue flame-retardant case
- Radial leads of solder-coated wire
- Withstands solvents and rinsing liquids
- Small stand-off pips to allow removal of solder flux
- Suitable for high density packaging.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series)	0.001 to 15 $\mu$ F
Capacitance tolerance	$\pm 10\%$ ; $\pm 5\%$
Rated voltage (DC)	63 V; 100 V; 250 V; 400 V
Climatic category	55/100/56
Maximum application temperature	100 °C
Rated temperature	85 °C
Tangent of loss angle at 10 kHz	$100 \times 10^{-4}$
Reference specification	IEC 384-2
Performance grade	grade 1 (long life)

## APPLICATIONS

- Blocking and coupling
- Bypass and energy reservoir.

## Metallized polyester film capacitors

MKT 370

## MKT 370 GENERAL DATA

PITCH 5 mm

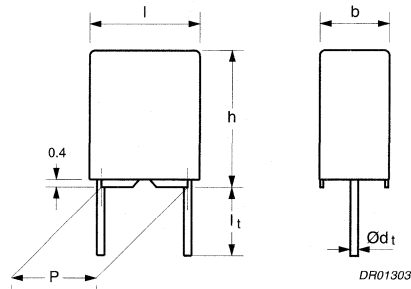


Fig.2 Outline.

## Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	60 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

## Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 370 75...	preferred
		$\pm 5\%$	2222 370 76...	preferred
	H = 16.0 mm; note 1	$\pm 10\%$	2222 370 78...	on request
		$\pm 5\%$	2222 370 79...	on request
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 370 11...	on request
		$\pm 5\%$	2222 370 12...	on request
	$l_t = 26.0 \pm 1.0$ mm	$\pm 10\%$	2222 370 15...	on request
		$\pm 5\%$	2222 370 16...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 370 18...	on request
		$\pm 5\%$	2222 370 19...	on request

## Note

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



## Metallized polyester film capacitors

MKT 370

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 370 ..... AND PACKAGING					
			AMMOPACK		REEL	LOOSE IN BOX		
			H = 18.5 mm		SPQ	SPQ	$l_t =$ 4.0 mm	$l_t =$ 26.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>				SPQ	SPQ
C-tol = $\pm 10\%$		C-tol = $\pm 5\%$						
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>								
0.056	$2.5 \times 6.5 \times 7.2$	0.25	75563	76563	2000	2000	2000	1000
0.068			75683	76683				
0.082			75823	76823				
0.1			75104	76104				
0.12			75124	76124				
0.15			75154	76154				
0.18			75184	76184				
0.22	$3.5 \times 8.0 \times 7.2$	0.35	75224	76224	1500	1500	2000	1000
0.27			75274	76274				
0.33			75334	76334				
0.39			75394	76394				
0.47			75474	76474				
0.56	$4.5 \times 9.0 \times 7.2$	0.45	75564	76564	1000	1000	2000	1000
0.68			75684	76684				
0.82	$5.0 \times 10.0 \times 7.2$	0.50	75824	76824	1000	1000	2000	1000
1	$6.0 \times 11.0 \times 7.2$	0.60	75105	76105	750	1000	2000	1000
1.2 <sup>(2)</sup>			75125	76125				

## Notes

- The shading indicates preferred types.
- For  $C = 1.2 \mu\text{F}$ :  $U_{Rdc} = 50 \text{ V}$  and  $U_{Rac} = 32 \text{ V}$ .

## Metallized polyester film capacitors

MKT 370

## MKT 370 GENERAL DATA

PITCH 5 mm

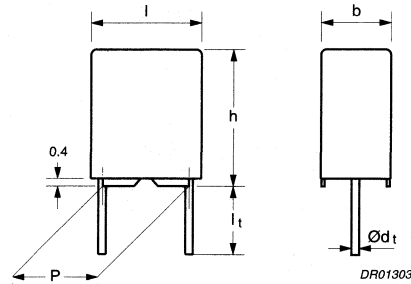


Fig.3 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$ $0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$ $\leq 300 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	110 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 370 85...	preferred
		$\pm 5\%$	2222 370 86...	preferred
	H = 16 mm; note 1	$\pm 10\%$	2222 370 88...	on request
		$\pm 5\%$	2222 370 89...	on request
Loose in box	$l_t = 4.0 + 1.0/-0.5$ mm	$\pm 10\%$	2222 370 21...	on request
		$\pm 5\%$	2222 370 22...	on request
	$l_t = 26.0 \pm 1.0$ mm	$\pm 10\%$	2222 370 25...	on request
		$\pm 5\%$	2222 370 26...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 370 28...	on request
		$\pm 5\%$	2222 370 29...	on request

## Note

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

## Metallized polyester film capacitors

MKT 370

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 370 ..... AND PACKAGING					
			AMMOPACK		REEL	LOOSE IN BOX		
			H = 18.5 mm		SPQ	SPQ	$l_t = 4.0 \text{ mm}$	$l_t = 26.0 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>				SPQ	SPQ
C-tol = $\pm 10\%$		C-tol = $\pm 5\%$						
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>								
0.012	$2.5 \times 6.5 \times 7.2$	0.25	85123	86123	2000	2000	2000	1000
0.015			85153	86153				
0.018			85183	86183				
0.022			85223	86223				
0.027			85273	86273				
0.033			85333	86333				
0.039			85393	86393				
0.047			85473	86473				
0.056			85563	86563				
0.068			85683	86683				
0.082			85823	86823				
0.10	$3.5 \times 8.0 \times 7.2$	0.35	85104	86104	1500	1500	2000	1000
0.12			85124	86124				
0.15			85154	86154				
0.18	85184	86184						
0.22	$4.5 \times 9.0 \times 7.2$	0.45	85224	86224	1000	1000	2000	1000
0.27			85274	86274				
0.33	$5.0 \times 10.0 \times 7.2$	0.50	85334	86334	1000	1000	2000	1000
0.39	$6.0 \times 11.0 \times 7.2$	0.65	85394	86394	750	1000	2000	1000
0.47			85474	86474				

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 370

## MKT 370 GENERAL DATA

PITCH 5 mm

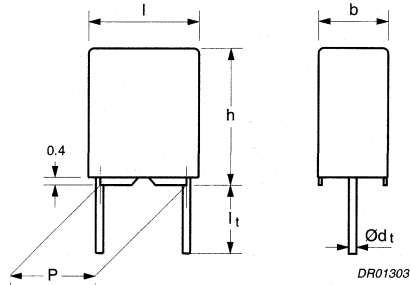


Fig.4 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	330 V/ $\mu\text{s}$		
R between leads	>30000 M $\Omega$		

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 370 35...	preferred
		$\pm 5\%$	2222 370 36...	preferred
	H = 16 mm; note 1	$\pm 10\%$	2222 370 38...	on request
		$\pm 5\%$	2222 370 39...	on request
Loose in box	$l_t = 4.0 + 1.0/-0.5$ mm	$\pm 10\%$	2222 370 41...	on request
		$\pm 5\%$	2222 370 42...	on request
	$l_t = 26.0 \pm 1.0$ mm	$\pm 10\%$	2222 370 45...	on request
		$\pm 5\%$	2222 370 46...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 370 48...	on request
		$\pm 5\%$	2222 370 49...	on request

## Note

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

## Metallized polyester film capacitors

MKT 370

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 370 ..... AND PACKAGING					
			AMMOPACK		REEL	LOOSE IN BOX		
			H = 18.5 mm		SPQ	SPQ	$l_t =$ 4.0 mm	$l_t =$ 26.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>				SPQ	SPQ
C-tol = $\pm 10\%$		C-tol = $\pm 5\%$						
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>								
0.0039	2.5 × 6.5 × 7.2	0.25	35392	36392	2000	2000	2000	1000
0.0047			35472	36472				
0.0056			35562	36562				
0.0068			35682	36682				
0.0082			35822	36822				
0.01			35103	36103				
0.012			35123	36123				
0.015			35153	36153				
0.018			35183	36183				
0.022	3.5 × 8.0 × 7.2	0.35	35223	36223	1500	1500	2000	1000
0.027			35273	36273				
0.033			35333	36333				
0.039	4.5 × 9.0 × 7.2	0.45	35393	36393	1000	1000	2000	1000
0.047			35473	36473				
0.056			35563	36563				
0.068	5.0 × 10.0 × 7.2	0.50	35683	36683	1000	1000	2000	1000
0.082	6.0 × 11.0 × 7.2	0.60	35823	36823	750	1000	2000	1000
0.1			35104	36104				

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 370

## MKT 370 GENERAL DATA

PITCH 5 mm

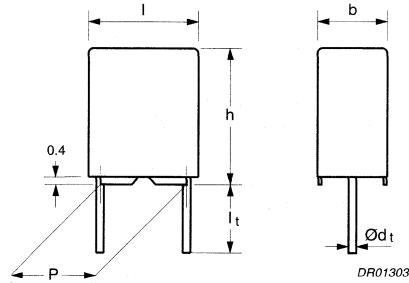


Fig.5 Outline.

## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	630 V/ $\mu\text{s}$		
R between leads	>30000 M $\Omega$		

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 370 65...	preferred
		$\pm 5\%$	2222 370 66...	preferred
	H = 16 mm; note 1	$\pm 10\%$	2222 370 68...	on request
		$\pm 5\%$	2222 370 69...	on request
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 370 51...	on request
		$\pm 5\%$	2222 370 52...	on request
	$l_t = 26.0 \pm 1.0$ mm	$\pm 10\%$	2222 370 55...	on request
		$\pm 5\%$	2222 370 56...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 370 58...	on request
		$\pm 5\%$	2222 370 59...	on request

## Note

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

## Metallized polyester film capacitors

MKT 370

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 370 ..... AND PACKAGING					
			AMMOPACK		REEL	LOOSE IN BOX		
			H = 18.5 mm		SPQ	SPQ	$l_t =$ 4.0 mm	$l_t =$ 26.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>				SPQ	SPQ
C-tol = $\pm 10\%$		C-tol = $\pm 5\%$						
<b>Pitch = <math>5.08 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>								
0.001	$2.5 \times 6.5 \times 7.2$	0.25	65102	66102	2000	2000	2000	1000
0.0012			65122	66122				
0.0015			65152	66152				
0.0018			65182	66182				
0.0022			65222	66222				
0.0027			65272	66272				
0.0033			65332	66332				
0.0039			65392	66392				
0.0047			65472	66472				
0.0056			65562	66562				
0.0068			65682	66682				
0.0082	65822	66822						
0.01	$3.5 \times 8.0 \times 7.2$	0.35	65103	66103	1500	1500	2000	1000
0.012			65123	66123				
0.015			65153	66153				
0.018	$4.5 \times 9.0 \times 7.2$	0.45	65183	66183	1000	1000	2000	1000
0.022			65223	66223				
0.027			65273	66273				
0.033	$6.0 \times 11.0 \times 7.2$	0.60	65333	66333	750	1000	2000	1000
0.039			65393	66393				
0.047			65473	66473				

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 371

## MKT 371 GENERAL DATA

PITCH 7.5mm

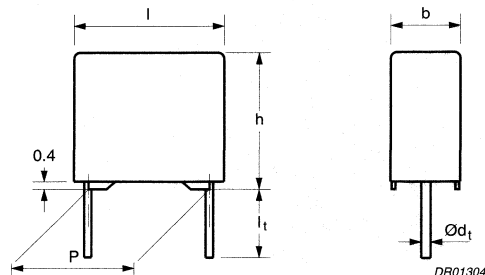


Fig.6 Outline.

## Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	18 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

## Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 + 1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 371 11...	preferred
		$\pm 5\%$	2222 371 12...	preferred
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 371 38...	preferred
		$\pm 5\%$	2222 371 39...	preferred
Loose in box	$l_t = 26.0 \pm 1.0 \text{ mm}$	$\pm 10\%$	2222 371 15...	on request
		$\pm 5\%$	2222 371 16...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 371 35...	on request
		$\pm 5\%$	2222 371 36...	on request
	H = 16.5 mm; note 1	$\pm 10\%$	2222 371 18...	on request
		$\pm 5\%$	2222 371 19...	on request

## Note

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



## Metallized polyester film capacitors

MKT 371

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 371 ..... AND PACKAGING							
			LOOSE IN BOX				AMMOPACK		REEL	
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 26.0 \text{ mm}$		H = 18.5 mm			
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ	last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ
C-tol = $\pm 10\%$		C-tol = $\pm 5\%$		C-tol = $\pm 10\%$		C-tol = $\pm 5\%$				
<b>Pitch = 7.62 +0.30/-0.40 mm; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>										
0.056	2.5 × 6.5 × 10.0	0.3	11563	12563	1000	1000	38563	39563	2000	2000
0.068			11683	12683			38683	39683		
0.082			11823	12823			38823	39823		
0.1			11104	12104			38104	39104		
0.12	3.0 × 8.0 × 10.0	0.4	11124	12124	1000	1000	38124	39124	1500	1500
0.15			11154	12154			38154	39154		
0.18			11184	12184			38184	39184		
0.22			11224	12224			38224	39224		
0.27	4.0 × 9.0 × 10.0	0.5	11274	12274	1000	1000	38274	39274	1000	1500
0.33			11334	12334			38334	39334		
0.39			11394	12394			38394	39394		
0.47			11474	12474			38474	39474		
0.56			11564	12564			38564	39564		
0.68			11684	12684			38684	39684		
0.82	5.0 × 10.5 × 10.0	0.7	11824	12824	1000	1000	38824	39824	1000	1000
0.1			11105	12105			38105	39105		

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 371

## MKT 371 GENERAL DATA

PITCH 7.5 mm

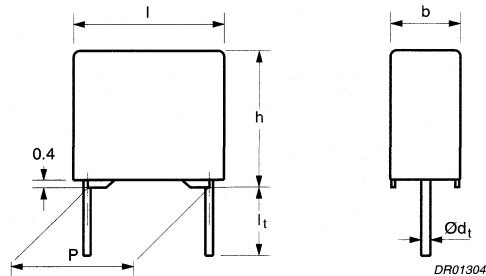


Fig.7 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF	≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup>	≤250 × 10 <sup>-4</sup>
0.1 μF < C ≤ 0.47 μF	≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup>	≤300 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	36 V/μs		
R between leads, for C ≤ 0.33 μF	>15000 MΩ		
RC between leads, for C > 0.33 μF	>5000 s		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 4.0 +1.0/-0.5 mm	±10%	2222 371 21...	preferred
		±5%	2222 371 22...	preferred
Ammopack	H = 18.5 mm; note 1	±10%	2222 371 68...	preferred
		±5%	2222 371 69...	preferred
Loose in box	l <sub>t</sub> = 26.0 ±1.0 mm	±10%	2222 371 25...	on request
		±5%	2222 371 26...	on request
Taped on reel	H = 18.5 mm; note 1	±10%	2222 371 65...	on request
		±5%	2222 371 66...	on request
	H = 16.5 mm; note 1	±10%	2222 371 28...	on request
		±5%	2222 371 29...	on request

## Note

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

## Metallized polyester film capacitors

MKT 371

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 371 ..... AND PACKAGING								
			LOOSE IN BOX				AMMOPACK				REEL
			$l_t = 4.0 + 1.0/-0.5 \text{ mm}$		$l_t = 26.0 \text{ mm}$		$H = 18.5 \text{ mm}$				
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ	last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ	
C-tol = $\pm 10\%$		C-tol = $\pm 5\%$				C-tol = $\pm 10\%$		C-tol = $\pm 5\%$			
<b>Pitch = <math>7.62 + 0.30/-0.40 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>											
0.018	2.5 × 6.5 × 10.0	0.3	21183	22183	1000	1000	68183	69183	2000	2000	
0.022			21223	22223			68223	69223			
0.027			21273	22273			68273	69273			
0.033			21333	22333			68333	69333			
0.039			21393	22393			68393	69393			
0.047			21473	22473			68473	69473			
0.056	3.0 × 8.0 × 10.0	0.4	21563	22563	1000	1000	68563	69563	1500	1500	
0.068			21683	22683			68683	69683			
0.082			21823	22823			68823	69823			
0.1			21104	22104			68104	69104			
0.12	4.0 × 9.0 × 10.0	0.5	21124	22124	1000	1000	68124	69124	1000	1500	
0.15			21154	22154			68154	69154			
0.18			21184	22184			68184	69184			
0.22			21224	22224			68224	69224			
0.27	5.0 × 10.5 × 10.0	0.7	21274	22274	1000	1000	68274	69274	1000	1000	
0.33			21334	22334			68334	69334			
0.39			21394	22394			68394	69394			
0.47			21474	22474			68474	69474			

**Note**

1. The shading indicates preferred types.

# Metallized polyester film capacitors

# MKT 371

## MKT 371 GENERAL DATA

PITCH 7.5 mm

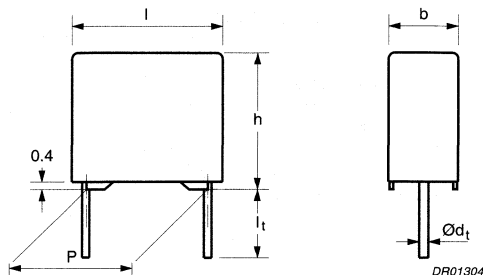


Fig.8 Outline.

### Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	70 V/ $\mu$ s		
R between leads	$> 30000 \text{ M}\Omega$		

### Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 371 41...	preferred
		$\pm 5\%$	2222 371 42...	preferred
Ammopack	$H = 18.5 \text{ mm}$ ; note 1	$\pm 10\%$	2222 371 78...	preferred
		$\pm 5\%$	2222 371 79...	preferred
Loose in box	$l_t = 26.0 \pm 1.0 \text{ mm}$	$\pm 10\%$	2222 371 45...	on request
		$\pm 5\%$	2222 371 46...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 10\%$	2222 371 75...	on request
		$\pm 5\%$	2222 371 76...	on request
	$H = 16.5 \text{ mm}$ ; note 1	$\pm 10\%$	2222 371 48...	on request
		$\pm 5\%$	2222 371 49...	on request

### Note

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

## Metallized polyester film capacitors

MKT 371

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 371 ..... AND PACKAGING								
			LOOSE IN BOX				AMMOPACK			REEL	
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 26.0 \text{ mm}$		$H = 18.5 \text{ mm}$			SPQ	SPQ
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ	last 5 digits of catalogue number <sup>(1)</sup>		SPQ		
C-tol = $\pm 10\%$	C-tol = $\pm 5\%$	C-tol = $\pm 10\%$	C-tol = $\pm 5\%$								
<b>Pitch = <math>7.62 +0.30/-0.40 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>											
0.0082	2.5 × 6.5 × 10.0	0.3	41822	42822	1000	1000	78822	79822	2000	2000	
0.01			41103	42103			78103	79103			
0.012			41123	42123			78123	79123			
0.015			41153	42153			78153	79153			
0.018	3.0 × 8.0 × 10.0	0.4	41183	42183	1000	1000	78183	79183	1500	1500	
0.022			41223	42223			78223	79223			
0.027			41273	42273			78273	79273			
0.033			41333	42333			78333	79333			
0.039			41393	42393			78393	79393			
0.047			41473	42473			78473	79473			
0.056	4.0 × 9.0 × 10.0	0.5	41563	42563	1000	1000	78563	79563	1000	1500	
0.068			41683	42683			78683	79683			
0.082			41823	42823			78823	79823			
0.1			41104	42104			78104	79104			

**Note**

1. The shading indicates preferred types.

# Metallized polyester film capacitors

MKT 371

## MKT 371 GENERAL DATA

PITCH 7.5 mm

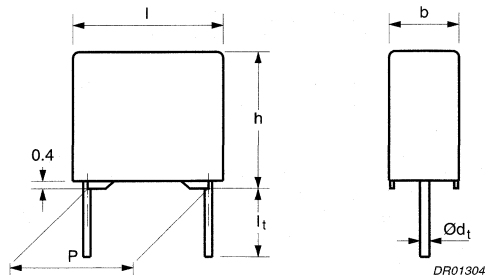


Fig.9 Outline.

### Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	190 V/ $\mu$ s		
R between leads	$>30000 \text{ M}\Omega$		

### Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 371 51...	preferred
		$\pm 5\%$	2222 371 52...	preferred
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 371 88...	preferred
		$\pm 5\%$	2222 371 89...	preferred
Loose in box	$l_t = 26.0 \pm 1.0 \text{ mm}$	$\pm 10\%$	2222 371 55...	on request
		$\pm 5\%$	2222 371 56...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 371 85...	on request
		$\pm 5\%$	2222 371 86...	on request
	H = 16.5 mm; note 1	$\pm 10\%$	2222 371 58...	on request
		$\pm 5\%$	2222 371 59...	on request

### Note

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

## Metallized polyester film capacitors

MKT 371

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 371 ..... AND PACKAGING							
			LOOSE IN BOX				AMMOPACK			REEL
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		$l_t = 26.0 \text{ mm}$	H = 18.5 mm			SPQ	SPQ
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	last 5 digits of catalogue number <sup>(1)</sup>		SPQ		
C-tol = $\pm 10\%$	C-tol = $\pm 5\%$	C-tol = $\pm 10\%$	C-tol = $\pm 5\%$							
<b>Pitch = 7.62 +0.30/-0.40 mm; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>										
0.0039	2.5 × 6.5 × 10.0	0.3	51392	52392	1000	1000	88392	89392	2000	2000
0.0047			51472	52472			88472	89472		
0.0056			51562	52562			88562	89562		
0.0068			51682	52682			88682	89682		
0.0082	3.0 × 8.0 × 10.0	0.4	51822	52822	1000	1000	88822	89822	1500	1500
0.01			51103	52103			88103	89103		
0.012	4.0 × 9.0 × 10.0	0.5	51123	52123	1000	1000	88123	89123	1000	1500
0.015			51153	52153			88153	89153		

**Note**

1. The shading indicates preferred types.

Metallized polyester film capacitors

MKT 372

MKT 372 GENERAL DATA

PITCH 10 mm

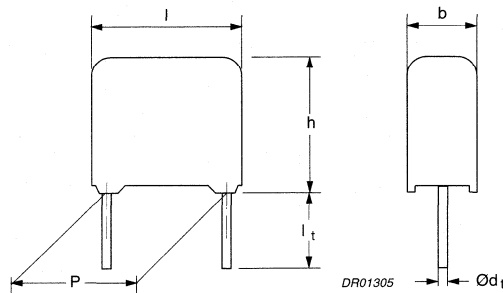


Fig.10 Outline.

Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 µF	≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup>	≤250 × 10 <sup>-4</sup>
0.1 µF < C ≤ 0.47 µF	≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup>	≤300 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	34 V/µs		
R between leads, for C < 0.33 µF	>15000 MΩ		
RC between leads, for C > 0.33 µF	>5000 s		

Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 4.0 +1.0/-0.5 mm	±10%	2222 372 21...	preferred
		±5%	2222 372 22...	on request
Taped on reel	H = 18.5 mm; note 1	±10%	2222 372 25...	on request
		±5%	2222 372 26...	on request
Ammopack	H = 18.5 mm; note 1	±10%	2222 372 28...	on request
		±5%	2222 372 29...	on request

Note

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



## Metallized polyester film capacitors

MKT 372

 $U_{Rdc} = 100V$ ;  $U_{Rac} = 63 V$ 

loose and taped

C ( $\mu F$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 372 ..... AND PACKAGING			
			LOOSE IN BOX		REEL	AMMOPACK
			$l_1 = 4.0 +1.0/-0.5$ mm		H = 18.5 mm	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ	SPQ
C-tol = $\pm 10\%$						
<b>Pitch = 10.0 <math>\pm 0.4</math> mm; <math>d_t = 0.60 \pm 0.06</math> mm</b>						
0.1	4.0 $\times$ 9.0 $\times$ 12.5	0.6	21104	1000	1400	750
0.12			21124			
0.15			21154			
0.18			21184			
0.22			21224			
0.27	4.0 $\times$ 10.0 $\times$ 12.5	0.7	21274	1000	1400	750
0.33			21334			
0.39	5.0 $\times$ 11.0 $\times$ 12.5	0.9	21394	1000	1100	600
0.47			21474			

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 372

## MKT 372 GENERAL DATA

PITCH 10 mm

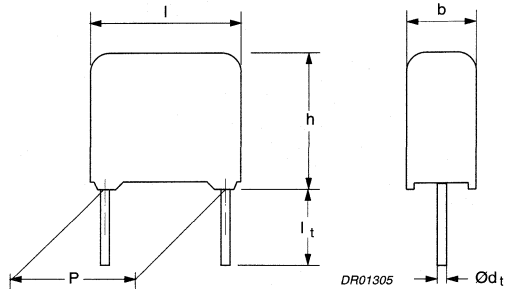


Fig.11 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$ $0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$ $\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$ $\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$ $\leq 300 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	50 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>30000 M $\Omega$		

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 372 41...	preferred
		$\pm 5\%$	2222 372 42...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 372 45...	on request
		$\pm 5\%$	2222 372 46...	on request
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 372 48...	on request
		$\pm 5\%$	2222 372 49...	on request

## Note

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

## Metallized polyester film capacitors

MKT 372

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 372 ..... AND PACKAGING			
			LOOSE IN BOX		REEL	AMMOPACK
			$l_t = 4.0 + 1.0/-0.5 \text{ mm}$		H = 18.5 mm	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ	SPQ
			C-tol = $\pm 10\%$			
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
0.047	$4.0 \times 9.0 \times 12.5$	0.6	41473	1000	1400	750
0.056			41563			
0.068			41683			
0.082	$4.0 \times 10.0 \times 12.5$	0.7	41823	1000	1400	750
0.1			41104			
0.12	$5.0 \times 11.0 \times 12.5$	0.9	41124	1000	1100	600
0.15			41154			

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 372

## MKT 372 GENERAL DATA

PITCH 10 mm

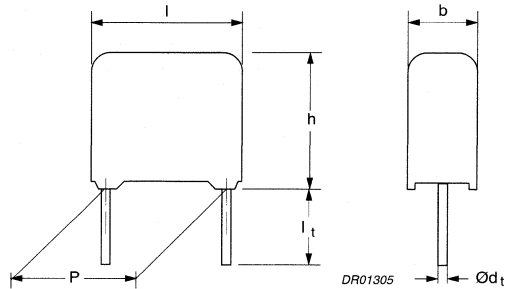


Fig.12 Outline.

## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	80 V/ $\mu$ s		
R between leads	>30 000 M $\Omega$		

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 372 51...	preferred
		$\pm 5\%$	2222 372 52...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 372 55...	on request
		$\pm 5\%$	2222 372 56...	on request
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 372 58...	on request
		$\pm 5\%$	2222 372 59...	on request

## Note

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

## Metallized polyester film capacitors

MKT 372

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 372 ..... AND PACKAGING			
			LOOSE IN BOX		REEL	AMMOPACK
			$l_t = 4.0 +1.0/-0.5 \text{ mm}$		H = 18.5 mm	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ	SPQ
C-tol = $\pm 10\%$						
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
0.0047	$4.0 \times 9.0 \times 12.5$	0.6	51472	1000	1400	750
0.0056			51562			
0.0068			51682			
0.0082			51822			
0.01			51103			
0.012			51123			
0.015			51153			
0.018			51183			
0.022			51223			
0.027	$4.0 \times 10.0 \times 12.5$	0.7	51273	1000	1400	750
0.033			51333			
0.039	$5.0 \times 11.0 \times 12.5$	0.9	51393	1000	1100	600
0.047			51473			

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 373

## MKT 373 GENERAL DATA

PITCH 15/22.5/27.5 mm

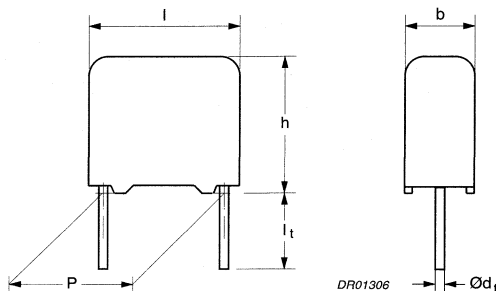


Fig.13 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
0.33 $\mu\text{F}$ < C $\leq$ 0.47 $\mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
0.47 $\mu\text{F}$ < C $\leq$ 1.0 $\mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	–
1.0 $\mu\text{F}$ < C $\leq$ 10 $\mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 150 \times 10^{-4}$	–
C > 10 $\mu\text{F}$	$\leq 75 \times 10^{-4}$	–	–
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> :			
P = 15 mm		14 V/ $\mu\text{s}$	
P = 22.5 mm		5 V/ $\mu\text{s}$	
P = 27.5 mm		4 V/ $\mu\text{s}$	
R between leads, for C $\leq$ 0.33 $\mu\text{F}$		>15000 M $\Omega$	
RC between leads, for C > 0.33 $\mu\text{F}$		>5000 s	

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0$ mm	$\pm 10\%$	2222 373 21...	preferred
		$\pm 5\%$	2222 373 22...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 373 25...	on request
		$\pm 5\%$	2222 373 26...	on request

## Note

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

## Metallized polyester film capacitors

MKT 373

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 373 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0 \text{ mm}$		$H = 18.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.33 0.39 0.47 0.56 0.68	5.0 × 11.0 × 17.5	1.1	21334 21394 21474 21564 21684	1000	1100
0.82 1	6.0 × 12.0 × 17.5	1.4	21824 21105	1000	900
1.2 1.5	7.0 × 13.5 × 17.5	1.9	21125 21155	1000	800
1.8 2.2	8.5 × 15.0 × 17.5	2.6	21185 21225	1000	650
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
2.7 3.3	8.5 × 18.0 × 26.0	4.4	21275 21335	200	450
3.9 4.7	10.0 × 19.5 × 26.0	5.5	21395 21475	200	350
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
5.6 6.8	11.0 × 21.0 × 31.0	8.0	21565 21685	100	300
8.2 10	13.0 × 23.0 × 31.0	10.5	21825 21106	100	250
12 15	18.0 × 28.0 × 31.0	17.5	21126 21156	100	150

## Available on request

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 373 ..... AND PACKAGING					
			loose in box; $l_t = 5.0 \pm 1.0 \text{ mm}$			taped on reel; $H = 18.5 \text{ mm}$ <sup>(2)</sup>		
			last 5 digits of catalogue number		SPQ	last 5 digits of catalogue number		SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		C-tol = $\pm 10\%$	C-tol = $\pm 5\%$	
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>								
1.5	6.0 × 15.5 × 26.0	2.5	90012	90013	200	90018	90019	600
1.8 2.2	7.0 × 16.5 × 26.0	3.2	90022 90002	90023 90003	200	90028 90008	90029 90009	550
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>								
4.7	9.0 × 19.0 × 31.0	5.8	90032	90033	100	90038	90039	400

## Notes

- The shading indicates preferred types.
- H = in-tape height for detailed specifications refer to this handbook, Chapter "Packaging".

# Metallized polyester film capacitors

# MKT 373

## MKT 373 GENERAL DATA

PITCH 15/22.5/27.5 mm

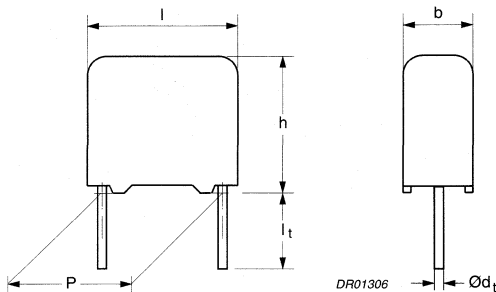


Fig.14 Outline.

### Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: 0.15 µF < C ≤ 0.47 µF 0.47 µF < C ≤ 1.0 µF 1.0 µF < C ≤ 4.7 µF	≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup> ≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup> ≤130 × 10 <sup>-4</sup> ≤150 × 10 <sup>-4</sup>	≤300 × 10 <sup>-4</sup> - -
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : P = 15 mm P = 22.5 mm P = 27.5 mm	16 V/µs 7 V/µs 6 V/µs		
R between leads, for C ≤ 0.33 µF	>30000 MΩ		
RC between leads, for C > 0.33 µF	>10000 s		

### Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 5.0 ± 1.0 mm	±10%	2222 373 41...	preferred
		±5%	2222 373 42...	on request
Taped on reel	H = 18.5 mm; note 1	±10%	2222 373 45...	on request
		±5%	2222 373 46...	on request

### Note

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



## Metallized polyester film capacitors

MKT 373

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 373 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0 \text{ mm}$		$H = 18.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 10\%$					
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.15	$5.0 \times 11.0 \times 17.5$	1.1	41154	1000	1100
0.18			41184		
0.22			41224		
0.27	$6.0 \times 12.0 \times 17.5$	1.4	41274	1000	900
0.33			41334		
0.39			41394		
0.47			41474		
0.56	$7.0 \times 13.5 \times 17.5$	1.9	41564	1000	800
0.68			41684		
0.82	$8.5 \times 15.0 \times 17.5$	2.6	41824	1000	650
1.0			41105		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
1.2	$8.5 \times 18.0 \times 26.0$	4.4	41125	200	450
1.5			41155		
1.8	$10.0 \times 19.5 \times 26.0$	5.5	41185	200	350
2.2			41225		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
2.7	$13.0 \times 23.0 \times 31.0$	10.4	41275	100	250
3.3			41335		
3.9	$15.0 \times 25.0 \times 31.0$	12.5	41395	100	200
4.7			41475		

## Available on request

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 373 ..... AND PACKAGING					
			loose in box; $l_t = 5.0 \pm 1.0 \text{ mm}$			taped on reel; $H = 18.5 \text{ mm}$ <sup>(2)</sup>		
			last 5 digits of catalogue number		SPQ	last 5 digits of catalogue number		SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		C-tol = $\pm 10\%$	C-tol = $\pm 5\%$	
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>								
0.47	$6.0 \times 15.5 \times 26.0$	2.5	90042	90043	200	90048	90049	600
0.56			90052	90053		90058	90059	
0.68			90062	90063		90068	90069	
0.82	$7.0 \times 16.5 \times 26.0$	3.2	90072	90073	200	90078	90079	550
1			90082	90083		90088	90089	
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>								
1.2	$9.0 \times 19.0 \times 31.0$	5.8	90172	90173	100	90174	90175	400
1.5			90092	90093		90098	90099	
1.8	$11.0 \times 21.0 \times 31.0$	7.8	90102	90103	100	90108	90109	300
2.2			90112	90113		90118	90119	

## Notes

- The shading indicates preferred types.
- H = in-tape height for detailed specifications refer to this handbook, Chapter "Packaging".

## Metallized polyester film capacitors

MKT 373

## MKT 373 GENERAL DATA

PITCH 15/22.5/27.5 mm

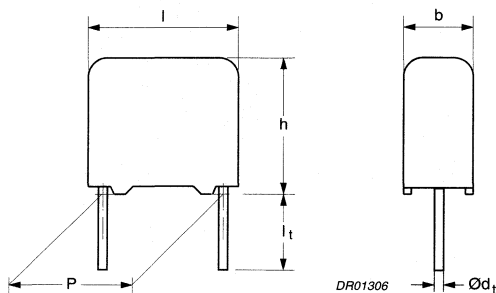


Fig.15 Outline.

## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	–
$1.0 \mu\text{F} < C \leq 1.5 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 150 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :			
$P = 15 \text{ mm}$		34 V/ $\mu\text{s}$	
$P = 22.5 \text{ mm}$		14 V/ $\mu\text{s}$	
$P = 27.5 \text{ mm}$		12 V/ $\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$		>30000 M $\Omega$	
RC between leads, for $C > 0.33 \mu\text{F}$		>10000 s	

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 10\%$	2222 373 51...	preferred
		$\pm 5\%$	2222 373 52...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 10\%$	2222 373 55...	on request
		$\pm 5\%$	2222 373 56...	on request

## Note

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

## Metallized polyester film capacitors

MKT 373

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 373 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0 \text{ mm}$		$H = 18.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.047 0.056 0.068 0.082 0.1	5.0 × 11.0 × 17.5	1.1	51473	1000	1100
			51563		
			51683		
			51823		
			51104		
0.12 0.15	6.0 × 12.0 × 17.5	1.4	51124	1000	900
			51154		
0.18 0.22	7.0 × 13.5 × 17.5	1.9	51184	1000	800
			51224		
0.27 0.33	8.5 × 15.0 × 17.5	2.6	51274	1000	650
			51334		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.39 0.47	8.5 × 18.0 × 26.0	4.4	51394	200	450
			51474		
0.56 0.68	10.0 × 19.5 × 26.0	4.4	51564	200	350
		5.5	51684		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.82 1	11.0 × 21.0 × 31.0	7.8	51824	100	300
			51105		
1.2 1.5	15.0 × 25.0 × 31.0	12.8	51125	100	200
			51155		

## Available on request

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 373 ..... AND PACKAGING					
			loose in box; $l_t = 5.0 \pm 1.0 \text{ mm}$			taped on reel; $H = 18.5 \text{ mm}^{(2)}$		
			last 5 digits of catalogue number		SPQ	last 5 digits of catalogue number		SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$		C-tol = $\pm 10\%$	C-tol = $\pm 5\%$	
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>								
0.22	6.0 × 15.5 × 26.0	2.5	90122	90123	200	90128	90129	600
0.27 0.33	7.0 × 16.5 × 26.0	3.2	90132	90133	200	90138	90139	550
			90142	90143		90148	90149	
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>								
0.68	9.0 × 19.0 × 31.0	5.8	90152	90153	100	90158	90159	400

## Notes

- The shading indicates preferred types.
- H = in-tape height for detailed specifications refer to this handbook, Chapter "Packaging".

# Metallized polyester film capacitors

## MKT 370/371/372/373

### CONSTRUCTION

#### Description

- Low-inductive wound cell of metallized polyethylene terephthalate (PETP) film, potted with epoxy resin in a blue flame-retardant case
- Radial leads, solder-coated:
  - Copper clad steel wire (pitch =  $2e$ )
  - Copper wire (pitch >  $2e$ )
- Small stand-off pips allow removal of solder flux etc. during cleaning of the printed-circuit board.

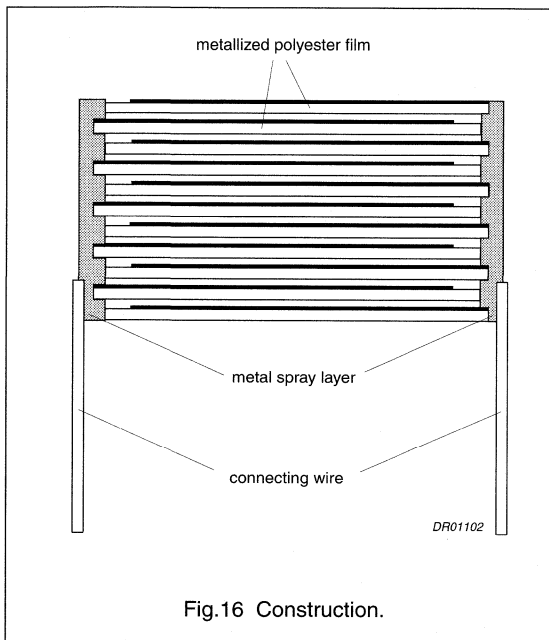


Fig.16 Construction.

#### 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

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 of  $\leq 15$  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.

#### SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD

The maximum length and width of film capacitors is shown in Fig.17:

- Eccentricity see Fig.17. The maximum eccentricity is smaller than or equal to the wire diameter of the product concerned.
- Product height with seating plane as given by "IEC 717" as reference:  $h_{\max} \leq h + 0.3$  mm.

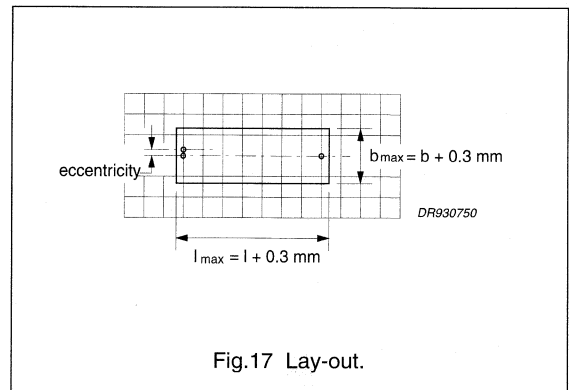


Fig.17 Lay-out.

#### RATINGS AND CHARACTERISTICS

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

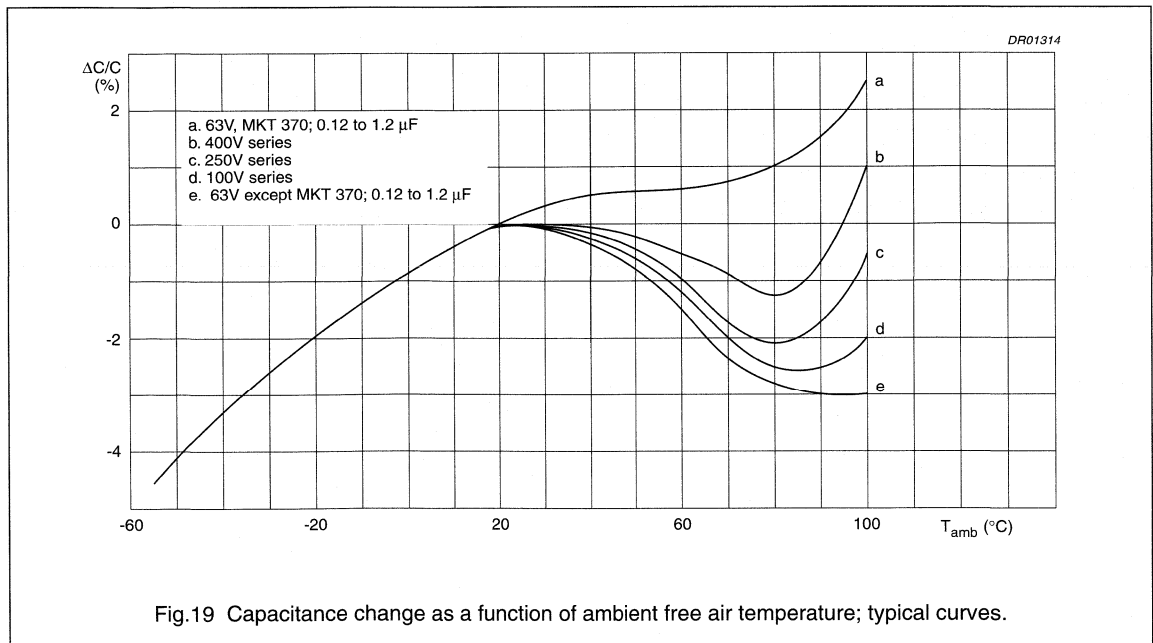
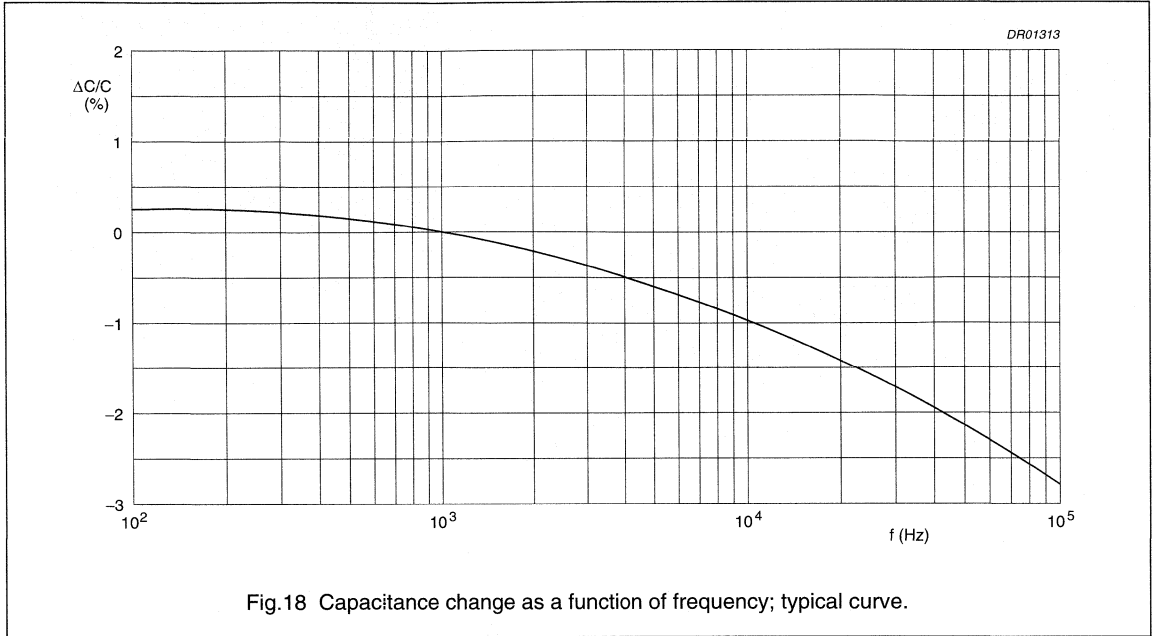
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

# Metallized polyester film capacitors

# MKT 370/371/372/373

## Capacitance

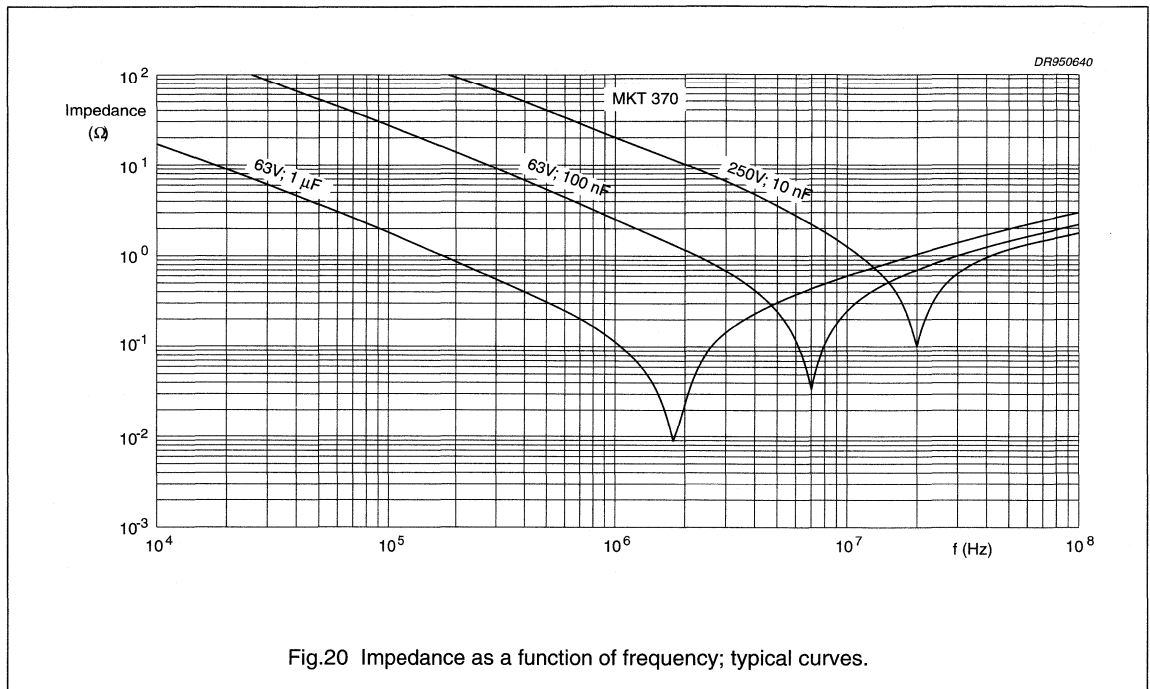
All capacitance values are specified at 1 kHz.



## Metallized polyester film capacitors

## MKT 370/371/372/373

## Impedance



## Temperature

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

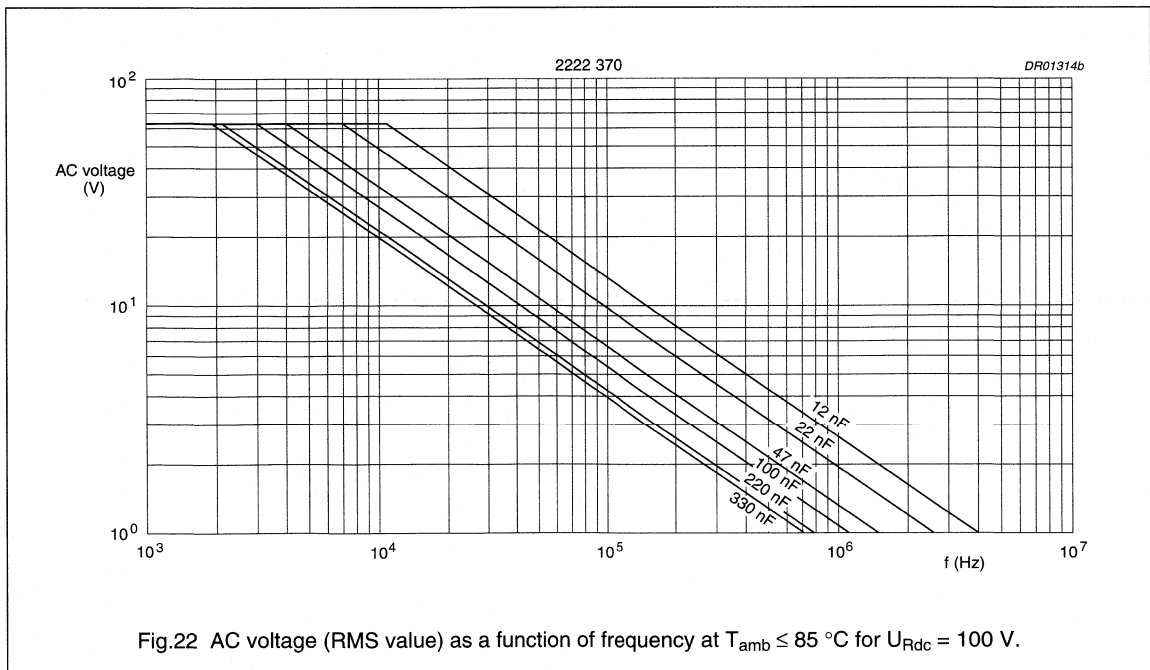
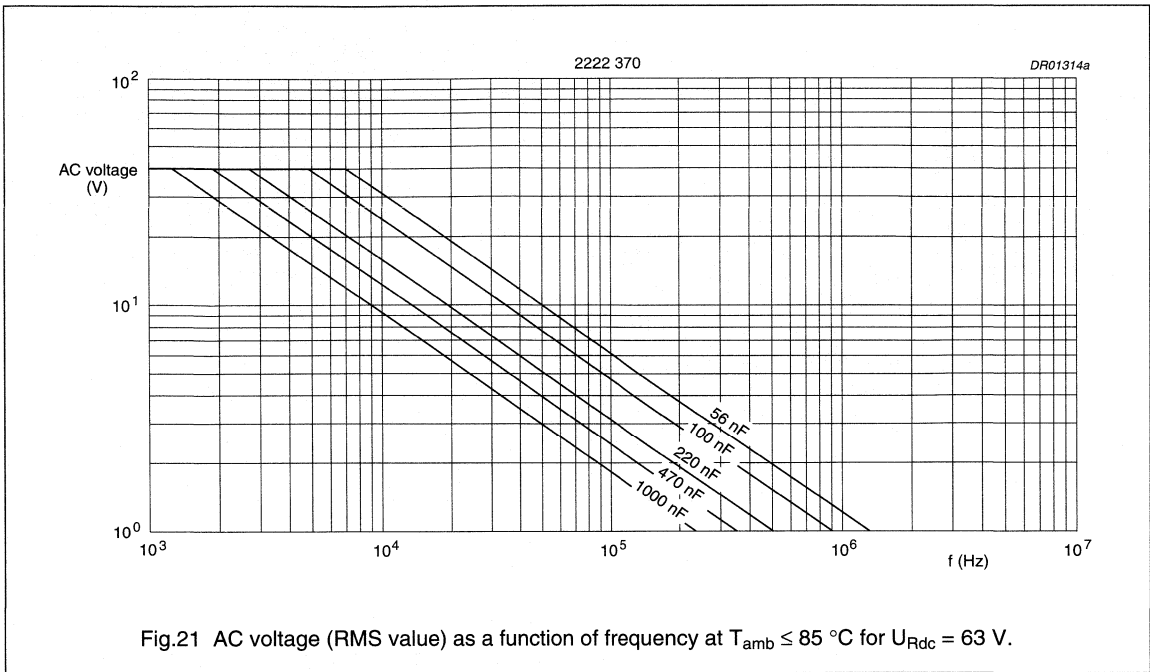
## Voltage

- Category voltage:  $U_c = 0.8 \times U_{Rdc}$
- Test voltage between leads:  $1.6 \times U_{Rdc}$
- Test voltage between interconnected leads and case (foil method):  $2 \times U_{Rdc}$  (min. 200 V).

Metallized polyester film capacitors

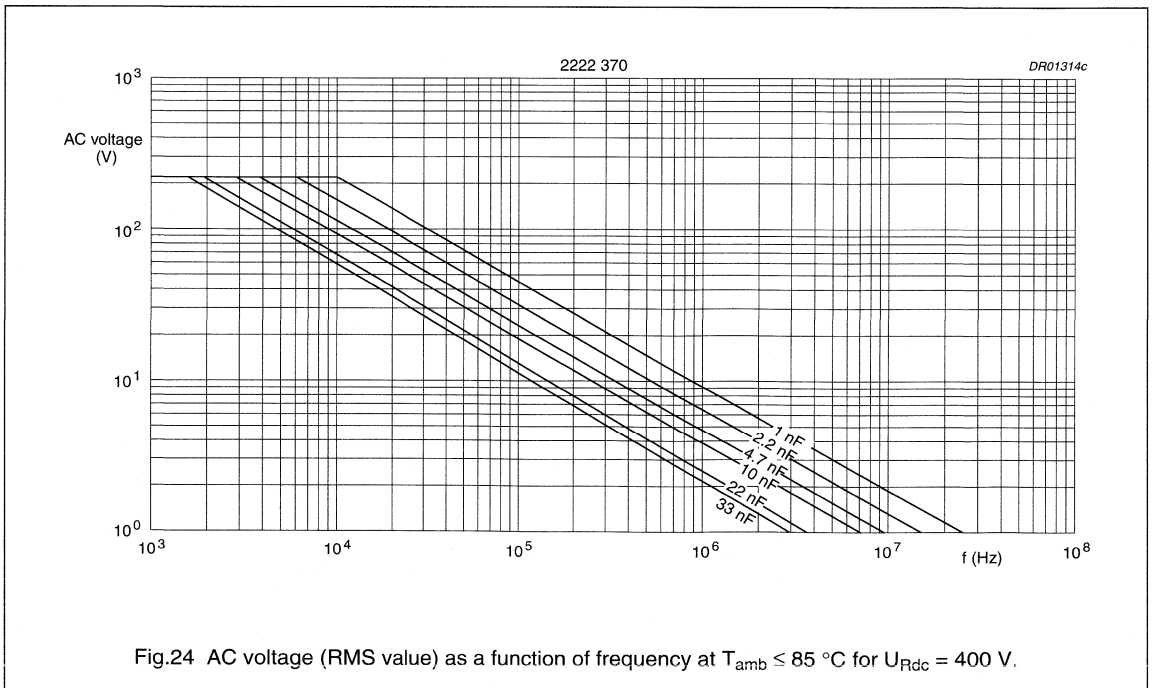
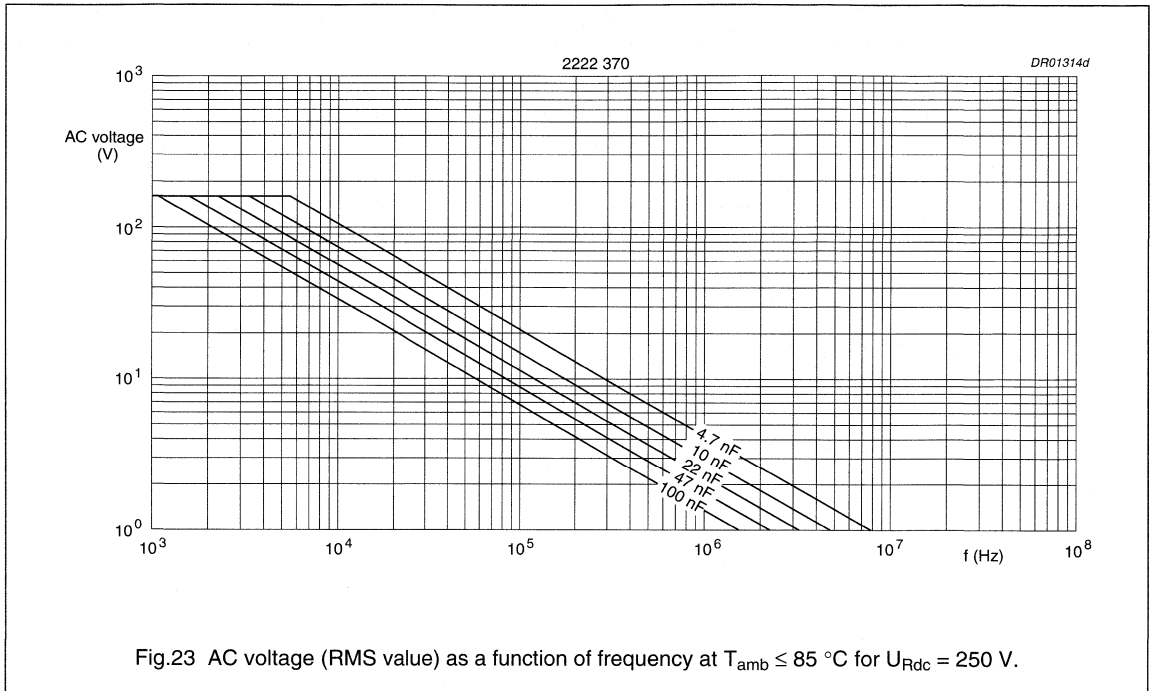
MKT 370/371/372/373

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



Metallized polyester film capacitors

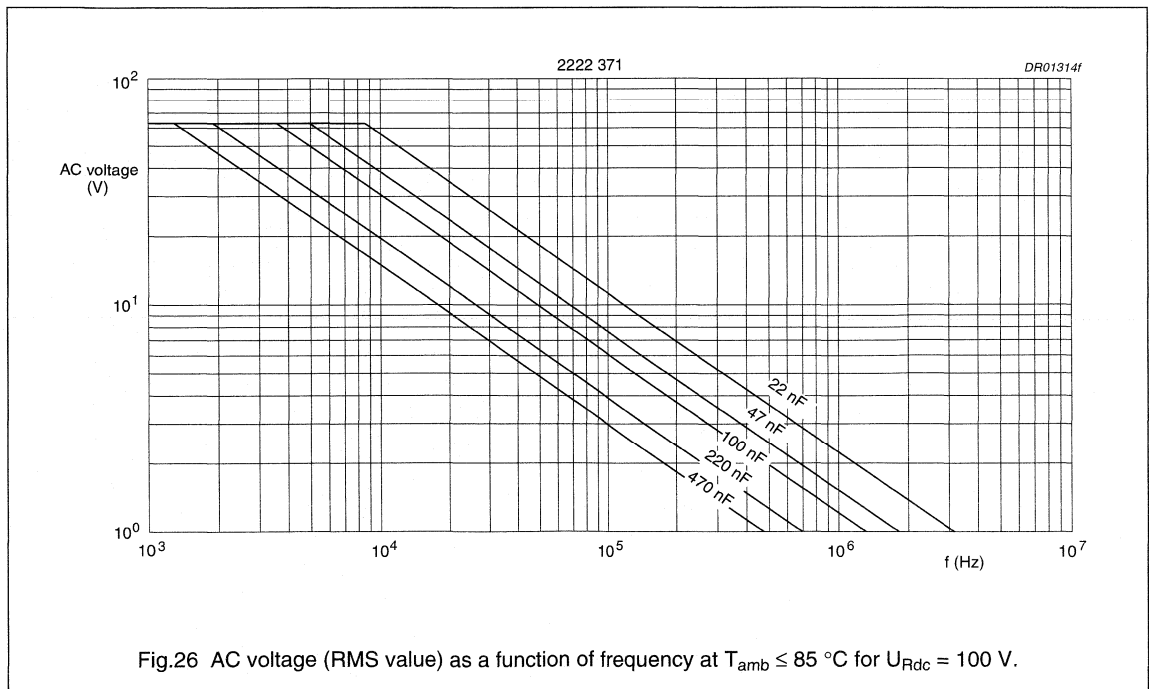
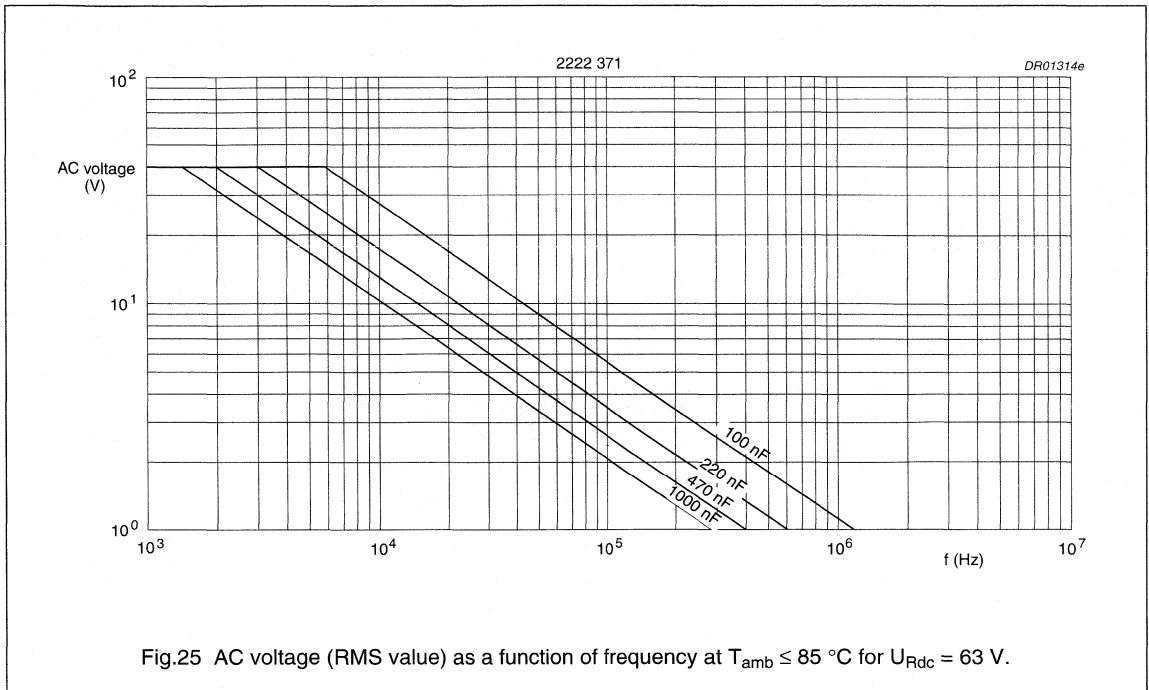
MKT 370/371/372/373





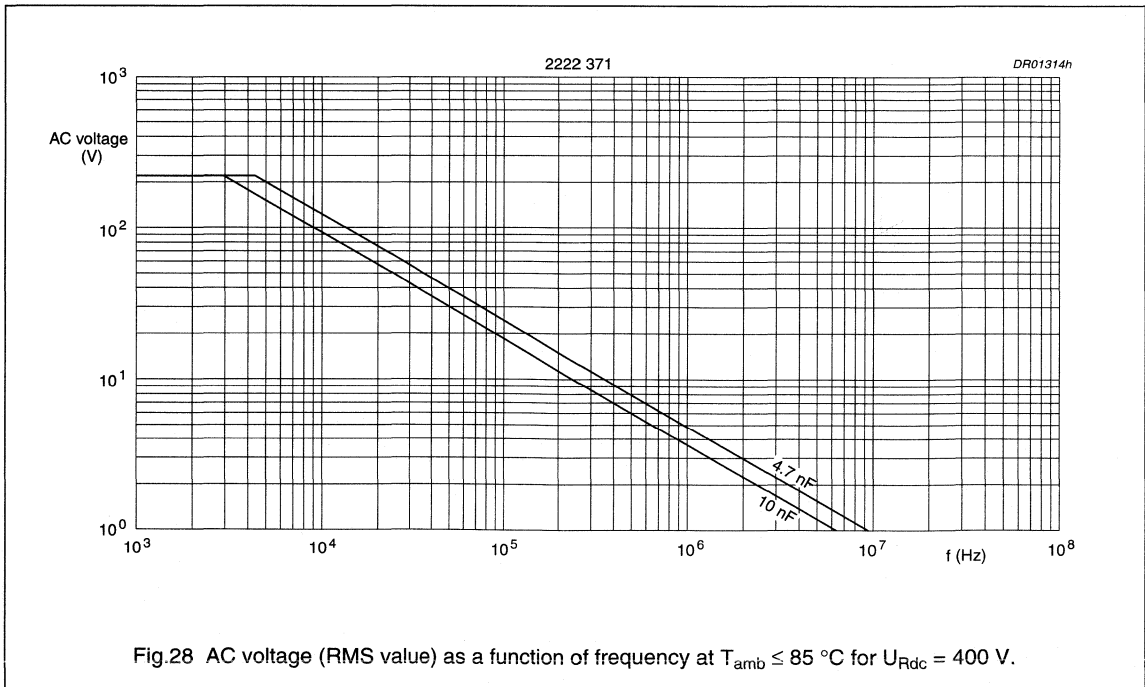
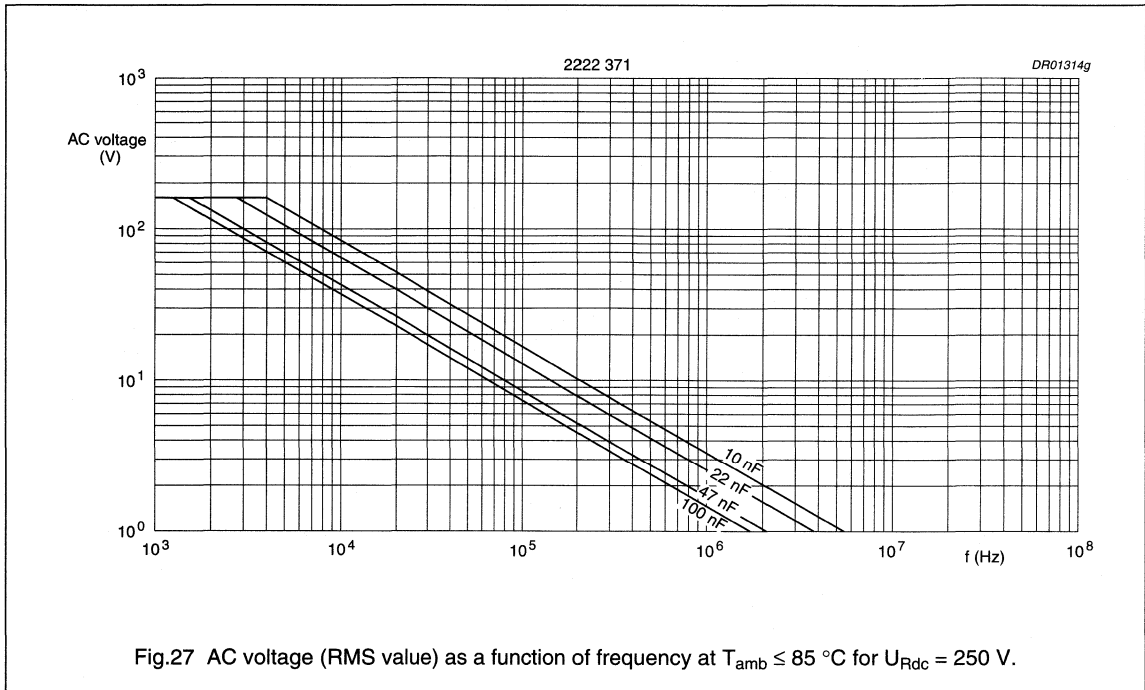
Metallized polyester film capacitors

MKT 370/371/372/373



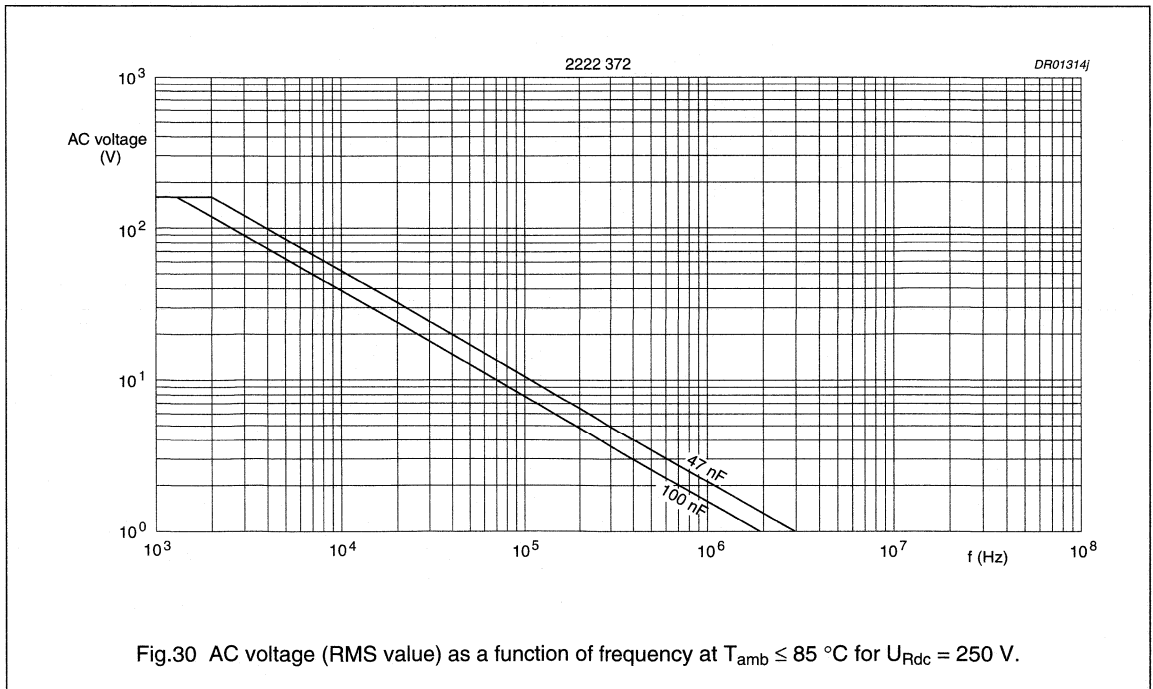
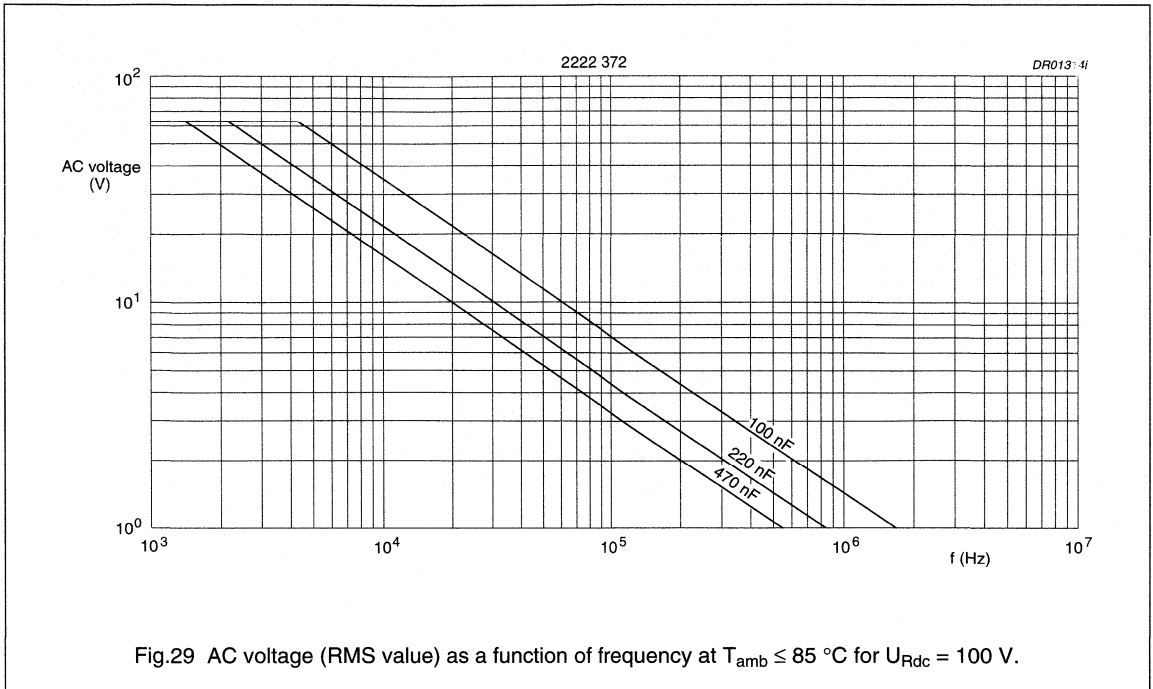
Metallized polyester film capacitors

MKT 370/371/372/373



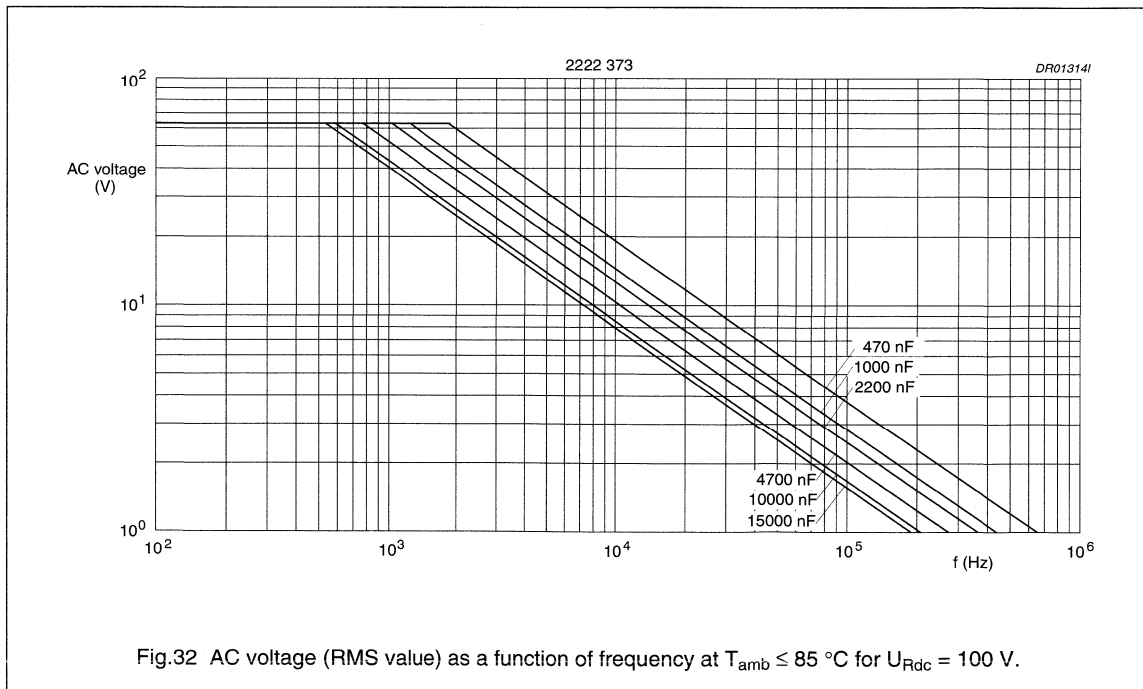
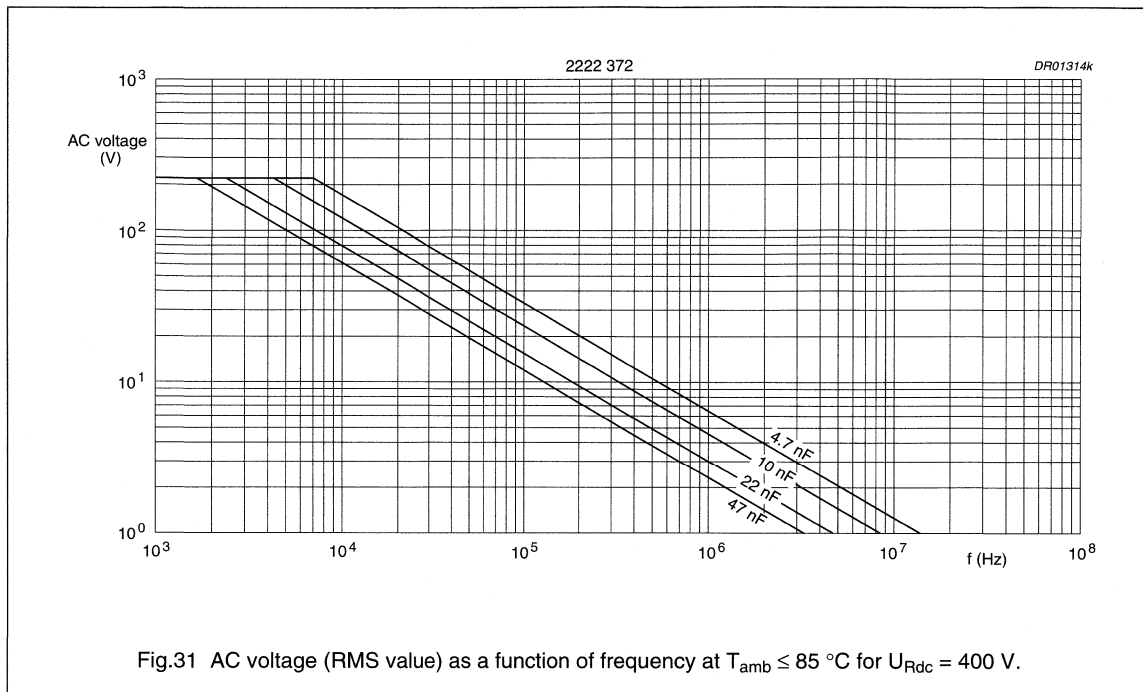
Metallized polyester film capacitors

MKT 370/371/372/373



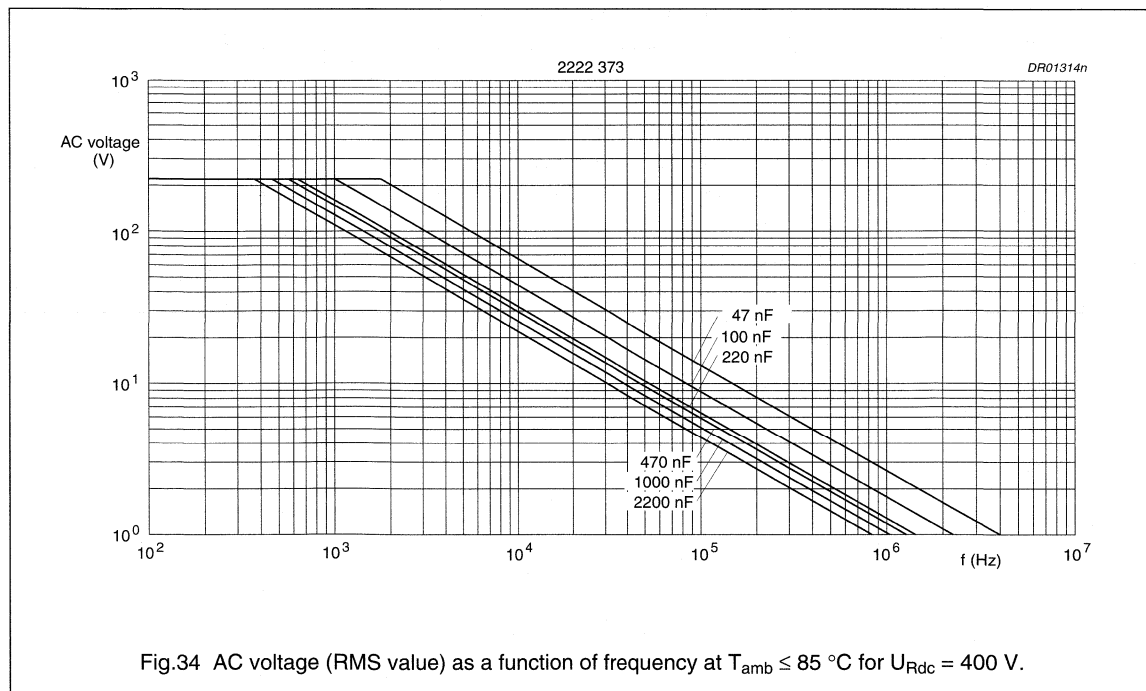
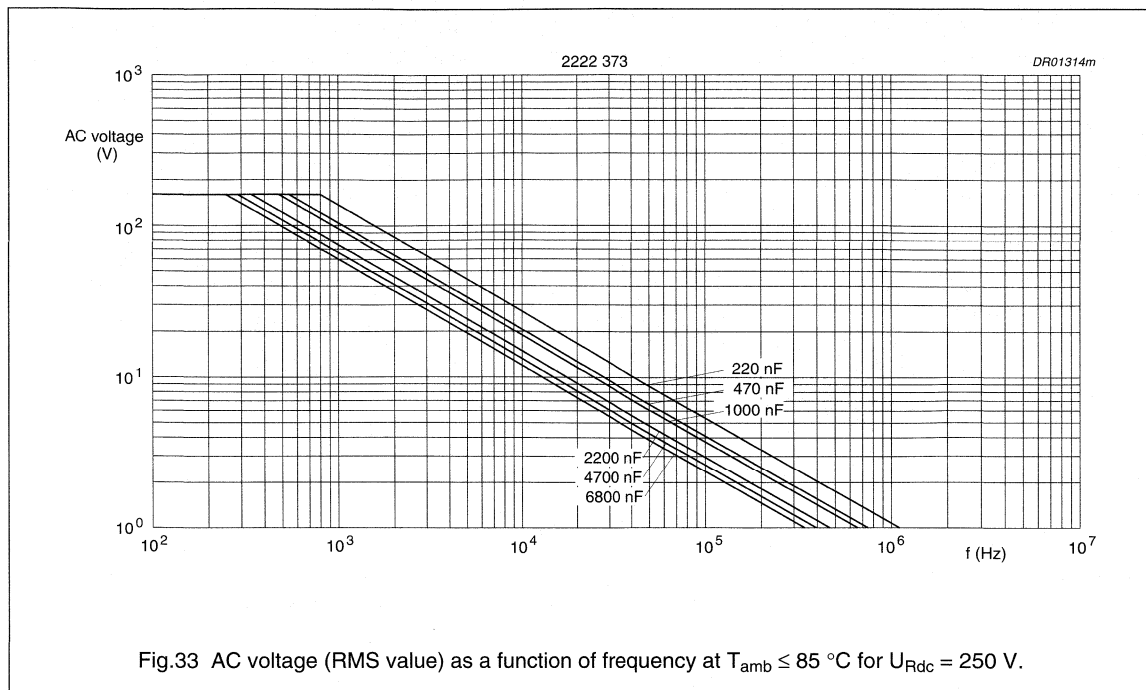
Metallized polyester film capacitors

MKT 370/371/372/373



Metallized polyester film capacitors

MKT 370/371/372/373



# Metallized polyester film capacitors

# MKT 370/371/372/373

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

The maximum RMS voltage in Figs 21 to 34 has to be multiplied by a factor given in Fig.35.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 38 and 39.

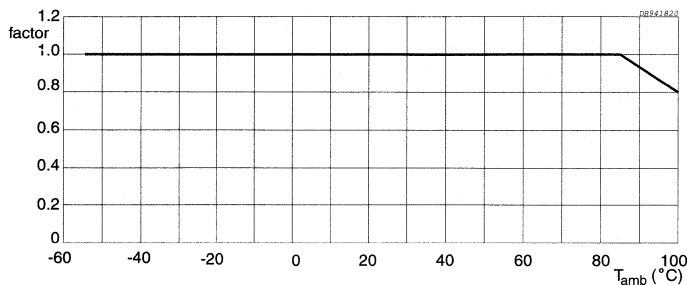


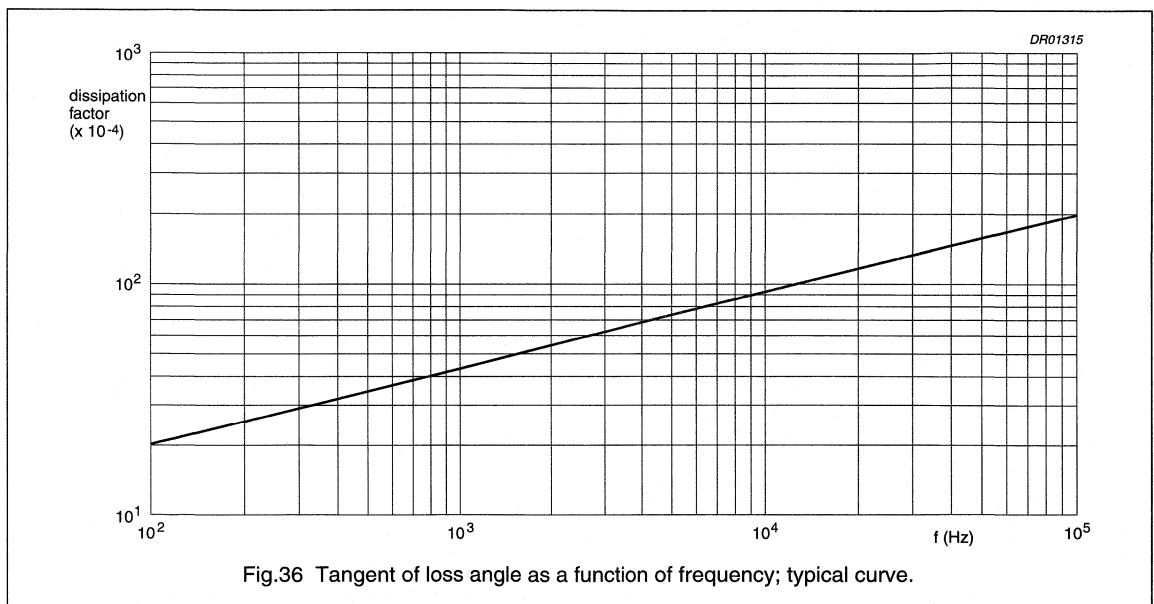
Fig.35 Multiplying factor as a function of temperature.

## Metallized polyester film capacitors

## MKT 370/371/372/373

## Tangent of loss angle

STYLE	CAPACITANCE	TANGENT OF LOSS ANGLE		
		at 1 kHz	at 10 kHz	at 100 kHz
2222 370	$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
	$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
2222 371	$0.47 \mu\text{F} < C \leq 1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	—
2222 372	$C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
	$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$
	$0.47 \mu\text{F} < C \leq 1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	—
2222 373	$1 \mu\text{F} < C \leq 10 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 150 \times 10^{-4}$	—
	$C > 10 \mu\text{F}$	$\leq 75 \times 10^{-4}$	—	—

Rated voltage pulse slope  $(dU/dt)_R$ 

RATED VOLTAGE $U_R$ (V)	MAXIMUM RATED PULSE LOAD (V/ $\mu\text{s}$ ) AS A FUNCTION OF PITCH <sup>(1)(2)</sup>					
	P = 5 mm	P = 7.5 mm	P = 10.0 mm	P = 15.0 mm	P = 22.5 mm	P = 27.5 mm
63	60	18	—	—	—	—
100	110	36	34	14	5	4
250	330	70	50	16	7	6
400	630	190	80	34	14	12

## Notes

1. The maximum pulse load values are valid for voltages equal to the rated voltage. For lower voltages the given values may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.
2. If the pulse requirement is satisfied, a check must be made to ensure that the maximum dissipation is not exceeded.

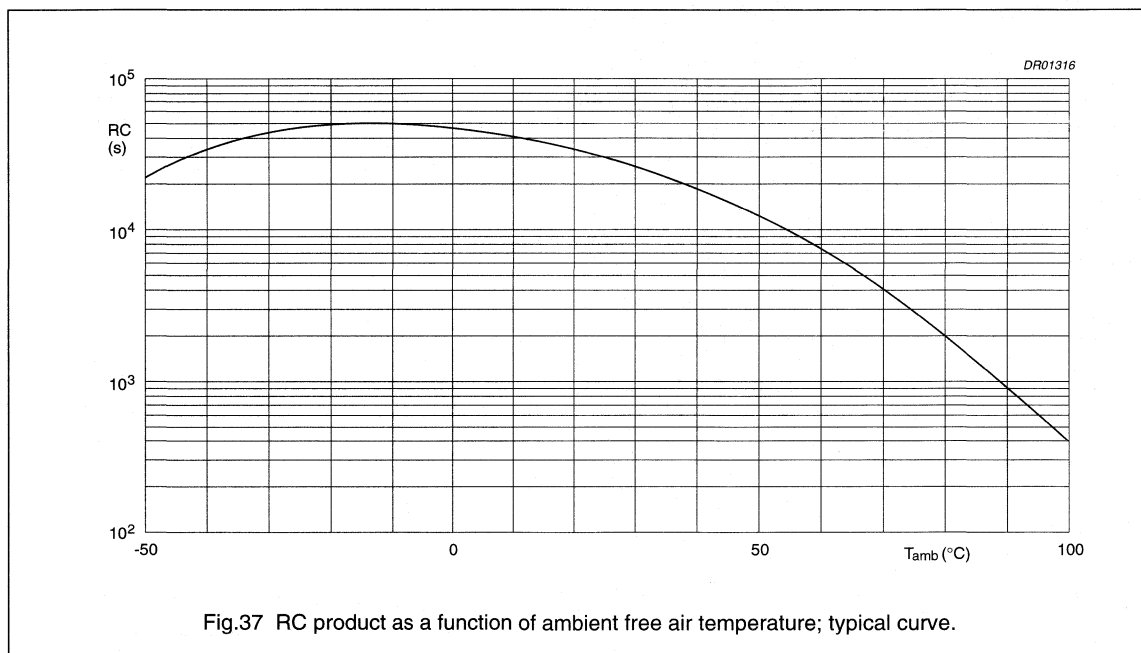
## Metallized polyester film capacitors

## MKT 370/371/372/373

**Insulation resistance**

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $10 \pm 1$  V for the 63 V version, and  $100 \pm 15$  V for the 100, 250 and 400 V versions:

- Resistance between leads, for  $C \leq 0.33 \mu\text{F}$ :
  - 63 and 100 V versions:  $>15000 \text{ M}\Omega$
  - 250 and 400 V versions:  $>30000 \text{ M}\Omega$
- RC time between leads, for  $C > 0.33 \mu\text{F}$ :
  - 63 and 100 V versions:  $>5000 \text{ s}$
  - 250 and 400 V versions:  $>10000 \text{ s}$
- Resistance between interconnected leads and case (foil method):  $>30000 \text{ M}\Omega$ .





# Metallized polyester film capacitors

# MKT 370/371/372/373

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Figs 38 and 39)

$d_{max}$ (mm)	PITCH (mm)					
	5	7.5	10	15	22.5	27.5
2.5	1	2	-	-	-	-
3.0	-	4	-	-	-	-
3.5	3	-	-	-	-	-
4.0	-	5	7	-	-	-
4.5	4	-	-	-	-	-
5.0	5	7	10	10	-	-
6.0	6	-	-	11	14	-
7.0	-	-	-	12	15	-
8.5	-	-	-	13	16	-
9.0	-	-	-	-	-	18
10.0	-	-	-	-	17	-
11.0	-	-	-	-	-	18
13.0	-	-	-	-	-	19
15.0	-	-	-	-	-	20
18.0	-	-	-	-	-	21

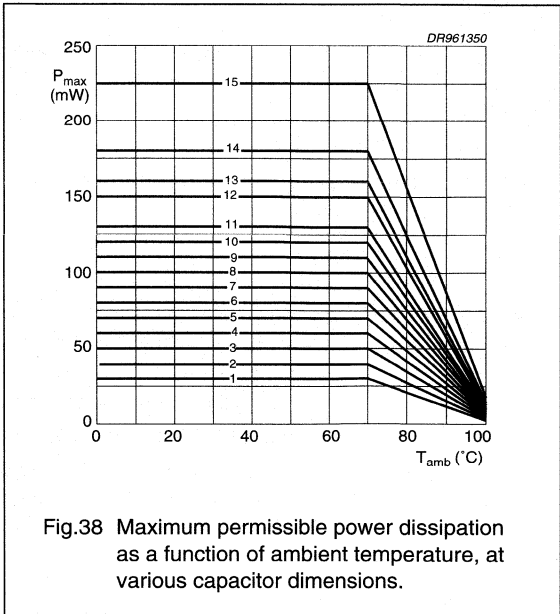


Fig.38 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

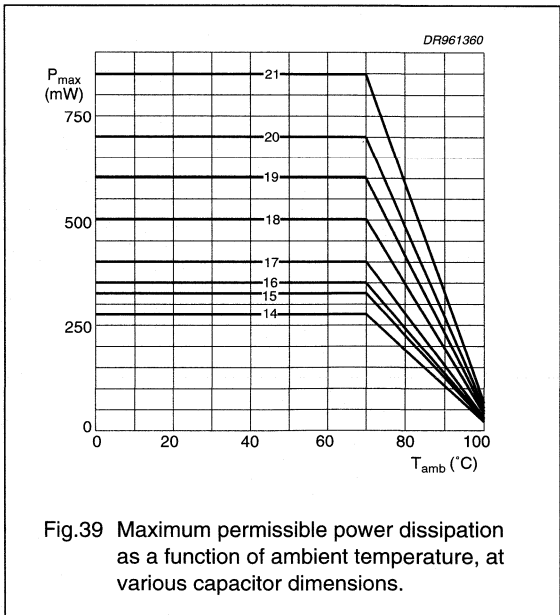


Fig.39 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

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**Metallized polyester film capacitors****MKT 370/371/372/373**

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**Application note**

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance:

$$I_{p\max} = C \left( \frac{dU}{dt} \right)_{\max}$$

Or the voltage pulse slope shall not exceed the rated voltage pulse slope. If the pulse voltage is lower than the rated voltage, the values (see Section "Rated voltage pulse slope ( $dU/dt$ )R" for more details) may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation shown in Figs 38 and 39.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.
6. Since all metallized polyethylene terephthalate film capacitors have an intrinsically active flammability risk after a capacitor breakdown (short circuit), it is recommended that for MKT styles the power to the component is limited to 10 times the maximum allowed power dissipation ( $P_{\max}$ ) during the short circuit failure mode of the capacitor.

## Metallized polyester film capacitors

## MKT 370/371/372/373

## MARKING

## Product marking

CAPACITORS WITH PITCH  $\leq 10$  mm: STYLES 2222 370, 2222 371, 2222 372

The capacitors are marked by laser print on the top with the following information:

1. Capacitance code in accordance with "IEC 62":  $n = nF$ ;  $\mu = \mu F$
2. Tolerance on rated capacitance:  $K = \pm 10\%$ ;  $J = \pm 5\%$ ;

and on the side with the following information:

1. Year and week of manufacture (e.g. 9210).
2. Rated voltage (DC) (e.g. 100 V).
3. Code for dielectric material (MKT).
4. Code for factory of origin (HQ)

CAPACITORS WITH PITCH 15 mm: STYLES 2222 373

The capacitors are marked by laser print on the top with the following information:

1. Rated capacitance code in accordance with "IEC 62":  $n = nF$ ;  $\mu = \mu F$
2. Tolerance on rated capacitance:  $K = \pm 10\%$ ;  $J = \pm 5\%$
3. Rated voltage (DC) (e.g. 100 V)
4. Manufacturer's type designation (373)
5. Code for dielectric material (MKT);

and on the side with the following information:

1. Manufacturer (PHILIPS)
2. Code for factory of origin (HQ)
3. Year and week of manufacture (e.g. 9210).

CAPACITORS WITH PITCH 22.5 AND 27.5 mm: STYLES 2222 373

The capacitors are marked on the top with the following information:

1. Rated capacitance code in accordance with "IEC 62":  $n = nF$ ;  $\mu = \mu F$
2. Tolerance on rated capacitance:  $K = \pm 10\%$ ;  $J = \pm 5\%$
3. Rated voltage (DC) (e.g. 100 V)
4. Manufacturer (PHILIPS)
5. Manufacturer's type designation (373)
6. Code for dielectric material (MKT)
7. Code for factory of origin (HQ)
8. Year and week of manufacture (e.g. 9210).

5. Manufacturer's type designation (e.g. 372)
6. Manufacturer (PHILIPS).

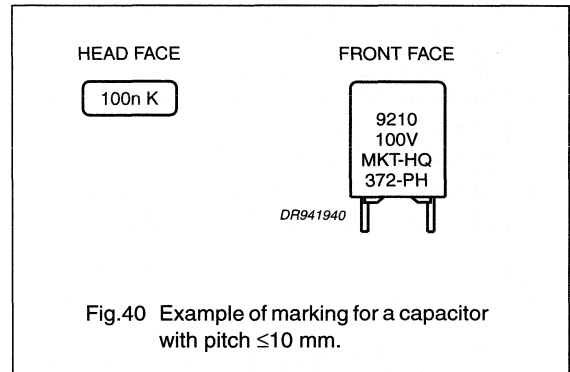


Fig.40 Example of marking for a capacitor with pitch  $\leq 10$  mm.

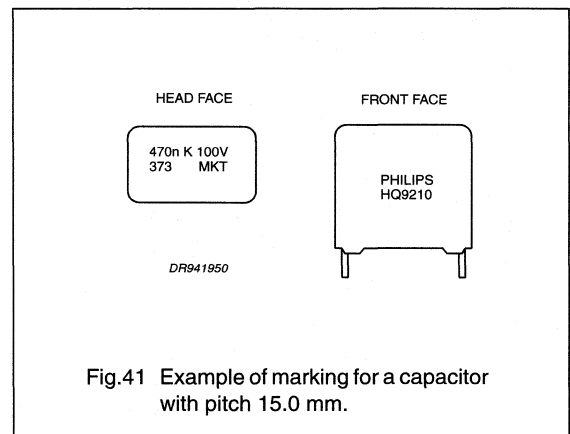


Fig.41 Example of marking for a capacitor with pitch 15.0 mm.

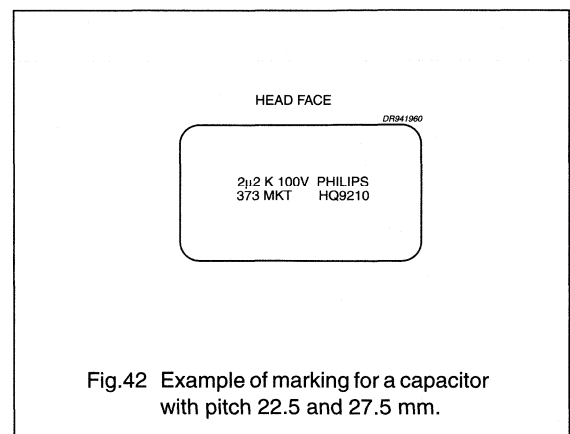


Fig.42 Example of marking for a capacitor with pitch 22.5 and 27.5 mm.

Metallized polyester film capacitors

MKT 370/371/372/373

Package marking

The package containing the capacitors is marked as shown in Fig.43.

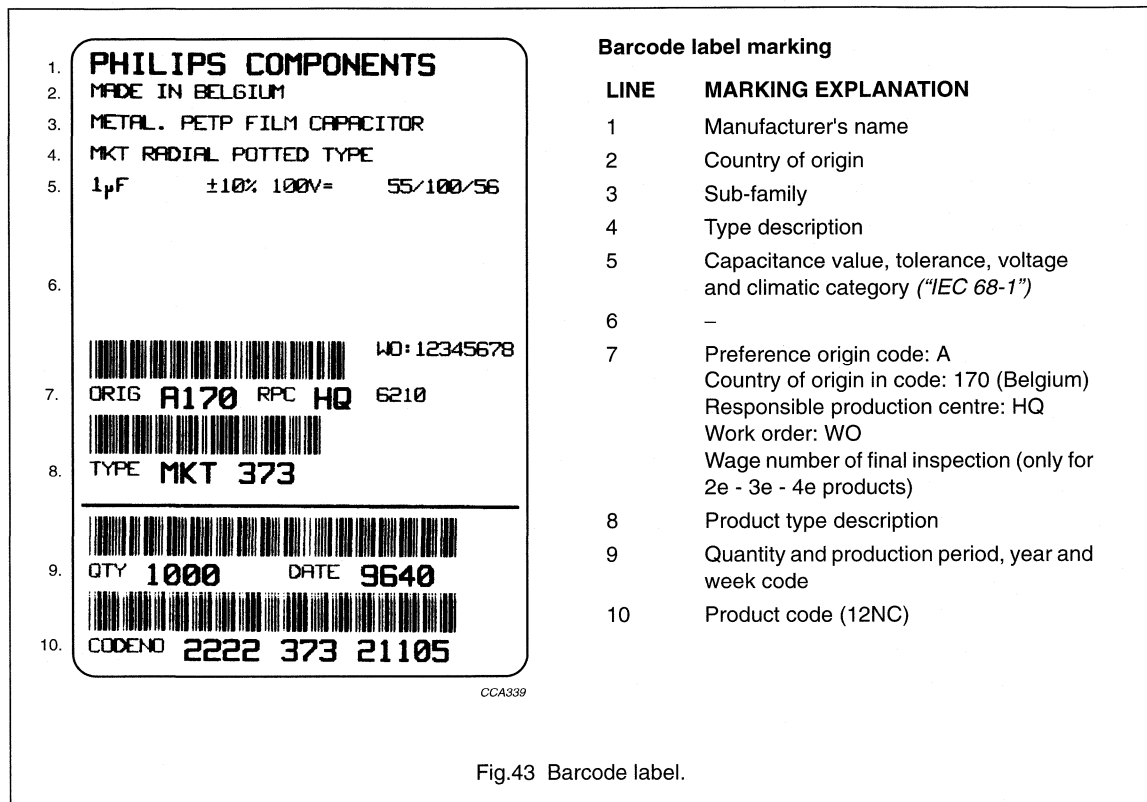


Fig.43 Barcode label.

## Metallized polyester film capacitors

MKT 370/371/372/373

**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  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 2\%$
Component solvent resistance		$\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 3\%$
Shock: "IEC 68-2-27"		$\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 100 °C	$ \Delta C/C  \leq 3\%$
Damp heat cyclic, test Db, first cycle: "IEC 68-2-30"		$\Delta \tan \delta \leq 50 \times 10^{-4}$ ; note 2
Cold: "IEC 68-2-1"	2 hours; -55 °C	$R_{\text{ins}} \geq 50\%$ of specified value
Damp heat, test Db, remaining cycles: "IEC 68-2-30"		

## Metallized polyester film capacitors

## MKT 370/371/372/373

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-2"	2000 hours; $1.25 \times U_{Rdc}$ ; 85 °C $1.25 \times U_{Cdc}$ ; 100 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 30 \times 10^{-4s}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-2"	2000 hours; 100 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
Endurance (AC) for capacitors with $\geq 200$ V (RMS): "IEC 384-2"	1000 h: $1.1 \times U_{Rac}$ ; 85 °C	$ \Delta C/C  \leq 8\%$ (style 370) $ \Delta C/C  \leq 5\%$ (style 371) $ \Delta C/C  \leq 3\%$ (style 372 and 373) $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
Resistance to detergents: "IEC 384-2"		$ \Delta C/C  \leq 1\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Resistance to soldering heat with preheating: "IEC 384-2"	body temperature: 100 °C; bath temperature: 260 °C; dwell time: 5 s	$ \Delta C/C  \leq 2\%$ ( $C \leq 10$ nF) $ \Delta C/C  \leq 1\%$ ( $C > 10$ nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
Passive flammability (styles 372 and 373): "IEC 695-2-2"	class C	no burning

**Notes**

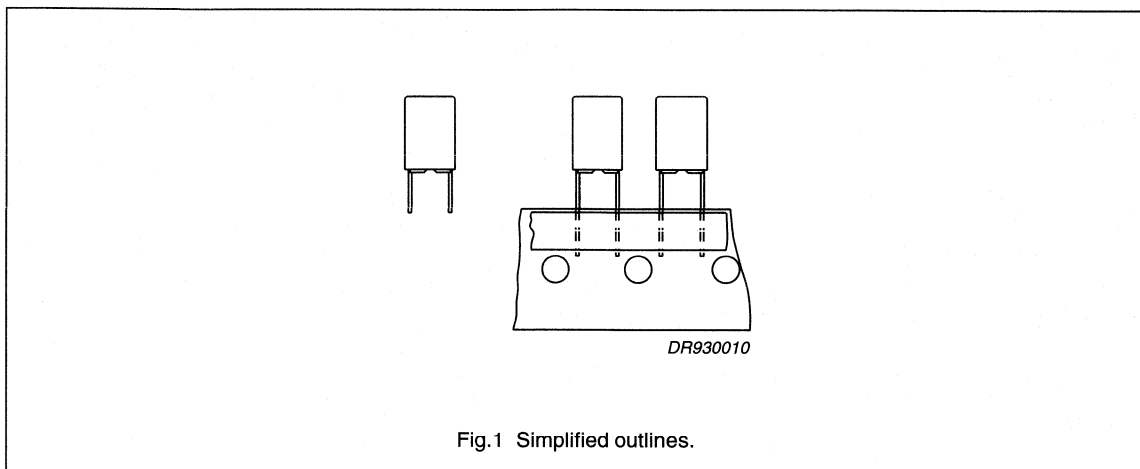
1. For detailed information, see "Type specification".
2. Measuring frequency 10 kHz.

# Metallized polyester film capacitors

# MKT 470

MKT RADIAL POTTED CAPACITORS

PITCH 5 mm



## FEATURES

- Low-inductive wound cell of metallized (PETP) film
- Potted with epoxy resin in a flame-retardant case
- Radial leads of solder-coated fecuma wire
- Withstands thermal shocks, oils, solvents and rinsing liquids
- Small stand-off pips to allow removal of solder flux
- Suitable for high density packaging.

## APPLICATIONS

- Blocking and coupling of signals
- Bypass and energy reservoir
- Filter networks
- Pulse circuits
- Heavy duty and automotive
- Where high reliability is required.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series)	0.001 to 1.2 $\mu$ F
Capacitance tolerance	$\pm 10\%$ ; $\pm 5\%$
Rated voltage (DC)	63 V; 100 V; 250 V; 400 V
Climatic category	55/125/56
Maximum application temperature	125 °C
Rated temperature	85 °C
Tangent of loss angle at 100 kHz	$150 \times 10^{-4}$
Reference specification	IEC 384-2
Performance grade	grade 1 (long life)

Metallized polyester film capacitors

MKT 470

MKT 470 GENERAL DATA

PITCH 5 mm

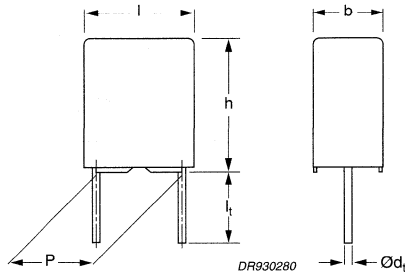


Fig.2 Outline.

Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 240 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.2 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	100 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

Available 63 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 470 75...	preferred
		$\pm 5\%$	2222 470 76...	preferred
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 470 11...	on request
		$\pm 5\%$	2222 470 12...	on request
	$l_t = 26.0 \pm 1.0$ mm	$\pm 10\%$	2222 470 15...	on request
		$\pm 5\%$	2222 470 16...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 470 18...	on request
		$\pm 5\%$	2222 470 19...	on request

Note

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



## Metallized polyester film capacitors

MKT 470

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 470 ..... AND PACKAGING						
			AMMOPACK			REEL	LOOSE IN BOX		
			H = 18.5 mm			SPQ	SPQ	$l_t =$ 4.0 mm	$l_t =$ 26.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ			SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$					
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>									
0.068	2.5 $\times$ 6.5 $\times$ 7.2	0.25	75683	76683	2000	2000	2000	1000	
0.082			75823	76823					
0.1			75104	76104					
0.12	3.5 $\times$ 8.0 $\times$ 7.2	0.35	75124	76124	1500	1500	2000	1000	
0.15			75154	76154					
0.18			75184	76184					
0.22			75224	76224					
0.27			75274	76274					
0.33			75334	76334					
0.39			75394	76394					
0.47	4.5 $\times$ 9.5 $\times$ 7.2	0.45	75474	76474	1000	1000	2000	1000	
0.56			75564	76564					
0.68			75684	76684					
0.82	6.0 $\times$ 11.0 $\times$ 7.2	0.60	75824	76824	750	1000	2000	1000	
1			75105	76105					
1.2			75125	76125					

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 470

## MKT 470 GENERAL DATA

PITCH 5 mm

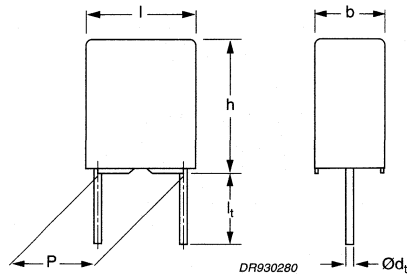


Fig.3 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 240 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 0.56 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	160 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	>15000 M $\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	>5000 s		

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 470 85...	preferred
		$\pm 5\%$	2222 470 86...	preferred
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 470 21...	on request
		$\pm 5\%$	2222 470 22...	on request
	$l_t = 26.0 \pm 1.0$ mm	$\pm 10\%$	2222 470 25...	on request
		$\pm 5\%$	2222 470 26...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 470 28...	on request
		$\pm 5\%$	2222 470 29...	on request

## Note

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

## Metallized polyester film capacitors

MKT 470

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 470 ..... AND PACKAGING						
			AMMOPACK			REEL	LOOSE IN BOX		
			H = 18.5 mm			SPQ	SPQ	$l_t =$ 4.0 mm	$l_t =$ 26.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ			SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$					
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>									
0.022	2.5 × 6.5 × 7.2	0.25	85223	86223	2000	2000	2000	1000	
0.027			85273	86273					
0.033			85333	86333					
0.039			85393	86393					
0.047			85473	86473					
0.056			85563	86563					
0.068	3.5 × 8.0 × 7.2	0.35	85683	86683	1500	1500	2000	1000	
0.082			85823	86823					
0.1			85104	86104					
0.12			85124	86124					
0.15	4.5 × 9.5 × 7.2	0.45	85154	86154	1000	1000	2000	1000	
0.18			85184	86184					
0.22			85224	86224					
0.27			85274	86274					
0.33	6.0 × 11.0 × 7.2	0.65	85334	86334	750	1000	2000	1000	
0.39			85394	86394					
0.47			85474	86474					
0.56			85564	86564					

**Note**

1. The shading indicates preferred types.

## Metallized polyester film capacitors

MKT 470

## MKT 470 GENERAL DATA

PITCH 5 mm

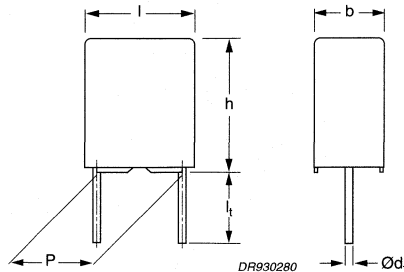


Fig.4 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$ $0.1 \mu\text{F} < C \leq 0.12 \mu\text{F}$	$\leq 60 \times 10^{-4}$ $\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$ $\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$ $\leq 240 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	400 V/ $\mu\text{s}$		
R between leads	>15000 M $\Omega$		

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 470 35...	preferred
		$\pm 5\%$	2222 470 36...	preferred
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 470 41...	on request
		$\pm 5\%$	2222 470 42...	on request
	$l_t = 26.0 \pm 1.0$ mm	$\pm 10\%$	2222 470 45...	on request
		$\pm 5\%$	2222 470 46...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 470 48...	on request
		$\pm 5\%$	2222 470 49...	on request

## Note

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

## Metallized polyester film capacitors

MKT 470

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 470 ..... AND PACKAGING					
			AMMOPACK			REEL	LOOSE IN BOX	
			H = 18.5 mm				$l_t =$ 4.0 mm	$l_t =$ 26.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	SPQ	SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$				
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>								
0.01	2.5 × 6.5 × 7.2	0.25	35103	36103	2000	2000	2000	1000
0.012			35123	36123				
0.015			35153	36153				
0.018			35183	36183				
0.022	3.5 × 8.0 × 7.2	0.35	35223	36223	1500	1500	2000	1000
0.027			35273	36273				
0.033			35333	36333				
0.039			35393	36393				
0.047	4.5 × 9.5 × 7.2	0.45	35473	36473	1000	1000	2000	1000
0.056			35563	36563				
0.068			35683	36683				
0.082	6.0 × 11.0 × 7.2	0.60	35823	36823	750	1000	2000	1000
0.1			35104	36104				
0.12			35124	36124				

**Note**

1. The shading indicates preferred types.

Metallized polyester film capacitors

MKT 470

MKT 470 GENERAL DATA

PITCH 5 mm

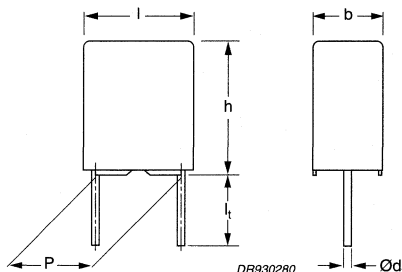


Fig.5 Outline.

Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.047 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	800 V/ $\mu\text{s}$		
R between leads	>15000 M $\Omega$		

Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 470 65...	preferred
		$\pm 5\%$	2222 470 66...	preferred
Loose in box	$l_t = 4.0 +1.0/-0.5$ mm	$\pm 10\%$	2222 470 51...	on request
		$\pm 5\%$	2222 470 52...	on request
	$l_t = 26.0 \pm 1.0$ mm	$\pm 10\%$	2222 470 55...	on request
		$\pm 5\%$	2222 470 56...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 470 58...	on request
		$\pm 5\%$	2222 470 59...	on request

Note

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

## Metallized polyester film capacitors

MKT 470

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 470 ..... AND PACKAGING						
			AMMOPACK			REEL	LOOSE IN BOX		
			H = 18.5 mm			SPQ	SPQ	$l_t =$ 4.0 mm	$l_t =$ 26.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ			SPQ	SPQ
			C-tol = $\pm 10\%$	C-tol = $\pm 5\%$					
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>									
0.001	$2.5 \times 6.5 \times 7.2$	0.25	65102	66102	2000	2000	2000	1000	
0.0012			65122	66122					
0.0015			65152	66152					
0.0018			65182	66182					
0.0022			65222	66222					
0.0027			65272	66272					
0.0033			65332	66332					
0.0039			65392	66392					
0.0047			65472	66472					
0.0056			65562	66562					
0.0068			65682	66682					
0.0082	65822	66822							
0.01	$3.5 \times 8.0 \times 7.2$	0.35	65103	66103	1500	1500	2000	1000	
0.012			65123	66123					
0.015			65153	66153					
0.018	$4.5 \times 9.5 \times 7.2$	0.45	65183	66183	1000	1000	2000	1000	
0.022			65223	66223					
0.027			65273	66273					
0.033	$6.0 \times 11.0 \times 7.2$	0.60	65333	66333	750	1000	2000	1000	
0.039			65393	66393					
0.047			65473	66473					

**Note**

1. The shading indicates preferred types.

# Metallized polyester film capacitors

MKT 470

## CONSTRUCTION

### Description

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

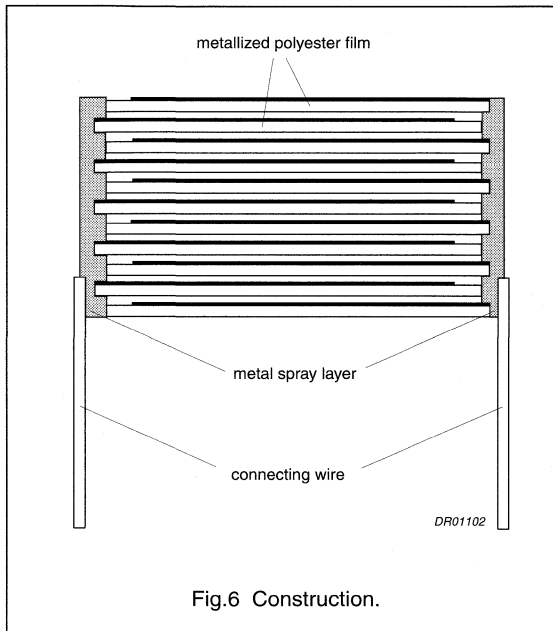


Fig.6 Construction.

### 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 TEST

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.

### SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD

The maximum length and width of film capacitors is shown in Fig.7:

- Eccentricity see Fig.7. The maximum eccentricity is smaller than or equal to the wire diameter of the product concerned.
- Product height with seating plane as given by "IEC 717" as reference:  $h_{max} \leq h + 0.3 \text{ mm}$ .

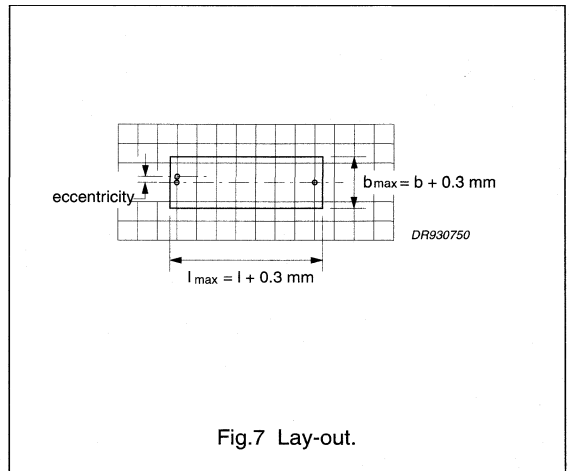


Fig.7 Lay-out.

## RATINGS AND CHARACTERISTICS

Unless otherwise specified, all electrical values apply to an ambient free air temperature of  $23 \pm 1^\circ\text{C}$ , 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%.

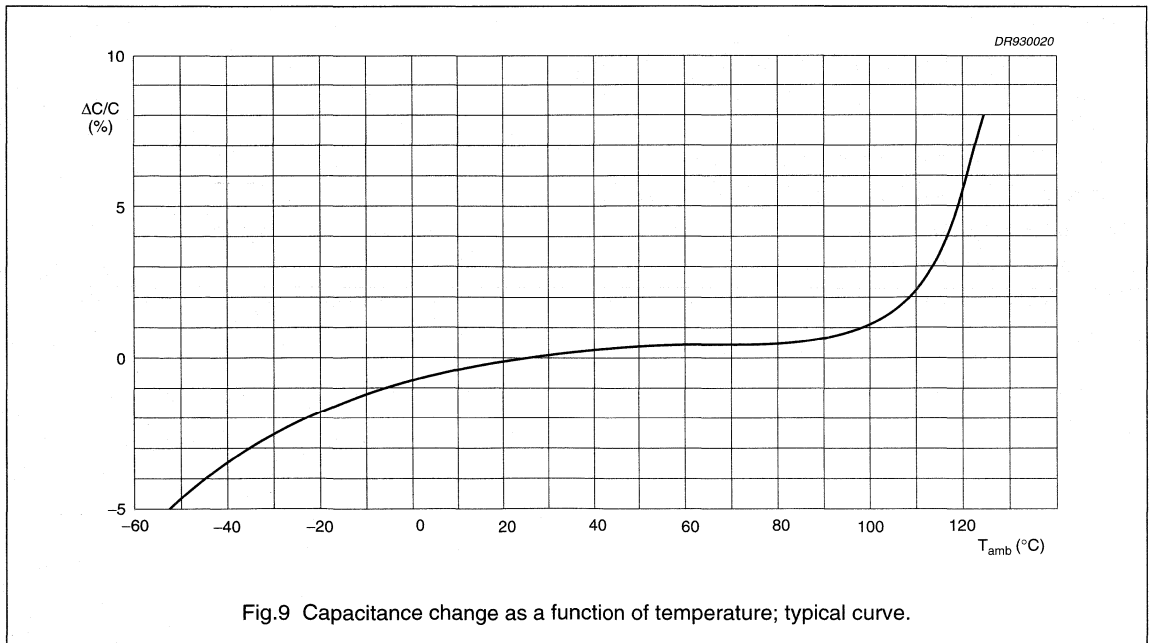
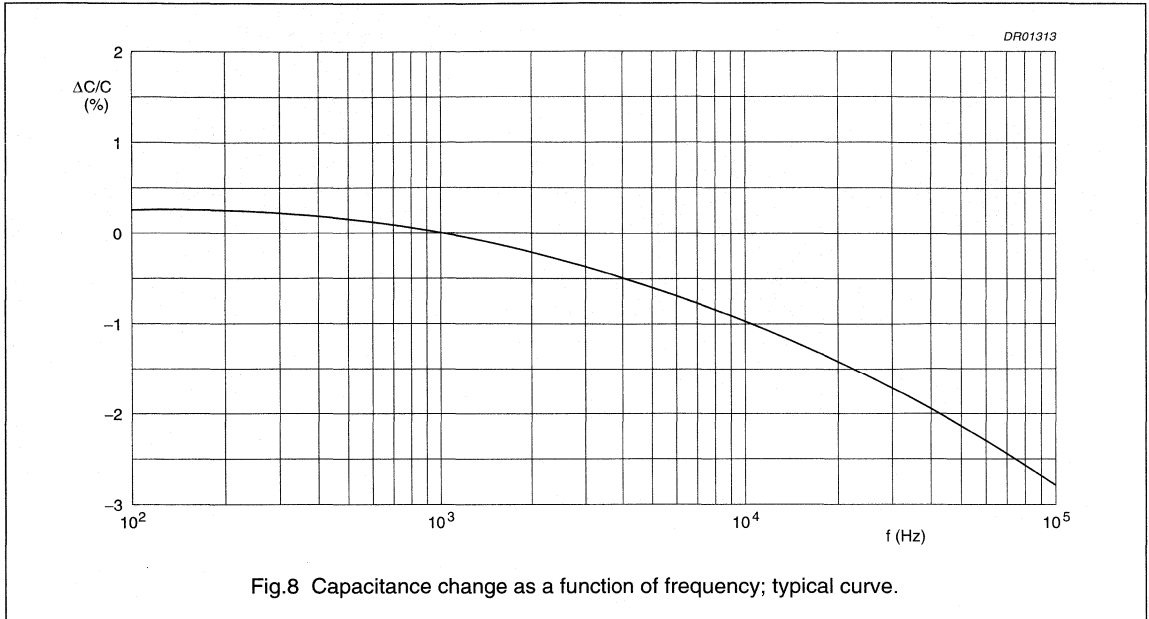


# Metallized polyester film capacitors

MKT 470

## Capacitance

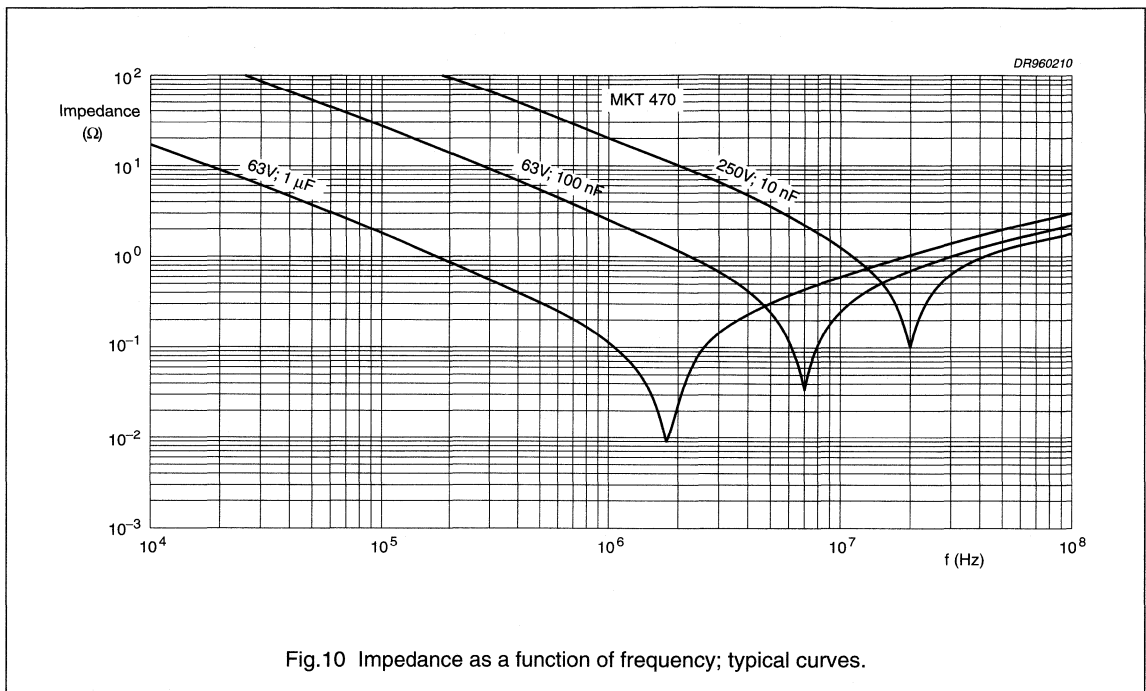
All capacitance values are specified at 1 kHz.



## Metallized polyester film capacitors

MKT 470

## Impedance



## Temperature

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

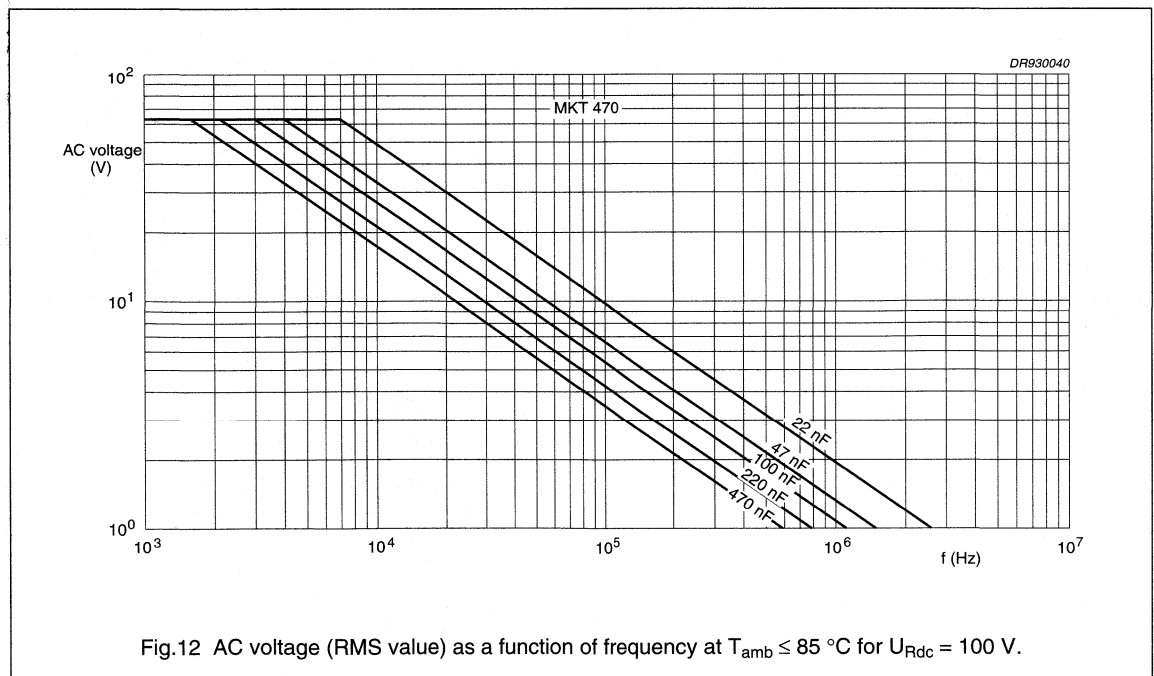
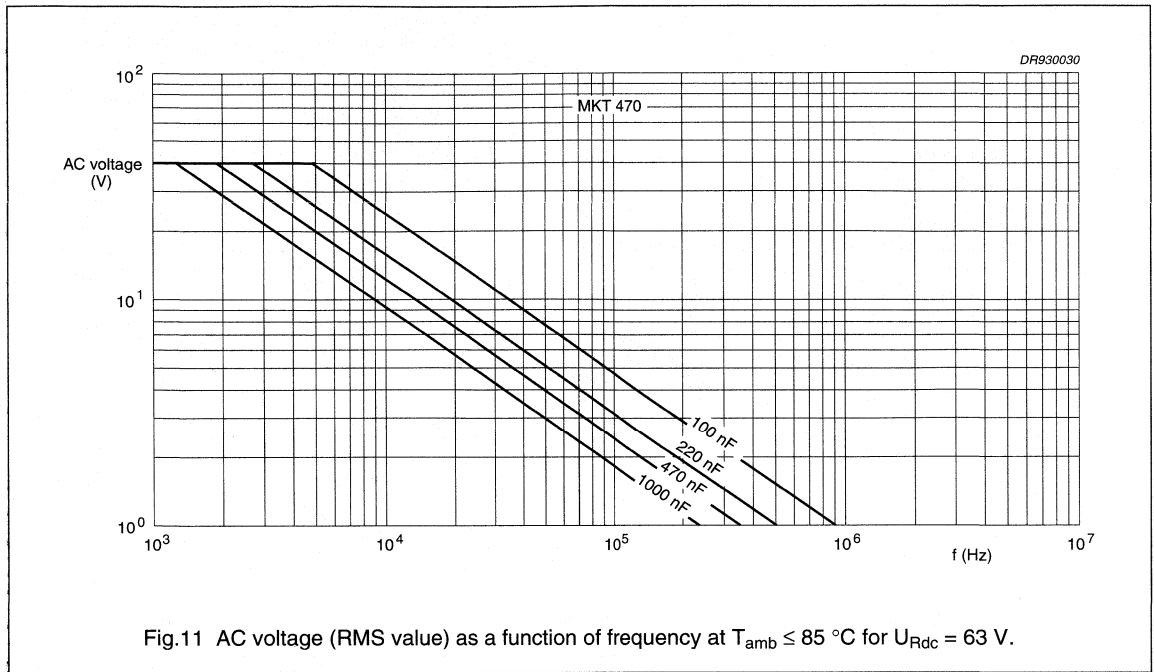
## Voltage

- Up to 85 °C: operating voltage = rated voltage
- Above 85 °C, DC and AC voltage derating is 1.25%/°C
- Category voltage:  $U_c = 0.5 \times U_{Rdc}$
- Test voltage between leads:  $1.6 \times U_{Rdc}$
- Test voltage between interconnected leads and case (foil method):  $2 \times U_{Rdc}$  (min. 200 V).

# Metalized polyester film capacitors

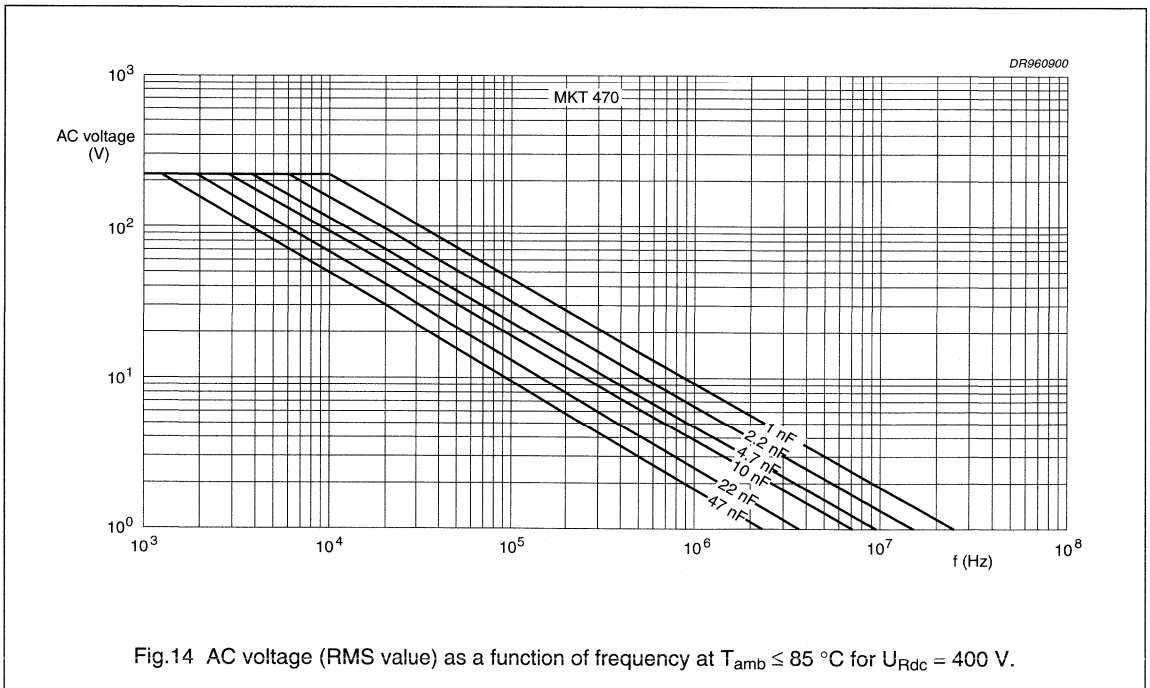
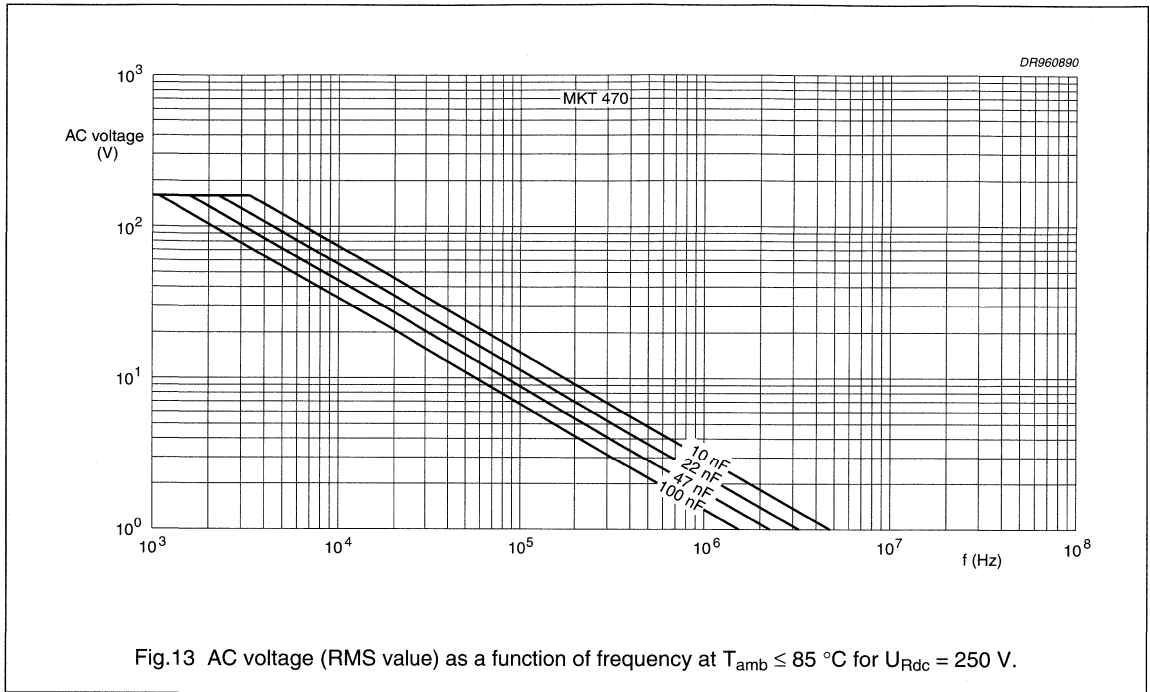
MKT 470

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



Metallized polyester film capacitors

MKT 470



## Metallized polyester film capacitors

MKT 470

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

The maximum RMS voltage in Figs 11 to 14 has to be multiplied by a factor given in Fig.15.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Fig.18.

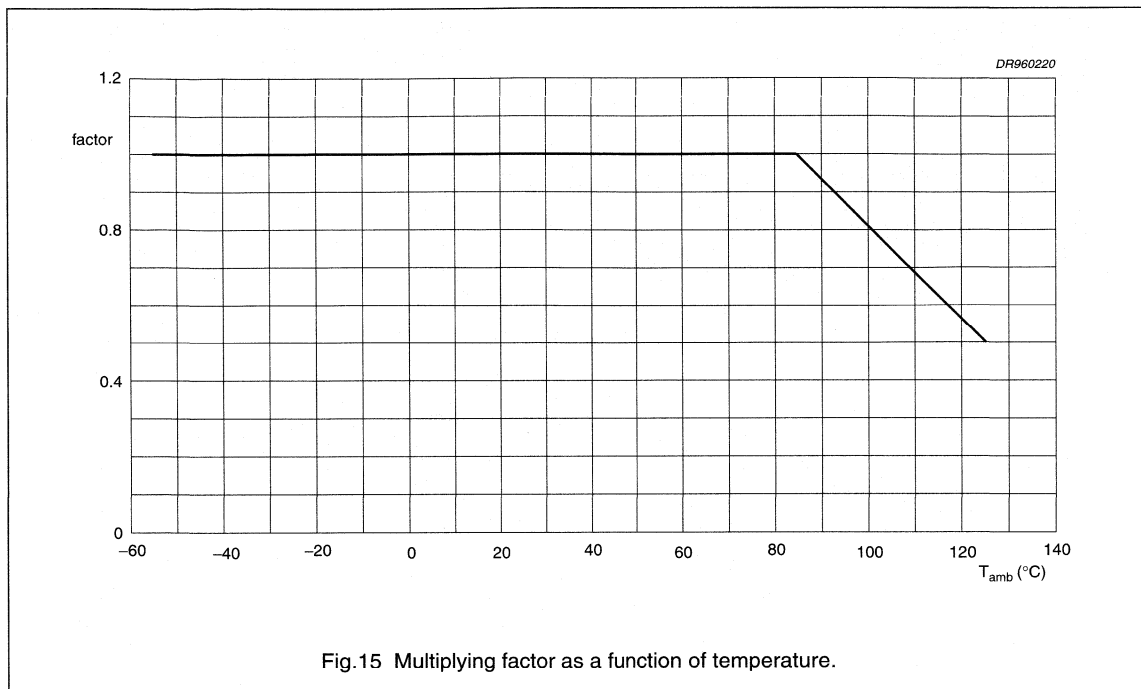


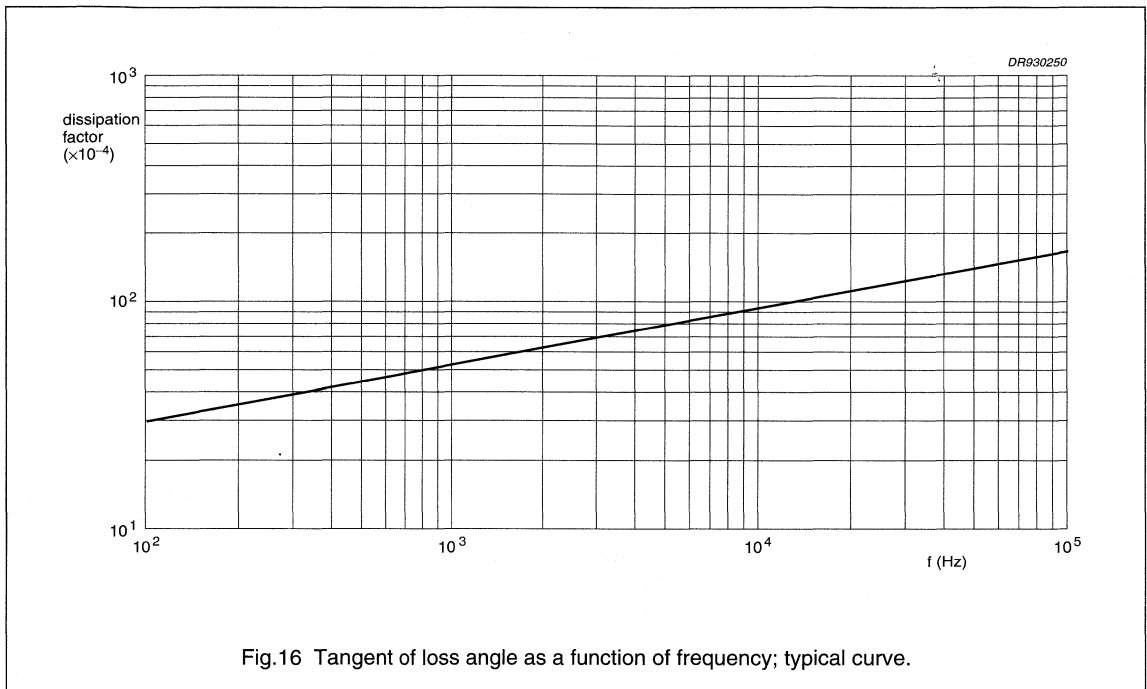
Fig.15 Multiplying factor as a function of temperature.

## Metallized polyester film capacitors

MKT 470

## Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE		
	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 0.1 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 240 \times 10^{-4}$
$0.47 \mu\text{F} < C \leq 1.2 \mu\text{F}$	$\leq 60 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	–

Rated voltage pulse slope  $(dU/dt)_R$ 

RATED VOLTAGE $U_R$ (V)	MAXIMUM RATED PULSE LOAD $(V/\mu\text{s})^{(1)(2)}$
63	100
100	160
250	400
400	800

## Notes

- The maximum pulse load values are valid for voltages equal to the rated voltage. For peak-to-peak voltages lower than  $U_{Rdc}$ , the given values may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.
- If the pulse requirement is satisfied, a check must be made to ensure that the maximum dissipation is not exceeded.

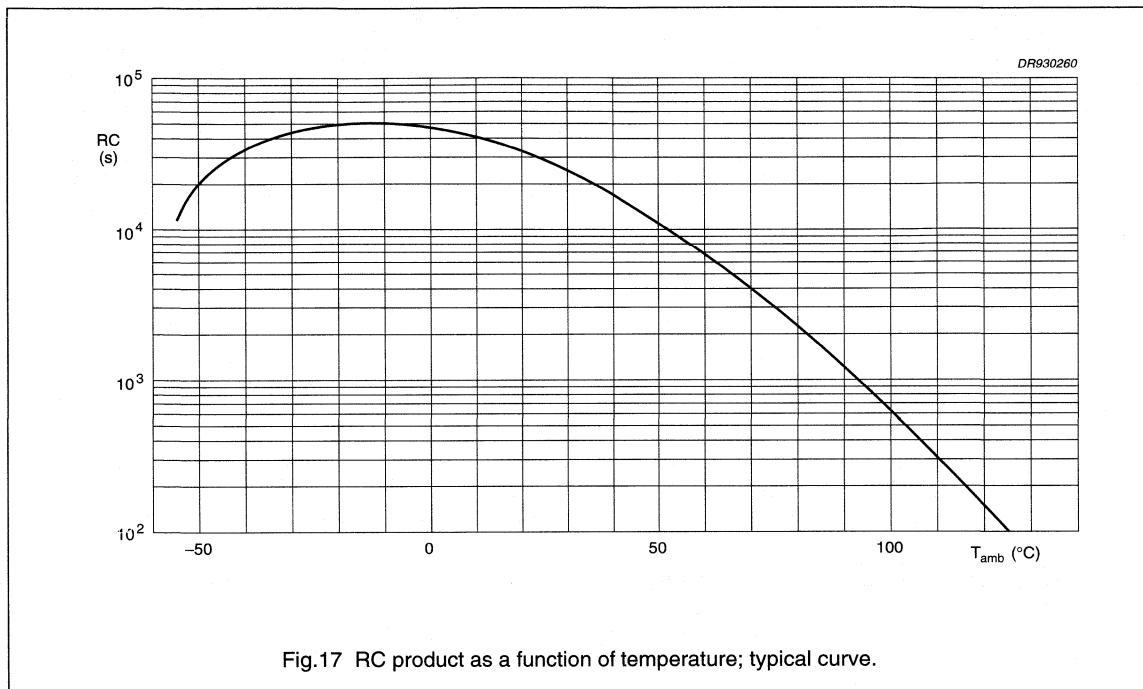
## Metallized polyester film capacitors

MKT 470

**Insulation resistance**

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $10 \pm 1$  V for the 63 V version, and  $100 \pm 15$  V for the 100, 250 and 400 V versions:

- Resistance between leads, for  $C \leq 0.33 \mu\text{F}$ :  $>15000 \text{ M}\Omega$
- RC time between leads, for  $C > 0.33 \mu\text{F}$ :  $>5000 \text{ s}$
- Resistance between interconnected leads and case (foil method):  $>30000 \text{ M}\Omega$ .



# Metalized polyester film capacitors

MKT 470

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Fig.18)

$b_{max}$ (mm)	5 mm pitch
2.5	1
3.5	2
4.5	3
6.0	4

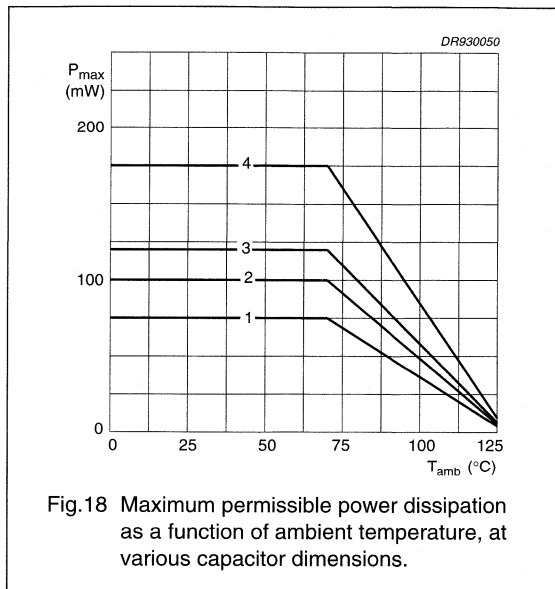


Fig.18 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

## Application note

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance:

$$I_{p \max} = C \left( \frac{dU}{dt} \right)_{\max}$$

Or the voltage pulse slope shall not exceed the rated voltage pulse slope. If the pulse voltage is lower than the rated voltage, the values (see Section "Rated voltage pulse slope ( $dU/dt$ )R" for more details) may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation stated in Fig.18.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.
6. Since all metallized polyethylene terephthalate film capacitors have an intrinsically active flammability risk after a capacitor breakdown (short circuit), it is recommended that for MKT styles the power to the component is limited to 10 times the maximum allowed power dissipation ( $P_{max}$ ) during the short circuit failure mode of the capacitor.



# Metallized polyester film capacitors

MKT 470

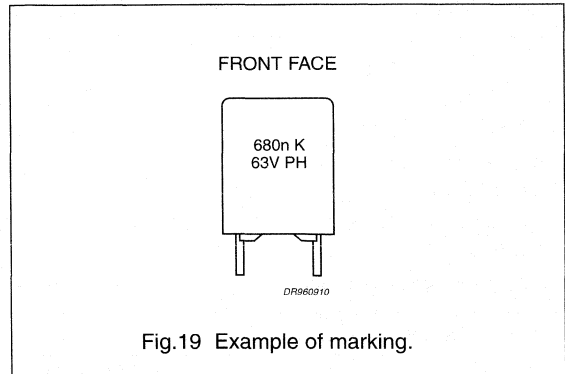
## MARKING

### Product marking

CAPACITORS WITH PITCH 5 mm:

The capacitors are marked by inkjet print on the side with the following information:

1. Capacitance code in accordance with "IEC 62":  
n = nF;  $\mu$  =  $\mu$ F
2. Tolerance on rated capacitance: K =  $\pm 10\%$ ; J =  $\pm 5\%$
3. Rated voltage (DC) (e.g. 63 V)
4. Manufacturer (PHILIPS).



### Package marking

The package containing the capacitors is marked as shown in Fig.20.

<div style="border: 1px solid black; padding: 5px;"> <p>1. <b>PHILIPS COMPONENTS</b></p> <p>2. <b>MADE IN BELGIUM</b></p> <p>3. <b>METAL. PETP FILM CAPACITOR</b></p> <p>4. <b>MKT RADIAL POTTED TYPE</b></p> <p>5. <b>0.68<math>\mu</math>F <math>\pm 10\%</math> 63V= 55/125/56</b></p> <p>6.  </p> <p style="text-align: right;">WO: 12345678</p> <p>7. <b>ORIG A170 RPC HQ</b></p> <p>8. <b>TYPE MKT 470</b></p> <hr/> <p>9. <b>QTY 2000 DATE 9626</b></p> <p>10. <b>COCEMD 2222 470 11684</b></p> <p style="text-align: right; font-size: x-small;">CCA392</p> </div>	<h3>Barcode label marking</h3> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">LINE</th> <th style="text-align: left;">MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>-</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO</td> </tr> <tr> <td>8</td> <td>Product type description</td> </tr> <tr> <td>9</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>10</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description	5	Capacitance value, tolerance and climatic category ("IEC 68-1")	6	-	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO	8	Product type description	9	Quantity and production period, year and week code	10	Product code (12NC)
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9	Quantity and production period, year and week code																						
10	Product code (12NC)																						

Fig.20 Barcode label.

## Metallized polyester film capacitors

MKT 470

## 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  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 2\%$
Component solvent resistance		$\Delta \tan \delta \leq 30 \times 10^{-4} (C \leq 470 \text{ nF})$ $\Delta \tan \delta \leq 20 \times 10^{-4} (C > 470 \text{ nF})$
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4} (C \leq 470 \text{ nF})$ $\Delta \tan \delta \leq 20 \times 10^{-4} (C > 470 \text{ nF})$
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; 125 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 50 \times 10^{-4} (C \leq 470 \text{ nF})$ $\Delta \tan \delta \leq 30 \times 10^{-4} (C > 470 \text{ nF})$
Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30"	2 hours; -55 °C	$R_{\text{ins}} \geq 50\%$ of specified value
Cold: "IEC 68-2-1"		
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		
<b>Other applicable tests</b>		
Damp heat steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4} (C \leq 470 \text{ nF})$ $\Delta \tan \delta \leq 30 \times 10^{-4} (C > 470 \text{ nF})$ $R_{\text{ins}} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-2"	2000 hours; $1.25 \times U_{\text{Rdc}}$ ; 85 °C $1.25 \times U_{\text{Cdc}}$ ; 125 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4} (C \leq 470 \text{ nF})$ $\Delta \tan \delta \leq 30 \times 10^{-4} (C > 470 \text{ nF})$ $R_{\text{ins}} \geq 50\%$ of specified value
Heat storage: "IEC 384-2"	2000 hours; 125 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4} (C \leq 470 \text{ nF})$ $\Delta \tan \delta \leq 20 \times 10^{-4} (C > 470 \text{ nF})$

## Metallized polyester film capacitors

MKT 470

TEST	PROCEDURE (quick reference)	REQUIREMENTS
Resistance to detergents: "IEC 384-2"		$ \Delta C/C  \leq 1\%$ $\Delta \tan \delta \leq 30 \times 10^{-4} (C \leq 470 \text{ nF})$ $\Delta \tan \delta \leq 20 \times 10^{-4} (C > 470 \text{ nF})$ $R_{\text{ins}} \geq 50\%$ of specified value
Resistance to soldering heat with preheating: "IEC 384-2"	body temperature: 125 °C bath temperature: 260 °C dwell time: 5 s	$ \Delta C/C  \leq 1\%$ $\Delta \tan \delta \leq 30 \times 10^{-4} (C \leq 470 \text{ nF})$ $\Delta \tan \delta \leq 20 \times 10^{-4} (C > 470 \text{ nF})$
Passive flammability: "IEC 695-2-2"	class C	no burning

**Note**

1. For detailed information, see "Type specification".



## Metallized PPS film capacitors

## MKPS 390/391/392/393/394

## MKPS CHIP CAPACITORS

SIZES 1206/1210/1812/2220/2824

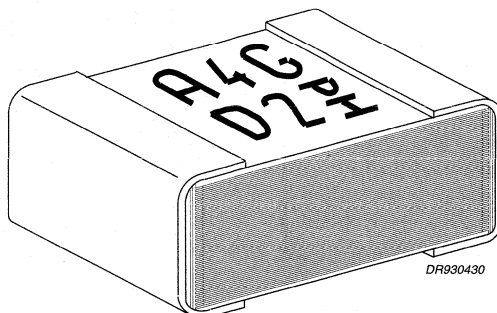


Fig.1 Simplified outline.

## FEATURES

- Self-encased chip capacitor for surface mounting
- Stacked metallized non-flammable film cell
- Solder-coated terminations
- Solvent resistant without damage
- Case sizes: 1206, 1210, 1812, 2220, 2824
- Taped versions for automatic placement.

## APPLICATIONS

- Blocking and coupling
- Tuning in data processing and telecommunication equipment.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series); note 1	0.22 to 470 nF
Capacitance tolerance	±10%; ±5%
Rated voltage (DC)	25 V; 160 V
Rated voltage (AC)	16 V; 100 V
Climatic category	55/125/56
Rated temperature	100 °C
Maximum application temperature	125 °C
Tangent of loss angle at 100 kHz	$25 \times 10^{-4}$
Reference specification	IEC: 40/782/FDIS and EN 132500
Performance grade	grade 1

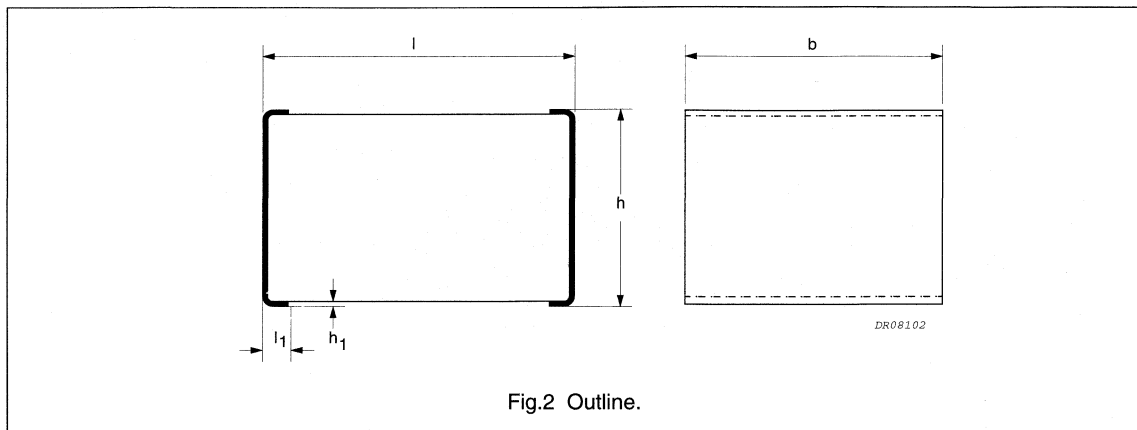
## Note

1. E24 series available on request.

## Metallized PPS film capacitors

## MKPS 390/391/392/393/394

## MKPS GENERAL DATA



## Specific reference data for the 25 V and 160 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 40 \times 10^{-4}$	$\leq 50 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ for case sizes:			
1206	$U_R = 25 \text{ V}: 200 \text{ V}/\mu\text{s}$	$U_R = 160 \text{ V}: 1500 \text{ V}/\mu\text{s}$	
1210	$U_R = 25 \text{ V}: 200 \text{ V}/\mu\text{s}$	$U_R = 160 \text{ V}: 1500 \text{ V}/\mu\text{s}$	
1812	$U_R = 25 \text{ V}: 60 \text{ V}/\mu\text{s}$	$U_R = 160 \text{ V}: 300 \text{ V}/\mu\text{s}$	
2220	$U_R = 25 \text{ V}: 30 \text{ V}/\mu\text{s}$	$U_R = 160 \text{ V}: 180 \text{ V}/\mu\text{s}$	
2824	$U_R = 25 \text{ V}: 15 \text{ V}/\mu\text{s}$	$U_R = 160 \text{ V}: 70 \text{ V}/\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 3750 \text{ M}\Omega$		
RC between leads, for $C > 0.33 \mu\text{F}$	$> 1250 \text{ s}$		

## Mechanical data and packaging quantities for the 25 V and 160 V DC versions

CASE SIZE	BLISTER TAPE ON REEL <sup>(1)</sup>		l (mm)	b (mm)	h <sub>max</sub> (mm)	l <sub>1</sub> (mm)	h <sub>1</sub> (mm)
	SPQ						
	25 V	160 V					
1206	3000	3000	3.2 ± 0.2	1.6 ± 0.2	note 2	0.7 ± 0.3	0.10 ± 0.05
1210	2500	2500	3.2 ± 0.2	2.5 ± 0.2		0.7 ± 0.3	0.10 ± 0.05
1812	3500	3500	4.5 ± 0.2	3.2 ± 0.2		0.7 ± 0.3	0.10 ± 0.05
2220	3000 (C ≤ 100 nF)	3000 (C ≤ 10 nF)	5.7 ± 0.4	5.0 ± 0.3		0.7 ± 0.3	0.10 ± 0.05
	2000 (C ≥ 150 nF)	2000 (C ≥ 15 nF)	5.7 ± 0.4	5.0 ± 0.3		–	–
2824	3000 (C = 220 nF)	3000 (C = 22 nF)	7.2 ± 0.4	6.1 ± 0.3		1.0 ± 0.3	0.10 ± 0.05
	1500 (C ≥ 330 nF)	1500 (C ≥ 33 nF)	7.2 ± 0.4	6.1 ± 0.3	–	–	

## Notes

- For dimensions, see Chapter "Packaging".
- See Tables 1 and 2.

## Metallized PPS film capacitors

## MKPS 390/391/392/393/394

Table 1  $U_{Rdc} = 25 \text{ V}$ ;  $U_{Rac} = 16 \text{ V}$ 

blister tape on reel

$C^{(1)(2)}$ ( $\mu\text{F}$ )	CATALOGUE NUMBER 2222 ... .. AND PACKAGING						
	digits 8 to 12 of catalogue number <sup>(3)</sup>		digits 5 to 7 of catalogue number				
	C-tol = $\pm 10\%$	C-tol = $\pm 5\%$	390	391	392	393	394
			$h_{\text{max}}$ at case size				
		1206	1210	1812	2220	2824	
0.001	28102	29102	1.4	1.7	2.0	–	–
0.0015	28152	29152	1.4	1.7	2.0	–	–
0.0022	28222	29222	1.4	1.7	2.0	–	–
0.0033	28332	29332	1.4	1.7	2.0	–	–
0.0047	28472	29472	1.4	1.7	2.0	–	–
0.0068	28682	29682	1.4	1.7	2.0	–	–
0.01	28103	29103	–	1.7	2.0	–	–
0.015	28153	29153	–	1.9	2.0	–	–
0.022	28223	29223	–	–	2.0	–	–
0.033	28333	29333	–	–	2.1	–	–
0.047	28473	29473	–	–	2.5	2.1	–
0.068	28683	29683	–	–	–	2.1	–
0.1	28104	29104	–	–	–	2.4	–
0.15	28154	29154	–	–	–	3.2	–
0.22	28224	29224	–	–	–	4.0	3.0
0.33	28334	29334	–	–	–	–	4.0
0.47	28474	29474	–	–	–	–	4.8

Table 2  $U_{Rdc} = 160 \text{ V}$ ;  $U_{Rac} = 100 \text{ V}$ 

blister tape on reel

$C^{(1)(2)}$ ( $\mu\text{F}$ )	CATALOGUE NUMBER 2222 ... .. AND PACKAGING						
	digits 8 to 12 of catalogue number <sup>(3)</sup>		digits 5 to 7 of catalogue number				
	C-tol = $\pm 10\%$	C-tol = $\pm 5\%$	390	391	392	393	394
			$h_{\text{max}}$ at case size				
		1206	1210	1812	2220	2824	
0.00022	48221	49221	1.4	–	–	–	–
0.00033	48331	49331	1.4	–	–	–	–
0.00047	48471	49471	1.4	1.7	–	–	–
0.00068	48681	49681	–	1.7	–	–	–
0.001	48102	49102	–	1.8	–	–	–
0.0015	48152	49152	–	2.0	2.0	–	–
0.0022	48222	49222	–	–	2.0	–	–
0.0033	48332	49332	–	–	2.2	–	–
0.0047	48472	49472	–	–	2.5	2.1	–
0.0068	48682	49682	–	–	–	2.2	–
0.01	48103	49103	–	–	–	2.6	–
0.015	48153	49153	–	–	–	3.3	–
0.022	48223	49223	–	–	–	4.0	3.0
0.033	48333	49333	–	–	–	–	4.0
0.047	48473	49473	–	–	–	–	4.8

## Notes

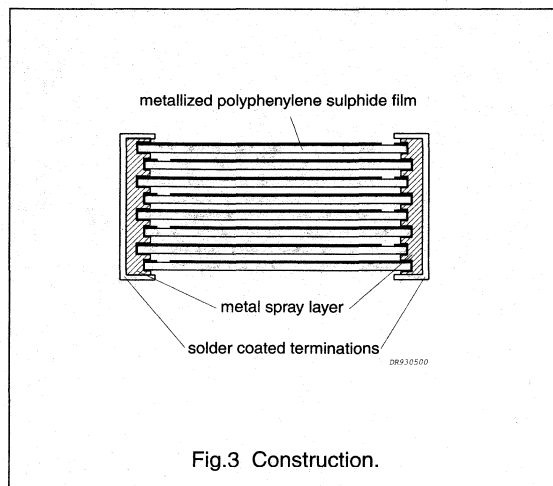
1. The standard range of PPS capacitors is shown. Other combinations of capacitance, size and voltage rating are available on request.
2. E24 series available on request.
3. The shading indicates preferred types.

## Metallized PPS film capacitors

## MKPS 390/391/392/393/394

**CONSTRUCTION****Description**

- Stacked cell of metallized polyphenylene sulphide (PPS) film
- The terminations are solder-coated. The capacitor can withstand solvents without damage.





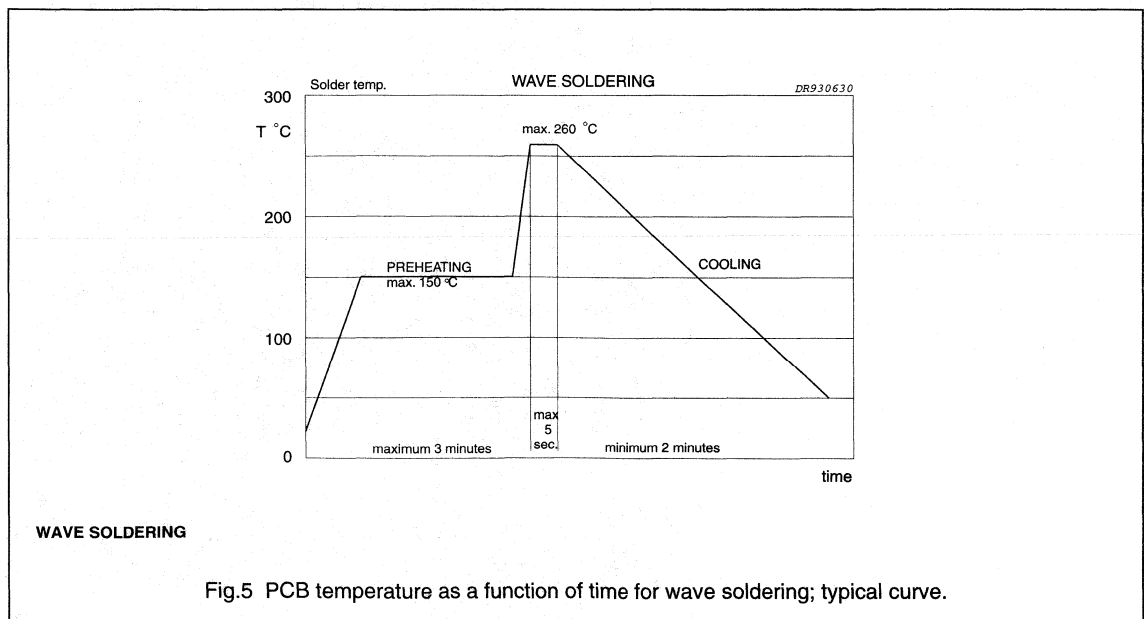
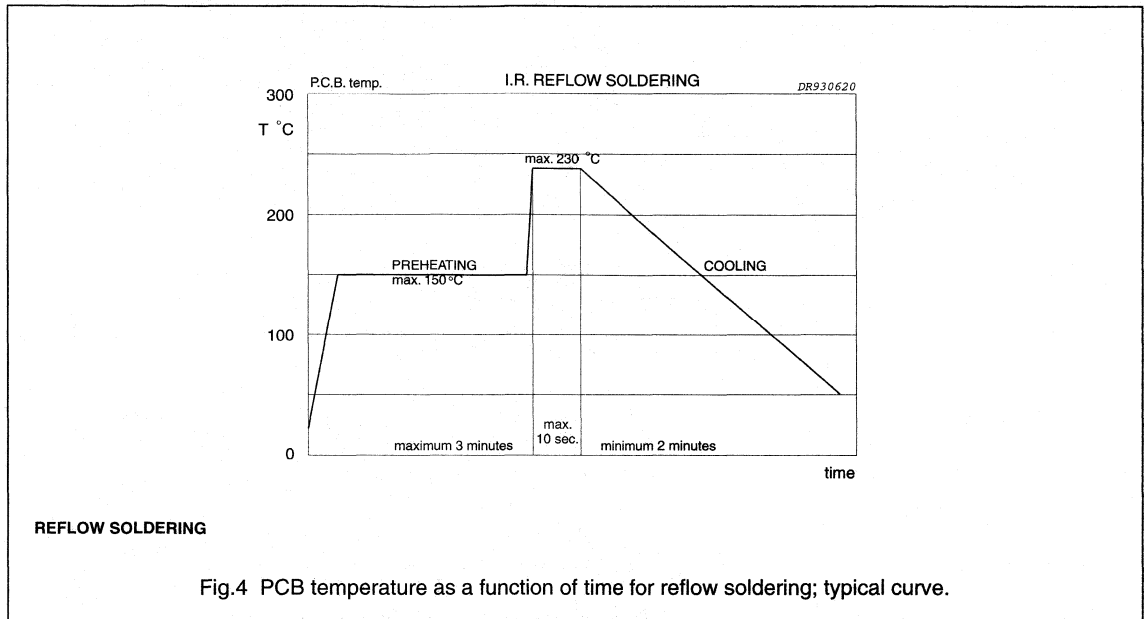
Metallized PPS film capacitors

MKPS 390/391/392/393/394

**Mounting**

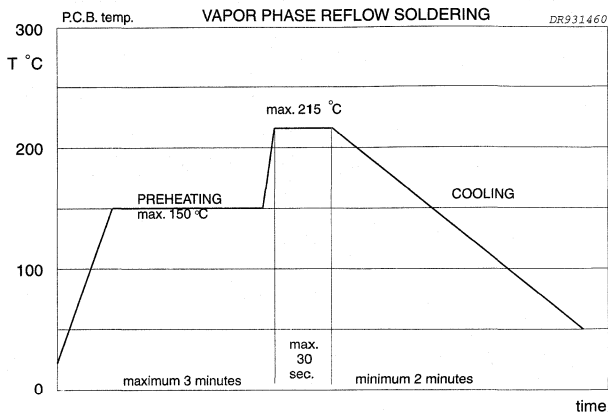
The capacitors can be mounted on printed-circuit boards or ceramic substrates by applying wave or reflow soldering.

Do not allow abrupt cooling after heating.



Metallized PPS film capacitors

MKPS 390/391/392/393/394



VAPOUR PHASE REFLOW SOLDERING

Fig.6 PCB temperature as a function of time for vapour phase reflow soldering; typical curve.

For advised soldering profiles and footprint design, refer to Fig.7 and Tables 3 and 4.

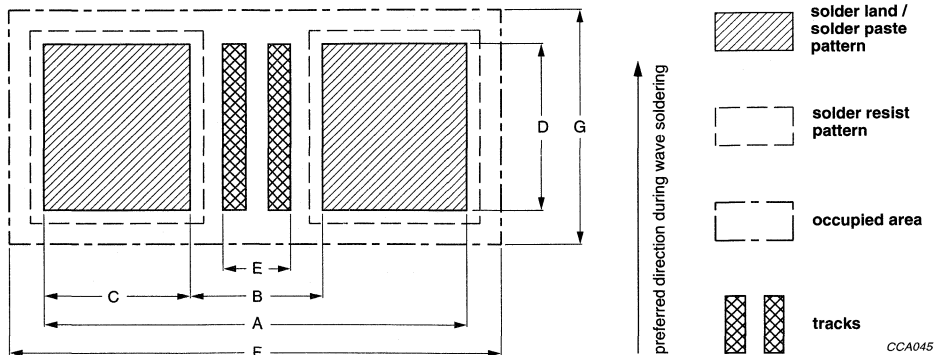


Fig.7 Soldering profiles and footprint design.

## Metallized PPS film capacitors

## MKPS 390/391/392/393/394

Table 3 Reflow soldering data

CASE SIZE	FOOTPRINT DIMENSIONS (mm)							PROCESSING REMARKS	PLACEMENT ACCURACY (mm)
	A	B	C	D	E	F	G		
1206	4.00	1.60	1.20	1.80	0.95	4.50	2.50	–	±0.25
1210	4.00	1.60	1.20	2.70	0.95	4.50	3.40	–	±0.25
1812	5.40	3.00	1.20	3.50	2.20	5.80	4.10	–	±0.25
2220	6.60	4.20	1.20	5.30	3.40	7.00	5.90	–	±0.25
2824	8.00	5.20	1.40	6.50	4.30	8.50	7.00	–	±0.25

Table 4 Wave soldering data

CASE SIZE	FOOTPRINT DIMENSIONS (mm)							PROPOSED NUMBER AND DIMENSIONS OF DUMMY TRACKS (mm)	PLACEMENT ACCURACY (mm)
	A	B	C	D	E	F	G		
1206	4.80	1.60	1.60	1.70	0.77	5.50	3.20	2 × (0.25 × 1.70)	±0.25
1210	5.40	1.60	1.90	2.60	0.77	6.60	4.70	2 × (0.25 × 2.60)	±0.25
1812	7.20	3.00	2.10	3.40	2.00	8.60	5.90	–	±0.25
2220	9.60	4.20	2.70	5.20	3.20	11.60	8.50	–	±0.25
2824	11.80	5.20	3.30	6.30	4.20	14.30	10.00	–	±0.25

## RATINGS AND CHARACTERISTICS

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

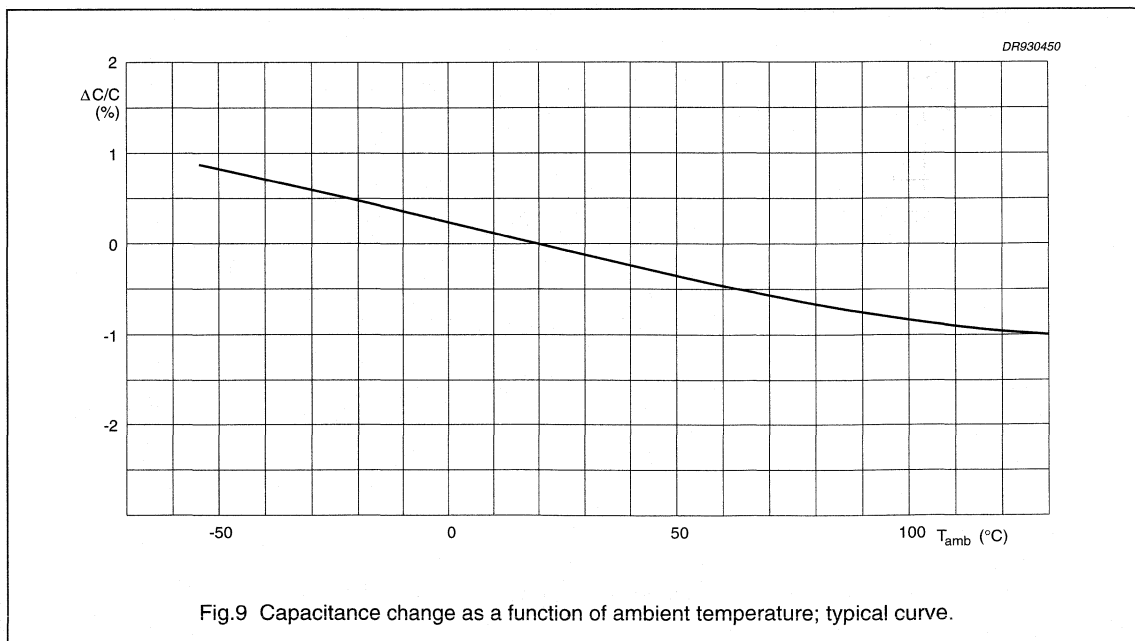
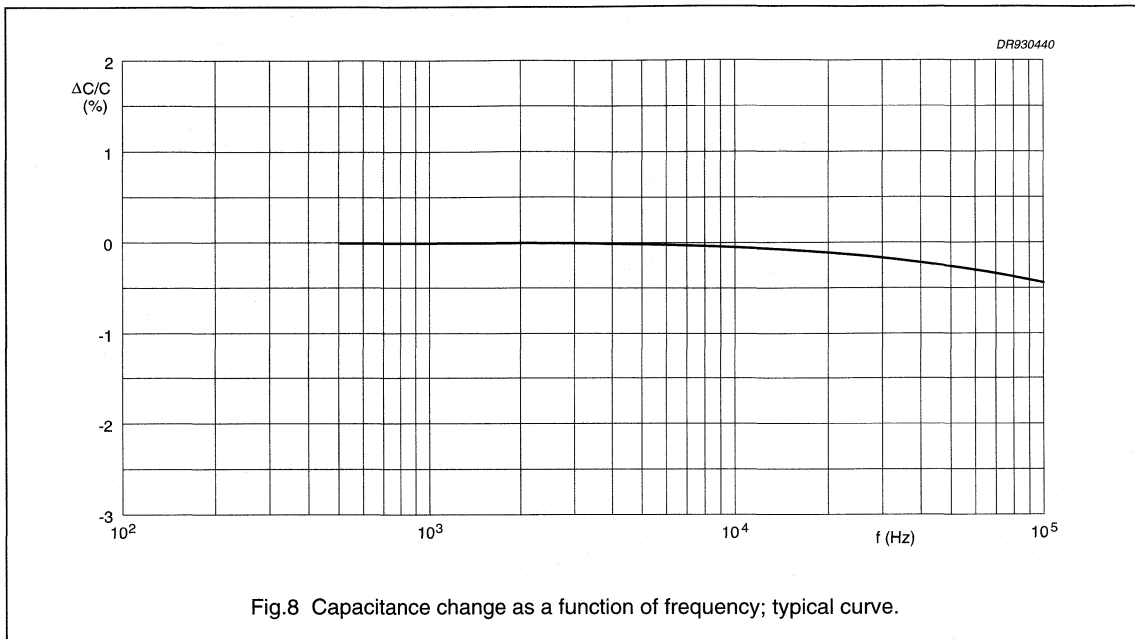
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating-air oven at the rated temperature and a relative humidity not exceeding 20%.

Metallized PPS film capacitors

MKPS 390/391/392/393/394

Capacitance

All capacitance values are specified at 1 kHz.



Metallized PPS film capacitors

MKPS 390/391/392/393/394

Impedance

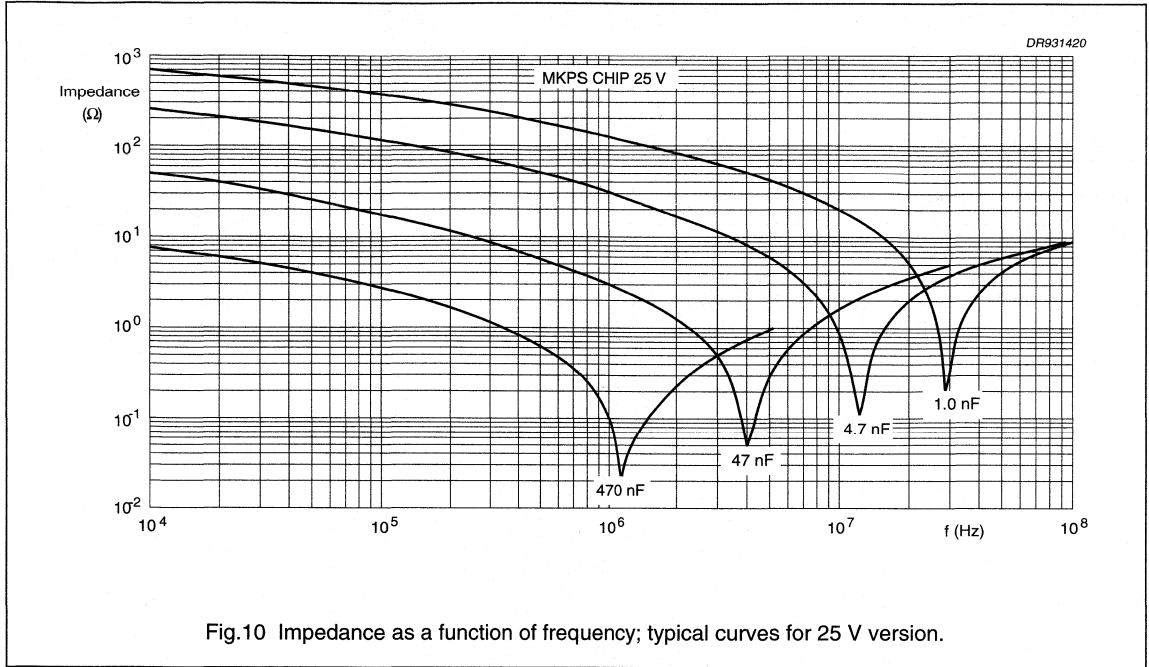


Fig.10 Impedance as a function of frequency; typical curves for 25 V version.

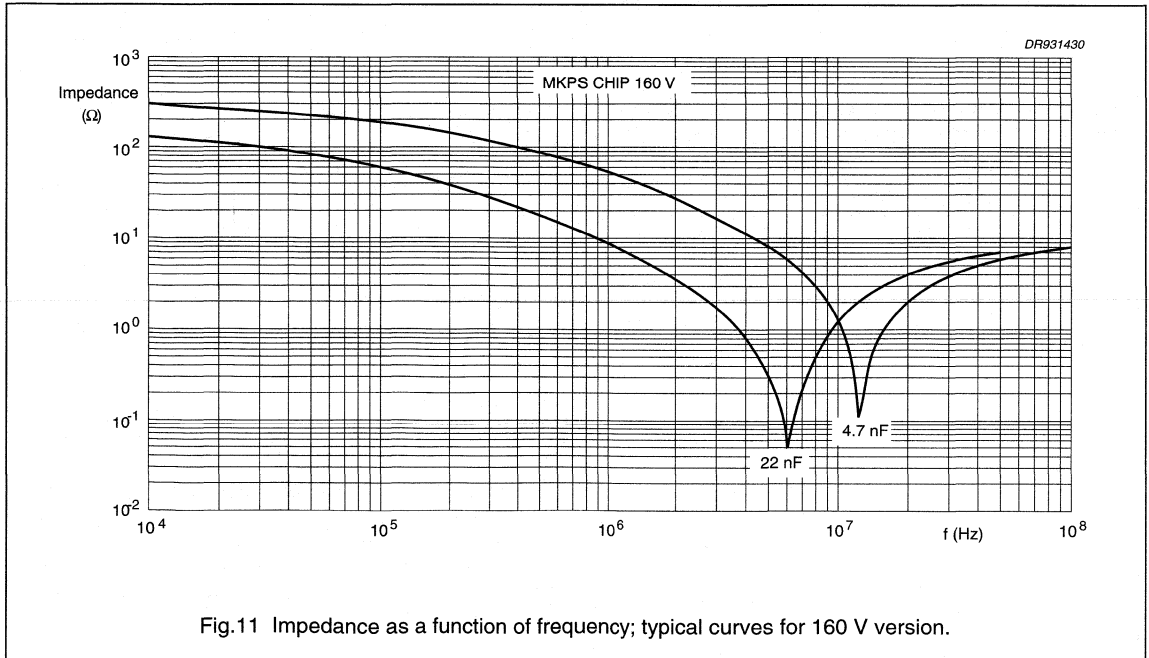


Fig.11 Impedance as a function of frequency; typical curves for 160 V version.

Metallized PPS film capacitors

MKPS 390/391/392/393/394

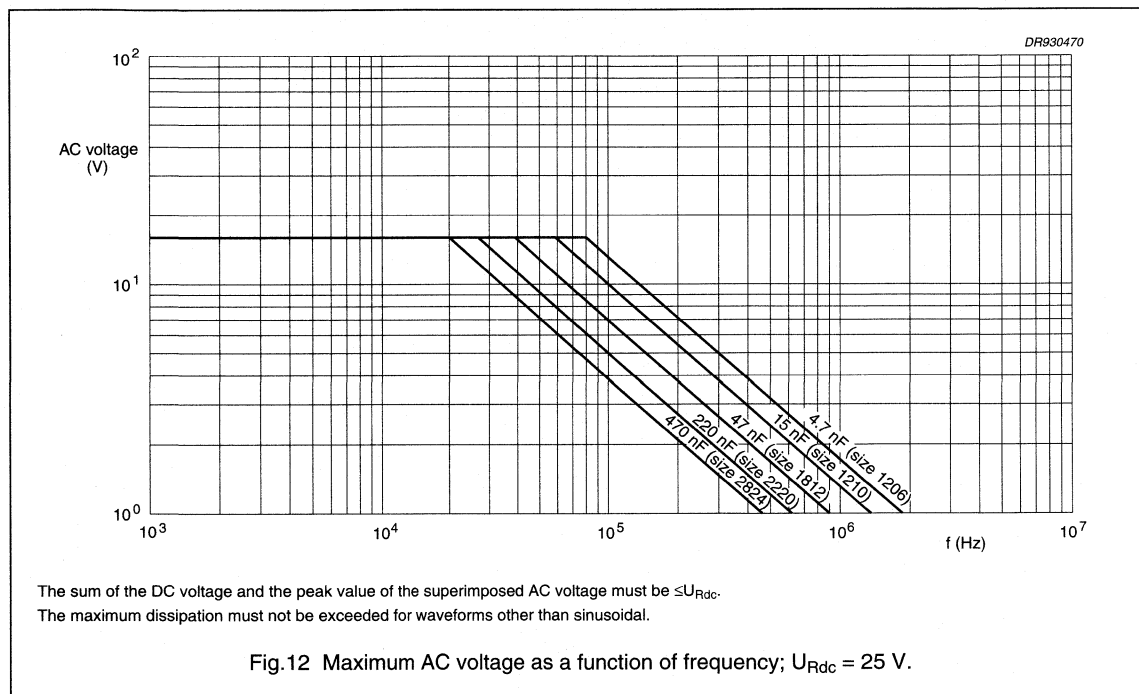
**Temperature**

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

**Voltage**

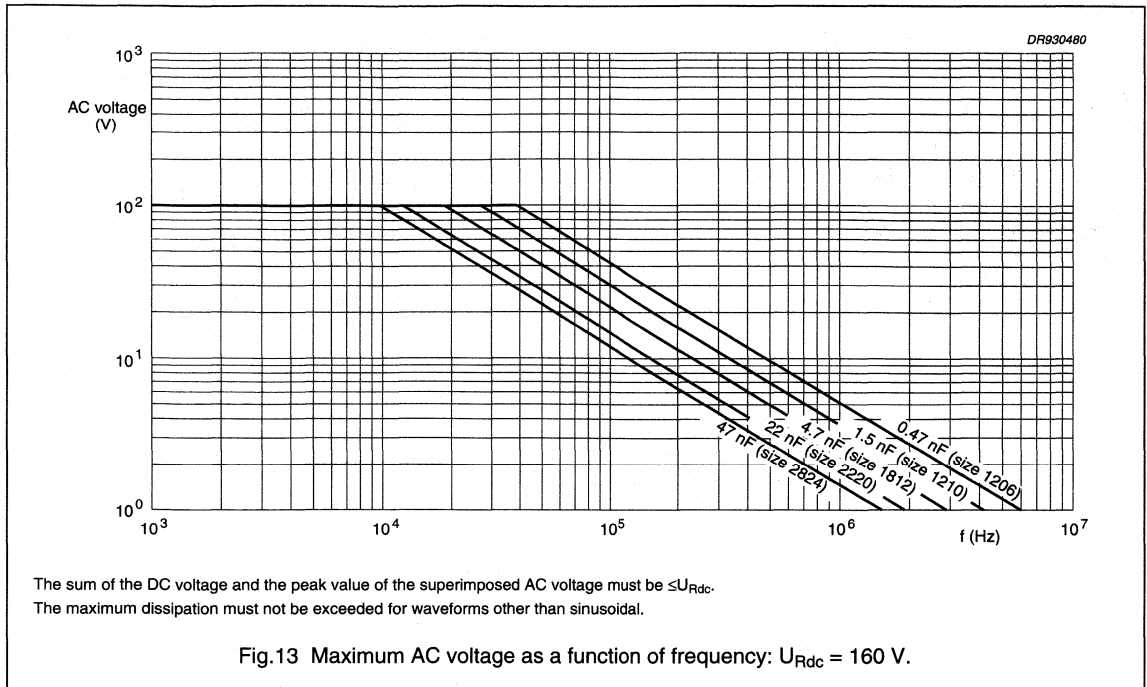
- Category voltage:  $U_c = 0.8 \times U_{Rdc}$
- Test voltage between leads:  $1.6 \times U_{Rdc}$ .

**Maximum RMS voltage (sinewave) as a function of frequency for  $T_{amb} \leq 85$  °C (see Figs 12 and 13)**



## Metallized PPS film capacitors

## MKPS 390/391/392/393/394

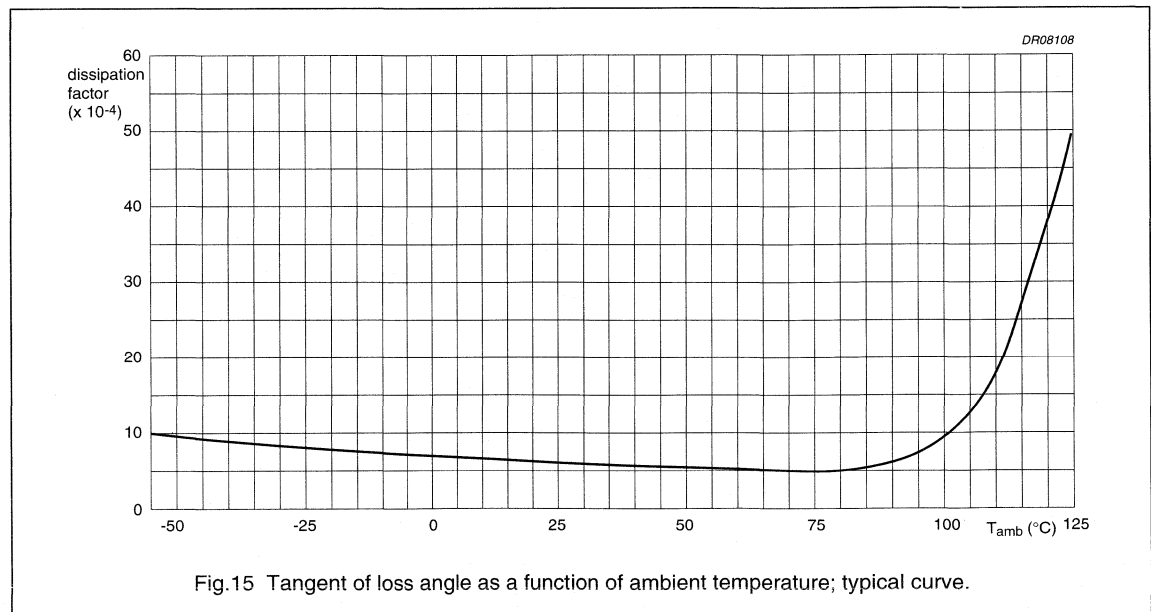
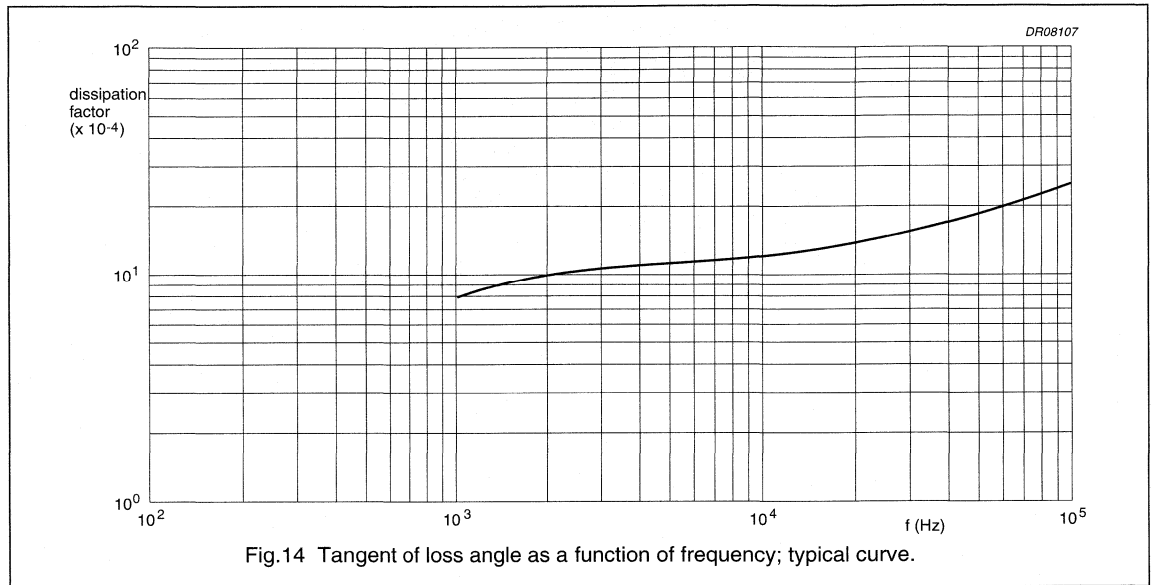


Metallized PPS film capacitors

MKPS 390/391/392/393/394

Tangent of loss angle

TANGENT OF LOSS ANGLE		
at 1 kHz	at 10 kHz	at 100 kHz
$\leq 40 \times 10^{-4}$	$\leq 50 \times 10^{-4}$	$\leq 100 \times 10^{-4}$





## Metallized PPS film capacitors

## MKPS 390/391/392/393/394

## Rated voltage pulse slope

RATED VOLTAGE (V)	MAXIMUM RATED PULSE LOAD (V/μs) <sup>(1)(2)</sup>				
	CASE SIZE 1206	CASE SIZE 1210	CASE SIZE 1812	CASE SIZE 2220	CASE SIZE 2824
25	200	200	60	30	15
160	1500	1500	300	180	70

## Notes

1. The maximum pulse load values are valid for voltages equal to the rated voltage. For lower voltages, the given values may be multiplied by  $U_R$  and divided by the applied voltage.
2. If the pulse load requirement is satisfied, a check must be made to ensure that the maximum dissipation is not exceeded.

## Insulation resistance

The insulation resistance is measured after a voltage of  $10 \pm 1$  V has been applied for 1 minute  $\pm 5$  seconds:

- R between leads, for  $C \leq 0.33 \mu\text{F}$ :  $>3750 \text{ M}\Omega$
- RC time between leads, for  $C > 0.33 \mu\text{F}$ :  $>1250 \text{ s}$ .

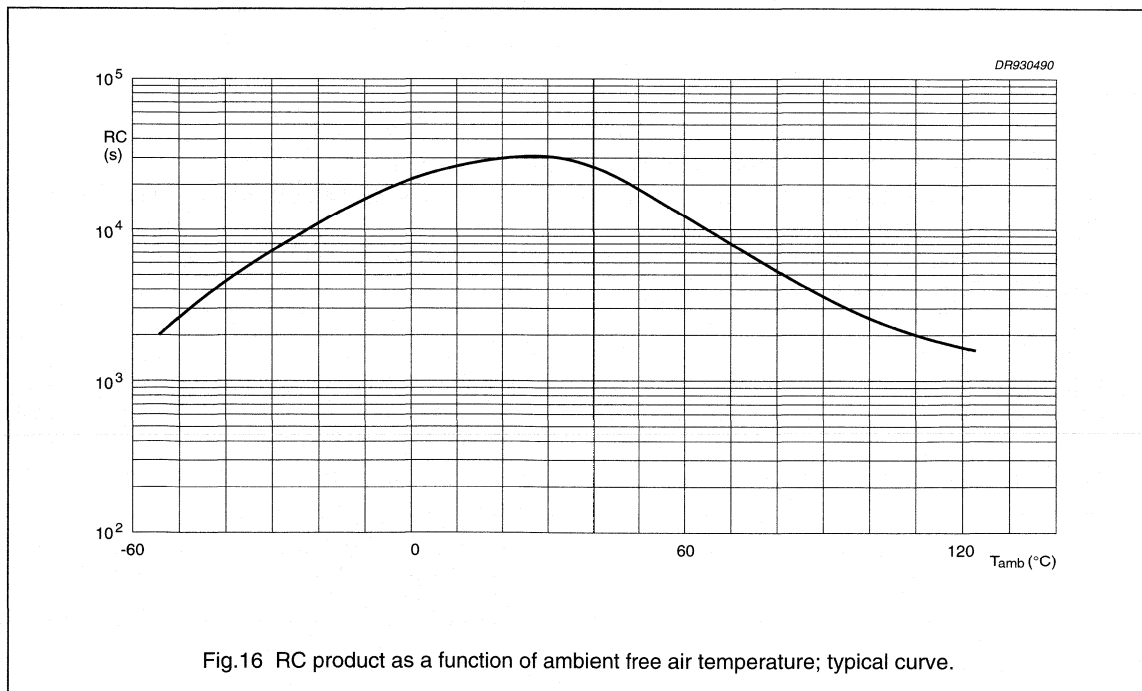


Fig.16 RC product as a function of ambient free air temperature; typical curve.

## Metallized PPS film capacitors

## MKPS 390/391/392/393/394

## Maximum dissipation

## Curve reference and dimensions

CURVE (see Fig.17)	CASE SIZE
1	1206
2	1210
3	1812
4	2220
5	2824

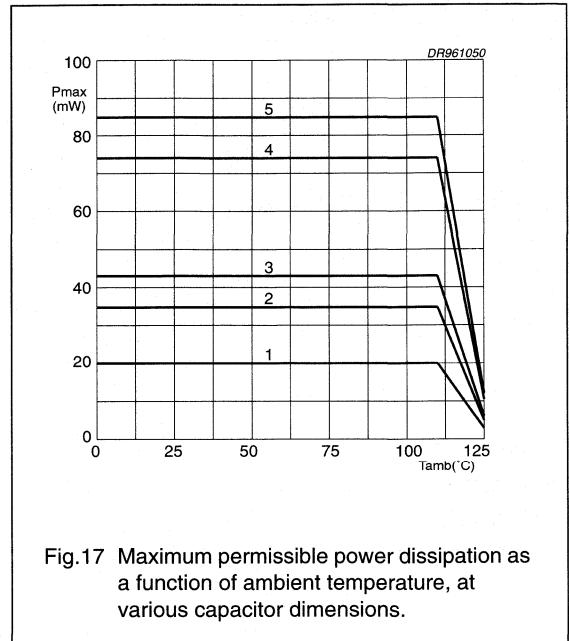


Fig.17 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

## Application note

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance:

$$I_p \max = C \left( \frac{dU}{dt} \right) \max$$

Or the voltage pulse slope shall not exceed the rated voltage pulse slope. If the pulse voltage is lower than the rated voltage, the values (see section "Rated voltage pulse slope" for more details) may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation stated in Fig.17.
5. The free air ambient temperature for the capacitor is not exceeding the category temperature.
6. Since all metallized polyphenylene sulphide capacitors have an intrinsically active flammability risk after a capacitor breakdown (short circuit), it is recommended that the power to the component is limited to 10 times the maximum allowed power dissipation ( $P_{max}$ ) during the short circuit failure mode of the capacitor.

## Metallized PPS film capacitors

MKPS 390/391/392/393/394

**MARKING****Product marking**

1. Rated capacitance
2. Rated voltage
3. Year and month of manufacture
4. Manufacturer's name.

**Capacitance data, voltage and tolerance codes**

**Letter codes for the E-series of capacitance values, cardinal numbers for multipliers, letter codes for voltage and tolerance**

CAPACITANCE SIGNIFICANT DIGITS (pF)	CODE FOR CAPACITANCE	MULTIPLIER FOR CAPACITANCE	CARDINAL NUMBER AS CODE	VOLTAGE (V)	CODE
1.0	A	1	0	25	G
1.1	B	10	1	160	none
1.2	C	10 <sup>2</sup>	2	–	–
1.3	D	10 <sup>3</sup>	3	–	–
1.5	E	10 <sup>4</sup>	4	–	–
1.6	F	10 <sup>5</sup>	5	–	–
1.8	G	10 <sup>6</sup>	6	–	–
2.0	H	10 <sup>7</sup>	7	–	–
2.2	J	10 <sup>8</sup>	8	–	–
2.4	K	–	–	–	–
2.7	L	–	–	–	–
3.0	M	–	–	–	–
3.3	N	–	–	–	–
3.6	P	–	–	–	–
3.9	Q	–	–	–	–
4.3	R	–	–	–	–
4.7	S	–	–	–	–
5.1	T	–	–	–	–
5.6	U	–	–	–	–
6.2	V	–	–	–	–
6.8	W	–	–	–	–
7.5	X	–	–	–	–
8.2	Y	–	–	–	–
9.1	Z	–	–	–	–

Metallized PPS film capacitors

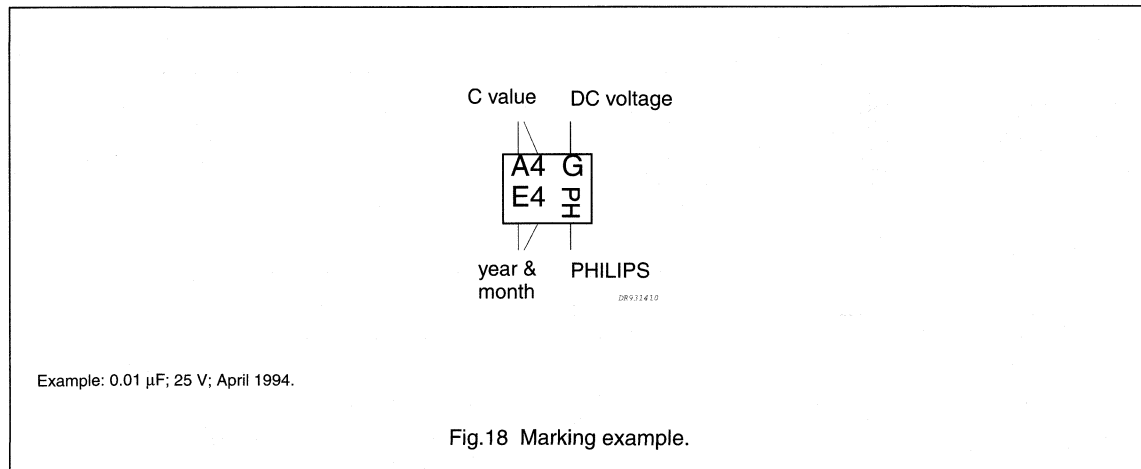
MKPS 390/391/392/393/394

Letter codes for year and numbers for month of production (see note 1)

YEAR	LETTER CODE	MONTH	CODE
1990	A	January	1
1991	B	February	2
1992	C	March	3
1993	D	April	4
1994	E	May	5
1995	F	June	6
1996	H	July	7
1997	J	August	8
1998	K	September	9
1999	L	October	O
2000	M	November	N
2001	N	December	D

Note

1. Case sizes 1206 and 1210 are not marked.







Metallized PPS film capacitors

MKPS 390/391/392/393/394

Package marking

The package containing the capacitors is marked as shown in Fig.19.

<ol style="list-style-type: none"> <li>1. PHILIPS COMPONENTS</li> <li>2. MADE IN BELGIUM</li> <li>3. POLYPHENYL. SULP. FILM CAPACITOR</li> <li>4. MKPS CHIP CAPACITOR TYPE</li> <li>5. 0.022<math>\mu</math>F <math>\pm</math>10% 25V= 55/125/56 UC=0.8 UR SIZE 1812</li> <li>6.</li> <li>7.  WO: 12345678 ORIG A170 RPC HQ 1234</li> <li>8.  TYPE SMD 392 — —</li> <li>9.  QTY 3500 DATE 9625</li> <li>10.  CODE NO 2222 392 28223</li> </ol>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>—</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO</td> </tr> <tr> <td>8</td> <td>Product type description</td> </tr> <tr> <td>9</td> <td>Quantity and production period, year and month code</td> </tr> <tr> <td>10</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description	5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")	6	—	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO	8	Product type description	9	Quantity and production period, year and month code	10	Product code (12NC)
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6	—																						
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8	Product type description																						
9	Quantity and production period, year and month code																						
10	Product code (12NC)																						

CCA340

Fig.19 Barcode label.

## Metallized PPS film capacitors

MKPS 390/391/392/393/394

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of component</b>		
Resistance to soldering heat "IEC 68-2-20" Component solvent resistance	260 °C; 5 s or 235 °C; 60 s  isopropyl alcohol; 23.5 °C; 5 minutes	no visible damage legible marking  smooth and bright solder-coating, scattered imperfections permitted (≤10% of terminations surface)  $ \Delta C/C  \leq 3\% + 20 \text{ pF}$ ( $C \leq 1 \text{ nF}$ ) $ \Delta C/C  \leq 3\%$ ( $C > 1 \text{ nF}$ )  $\Delta \tan \delta \leq 20 \times 10^{-4}$
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2" Damp heat cyclic, first cycle: "IEC 68-2-30" Cold: "IEC 68-2-1" Damp heat, remaining cycles: "IEC 68-2-30"	16 hours; 125 °C   2 hours; -55 °C	$ \Delta C/C  \leq 3\% + 20 \text{ pF}$ ( $C \leq 1 \text{ nF}$ ) $ \Delta C/C  \leq 3\%$ ( $C > 1 \text{ nF}$ )  $\Delta \tan \delta \leq 25 \times 10^{-4}$  $R_{\text{ins}} \geq 50\%$ of specified value
<b>Other applicable tests</b>		
Damp heat steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 5\% + 20 \text{ pF}$ ( $C \leq 1 \text{ nF}$ ) $ \Delta C/C  \leq 5\%$ ( $C > 1 \text{ nF}$ )  $\Delta \tan \delta \leq 20 \times 10^{-4}$  $R_{\text{ins}} \geq 50\%$ of specified value
Endurance (DC): "IEC: 40 (secr)699" and "EN 132500 (DRAFT)"	2000 hours; $1.25 \times U_{\text{Rdc}}$ ; 100 °C $1.25 \times U_{\text{Cdc}}$ ; 125 °C	$ \Delta C/C  \leq 5\% + 20 \text{ pF}$ ( $C \leq 1 \text{ nF}$ ) $ \Delta C/C  \leq 5\%$ ( $C > 1 \text{ nF}$ )  $\Delta \tan \delta \leq 25 \times 10^{-4}$  $R_{\text{ins}} \geq 50\%$ of specified value
Heat storage: "IEC: 40 (secr)699" and "EN 132500 (DRAFT)"	2000 hours; 125 °C	$ \Delta C/C  \leq 3\% + 20 \text{ pF}$ ( $C \leq 1 \text{ nF}$ ) $ \Delta C/C  \leq 3\%$ ( $C > 1 \text{ nF}$ )  $\Delta \tan \delta \leq 25 \times 10^{-4}$
Passive flammability: "IEC 695-2-2"	class C	no burning

**Note**

1. For detailed information: see "Type specification"

## Metallized Polycarbonate film capacitors

MKC 344

## MKC RADIAL POTTED CAPACITORS

PITCH 10/15/22.5/27.5 mm

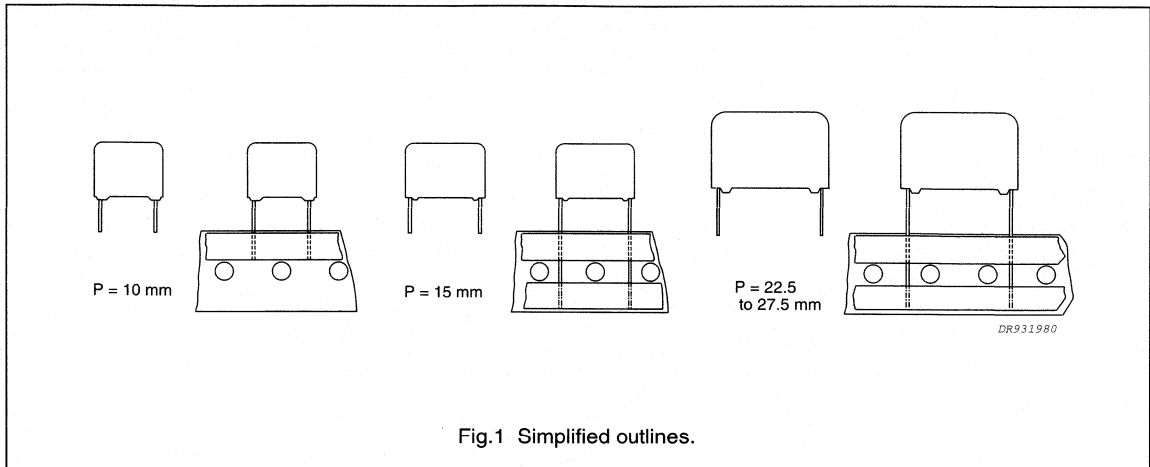


Fig.1 Simplified outlines.

## FEATURES

- 10 to 27.5 mm lead pitch
- Small dimensions for high density packaging
- Supplied loose in box and on tape.

## APPLICATIONS

- In electronic circuits for blocking and coupling, bypass and energy reservoir applications.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series)	0.010 to 6.8 $\mu$ F
Capacitance tolerance	$\pm 10\%$ ; $\pm 5\%$
Rated voltage (DC)	100 V; 250 V; 400 V; 630V
Climatic category	55/100/56
Rated temperature	85 °C
Maximum application temperature	100 °C
Tangent of loss angle at 10 kHz	$20 \times 10^{-4}$
Reference specification	IEC 384-6
Performance grade	grade 1 (long life)

## Metallized Polycarbonate film capacitors

MKC 344

## MKC 344 GENERAL DATA

PITCH 10/15/22.5/27.5 mm

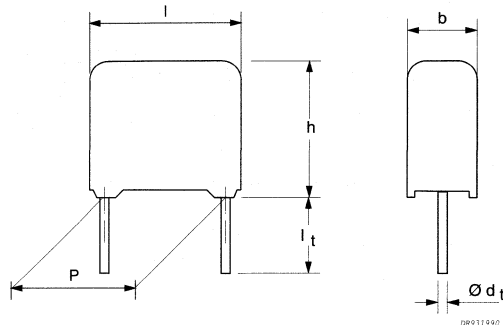


Fig.2 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 60 \times 10^{-4}$	$\leq 130 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 60 \times 10^{-4}$	–
$C > 1.0 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 75 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :			
$P = 10.0 \text{ mm}$		60 V/ $\mu\text{s}$	
$P = 15.0 \text{ mm}$		26 V/ $\mu\text{s}$	
$P = 22.5 \text{ mm}$		12 V/ $\mu\text{s}$	
$P = 27.5 \text{ mm}$		9 V/ $\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$		>15000 M $\Omega$	
RC between leads, for $C > 0.33 \mu\text{F}$		>5000 s	

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 10\%$	2222 344 21...	on request
		$\pm 5\%$	2222 344 22...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 10\%$	2222 344 28...	on request
		$\pm 5\%$	2222 344 29...	on request

## Note

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



## Metallized Polycarbonate film capacitors

MKC 344

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 344 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 5.0 \pm 1.0 \text{ mm}$		REEL
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.082 0.1 0.12 0.15	$4.0 \times 10.0 \times 12.5$	0.7	21823	1000	1400
			21104		
			21124		
			21154		
0.18 0.22	$5.0 \times 11.0 \times 12.5$	0.9	21184	1000	1100
			21224		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.27 0.33 0.39 0.47	$5.0 \times 11.0 \times 17.5$	1.1	21274	1000	1100
			21334		
			21394		
			21474		
0.56 0.68	$6.0 \times 12.0 \times 17.5$	1.4	21564	1000	900
			21684		
0.82 1	$7.0 \times 13.5 \times 17.5$	1.8	21824	1000	800
			21105		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
1.2 1.5	$6.0 \times 15.5 \times 26.0$	2.8	21125	200	600
			21155		
1.8	$7.0 \times 16.5 \times 26.0$	4.3	21185	200	550
2.2 2.7	$8.5 \times 18.0 \times 26.0$	4.3	21225	200	450
		5.1	21275		
3.3	$10.0 \times 19.5 \times 26.0$	5.1	21335	200	350
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
3.9 4.7	$11.0 \times 21.0 \times 31.0$	7.4	21395	100	300
			21475		
5.6 6.8	$13.0 \times 23.0 \times 31.0$	10.2	21565	100	250
			21685		

## Metallized Polycarbonate film capacitors

MKC 344

## MKC 344 GENERAL DATA

PITCH 10/15/22.5/27.5 mm

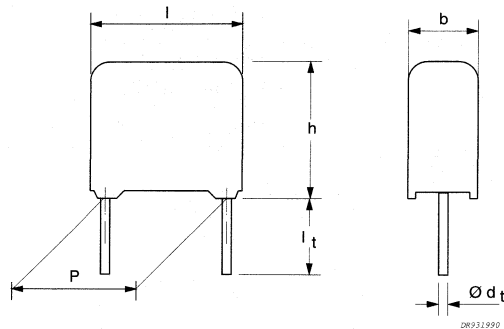


Fig.3 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
$C \leq 0.1 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 60 \times 10^{-4}$	$\leq 130 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 60 \times 10^{-4}$	–
$C > 1.0 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 75 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :			
$P = 10.0 \text{ mm}$		90 V/ $\mu\text{s}$	
$P = 15.0 \text{ mm}$		36 V/ $\mu\text{s}$	
$P = 22.5 \text{ mm}$		16 V/ $\mu\text{s}$	
$P = 27.5 \text{ mm}$		14 V/ $\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$		>30000 M $\Omega$	
RC between leads, for $C > 0.33 \mu\text{F}$		>10000 s	

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 10\%$	2222 344 45...	on request
		$\pm 5\%$	2222 344 43...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 10\%$	2222 344 48...	on request
		$\pm 5\%$	2222 344 49...	on request

## Note

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

## Metallized Polycarbonate film capacitors

MKC 344

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 344 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 5.0 \pm 1.0 \text{ mm}$		REEL
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.039 0.047 0.056 0.068	4.0 × 10.0 × 12.5	0.7	45393	1000	1400
			45473		
			45563		
			45683		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.082 0.1 0.12 0.15	5.0 × 11.0 × 17.5	1.1	45823	1000	1100
			45104		
			45124		
			45154		
0.18 0.22	6.0 × 12.0 × 17.5	1.4	45184	1000	900
			45224		
0.27 0.33	7.0 × 13.5 × 17.5	1.8	45274	1000	800
			45334		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.39 0.47	6.0 × 15.5 × 26.0	2.8	45394	200	600
			45474		
0.56 0.68	7.0 × 16.5 × 26.0	3.5	45564	200	550
			45684		
0.82 1	8.5 × 18.0 × 26.0	5.1	45824	200	450
			45105		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
1.2	9.0 × 19.0 × 31.0	7.4	45125	100	400
1.5 1.8	11.0 × 21.0 × 31.0	7.4	45155	100	300
		10.2	45185		
2.2	13.0 × 23.0 × 31.0	10.2	45225	100	250

## Metallized Polycarbonate film capacitors

MKC 344

## MKC 344 GENERAL DATA

PITCH 10/15/22.5/27.5 mm

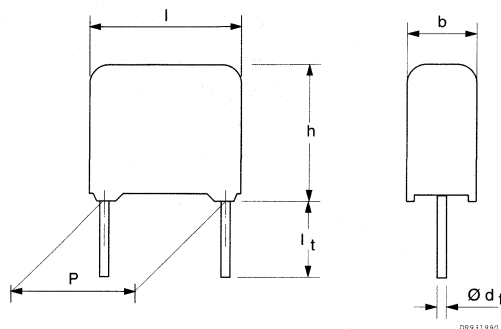


Fig.4 Outline.

## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF 0.1 μF < C ≤ 1.0 μF	≤30 × 10 <sup>-4</sup> ≤30 × 10 <sup>-4</sup>	≤60 × 10 <sup>-4</sup> ≤60 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup> -
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : P = 10.0 mm P = 15.0 mm P = 22.5 mm P = 27.5 mm		140 V/μs 60 V/μs 26 V/μs 22 V/μs	
R between leads, for C ≤ 0.33 μF		>30000 MΩ	
RC between leads, for C > 0.33 μF		>10000 s	

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 5.0 ±1.0 mm	±10%	2222 344 51...	on request
		±5%	2222 344 52...	on request
Taped on reel	H = 18.5 mm; note 1	±10%	2222 344 58...	on request
		±5%	2222 344 59...	on request

## Note

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

## Metallized Polycarbonate film capacitors

MKC 344

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 344 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 5.0 \pm 1.0 \text{ mm}$		REEL
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.01	4.0 × 10.0 × 12.5	0.7	51103	1000	1400
0.012			51123		
0.015			51153		
0.018			51183		
0.022			51223		
0.027			51273		
0.033			51333		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.039	5.0 × 11.0 × 17.5	1.1	51393	1000	1100
0.047			51473		
0.056			51563		
0.068			51683		
0.082	6.0 × 12.0 × 17.5	1.4	51823	1000	900
0.1			51104		
0.12	7.0 × 13.5 × 17.5	1.8	51124	1000	800
0.15			51154		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.18	6.0 × 15.5 × 26.0	2.8	51184	200	600
0.22			51224		
0.27	7.0 × 16.5 × 26.0	3.5	51274	200	550
0.33	8.5 × 18.0 × 26.0	3.5	51334	200	450
0.39		5.1	51394		
0.47	10.0 × 19.5 × 26.0	5.1	51474	200	350
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.56	11.0 × 21.0 × 31.0	7.4	51564	100	300
0.68			51684		
0.82	13.0 × 23.0 × 31.0	10.2	51824	100	250
1			51105		

## Metallized Polycarbonate film capacitors

MKC 344

## MKC 344 GENERAL DATA

PITCH 10/15/22.5/27.5 mm

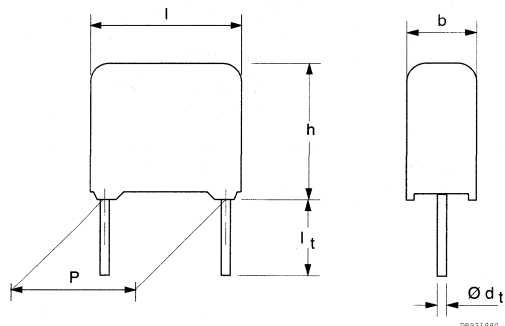


Fig.5 Outline.

## Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF 0.1 μF < C ≤ 1.0 μF	≤30 × 10 <sup>-4</sup> ≤30 × 10 <sup>-4</sup>	≤60 × 10 <sup>-4</sup> ≤60 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup> -
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : P = 10.0 mm P = 15.0 mm P = 22.5 mm P = 27.5 mm	200 V/μs 90 V/μs 36 V/μs 30 V/μs		
R between leads, for C ≤ 0.33 μF	>30 000 MΩ		
RC between leads, for C > 0.33 μF	>10 000 s		

## Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 5.0 ±1.0 mm	±10%	2222 344 61...	on request
		±5%	2222 344 62...	on request
Taped on reel	H = 18.5 mm; note 1	±10%	2222 344 68...	on request
		±5%	2222 344 69...	on request

## Note

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

## Metallized Polycarbonate film capacitors

MKC 344

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 344 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 5.0 \pm 1.0 \text{ mm}$		REEL
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.01	$4.0 \times 10.0 \times 12.5$	0.7	61103	1000	1400
0.012	$5.0 \times 11.0 \times 12.5$	0.9	61123	1000	1100
0.015			61153		
0.018			61183		
0.022	$6.0 \times 12.0 \times 12.5$	1.0	61223	1000	900
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.027	$5.0 \times 11.0 \times 17.5$	1.4	61273	1000	1100
0.033	$6.0 \times 12.0 \times 17.5$	1.4	61333	1000	900
0.039		1.8	61393		
0.047	$7.0 \times 13.5 \times 17.5$	1.8	61473	1000	800
0.056		2.6	61563		
0.068	$8.5 \times 15.0 \times 17.5$	2.6	61683	1000	650
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.082	$7.0 \times 16.5 \times 26.0$	2.8	61823	200	550
0.1		3.5	61104		
0.12		3.5	61124		
0.15	$8.5 \times 18.0 \times 26.0$	3.5	61154	200	450
0.18	$10.0 \times 19.5 \times 26.0$	5.1	61184	200	350
0.22		5.1	61224		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.27	$11.0 \times 21.0 \times 31.0$	7.4	61274	100	300
0.33			61334		
0.39	$13.0 \times 23.0 \times 31.0$	10.2	61394	100	250
0.47			61474		

# Metallized Polycarbonate film capacitors

# MKC 344

## CONSTRUCTION

### Description

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

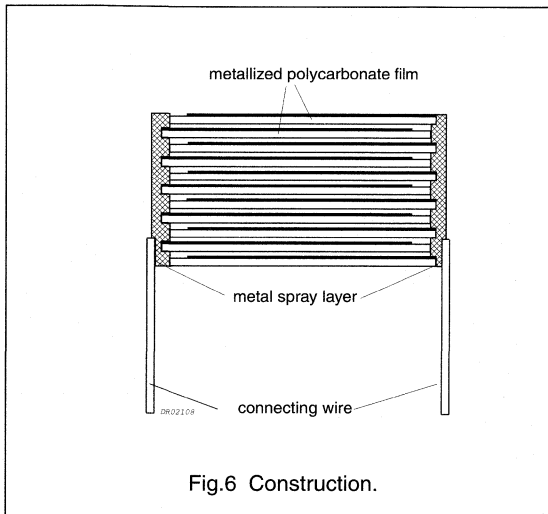


Fig.6 Construction.

## SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD

The maximum length and width of film capacitors is shown in Fig.7:

- Eccentricity as in Fig.7. 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:  $h_{\max} \leq h + 0.3 \text{ mm}$ .

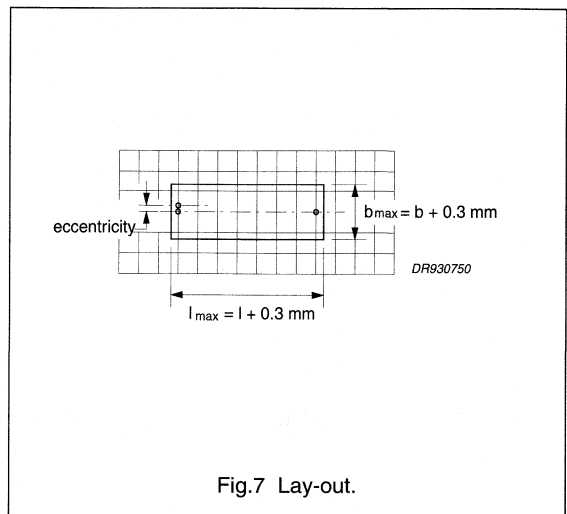


Fig.7 Lay-out.

## 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  $\leq 15 \text{ mm}$  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 of  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

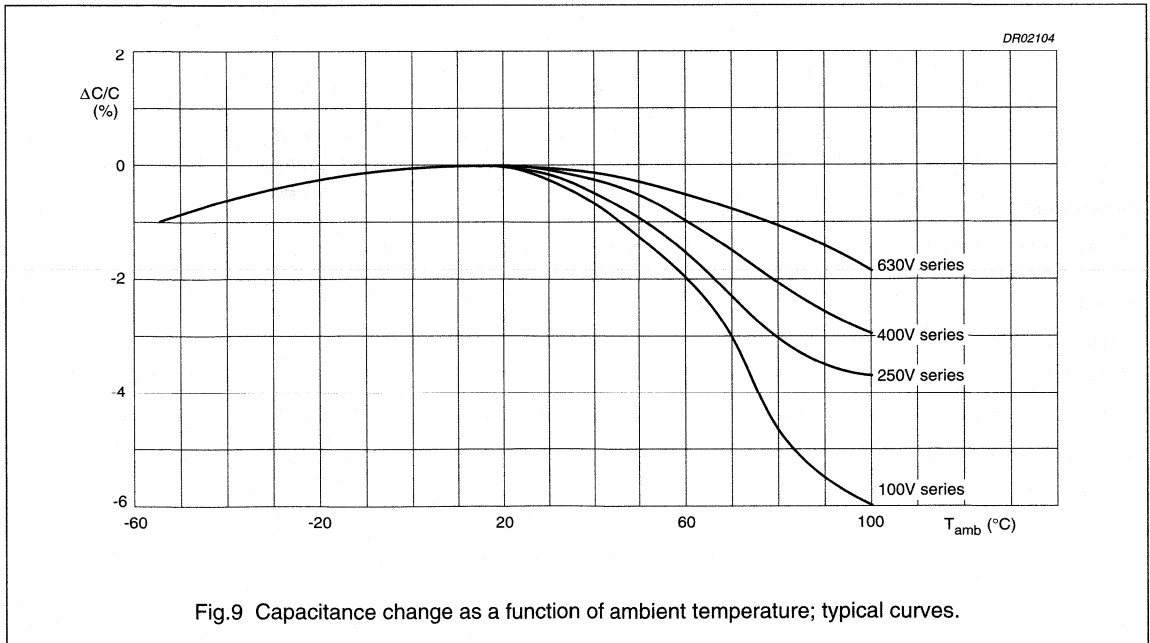
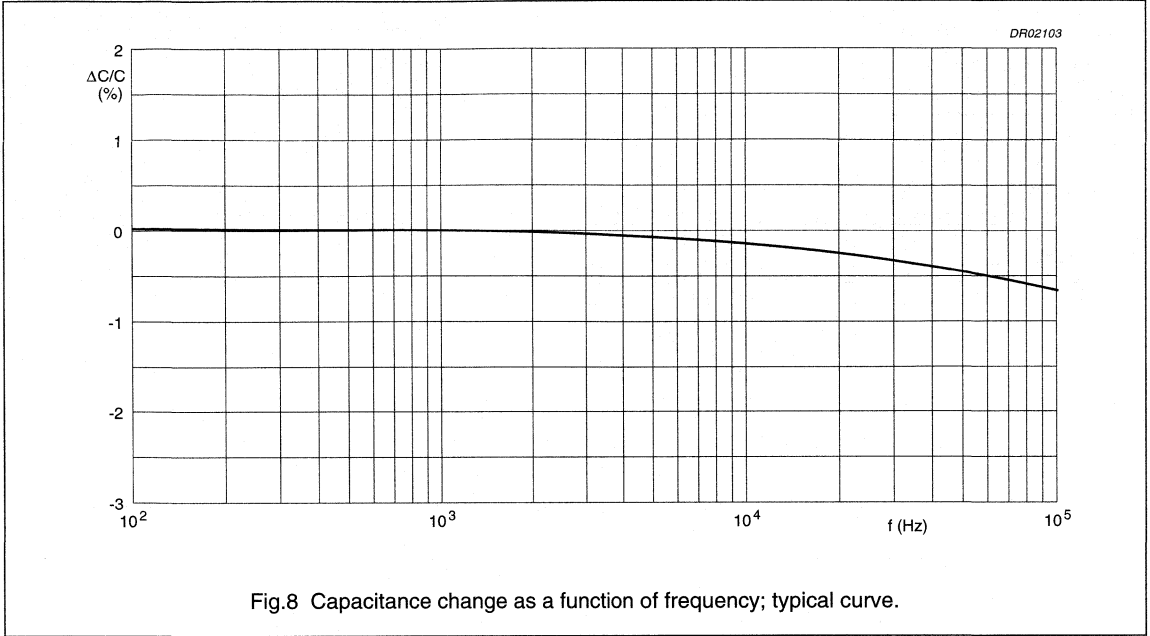


# Metallized Polycarbonate film capacitors

MKC 344

## Capacitance

All capacitance values are specified at 1 kHz.

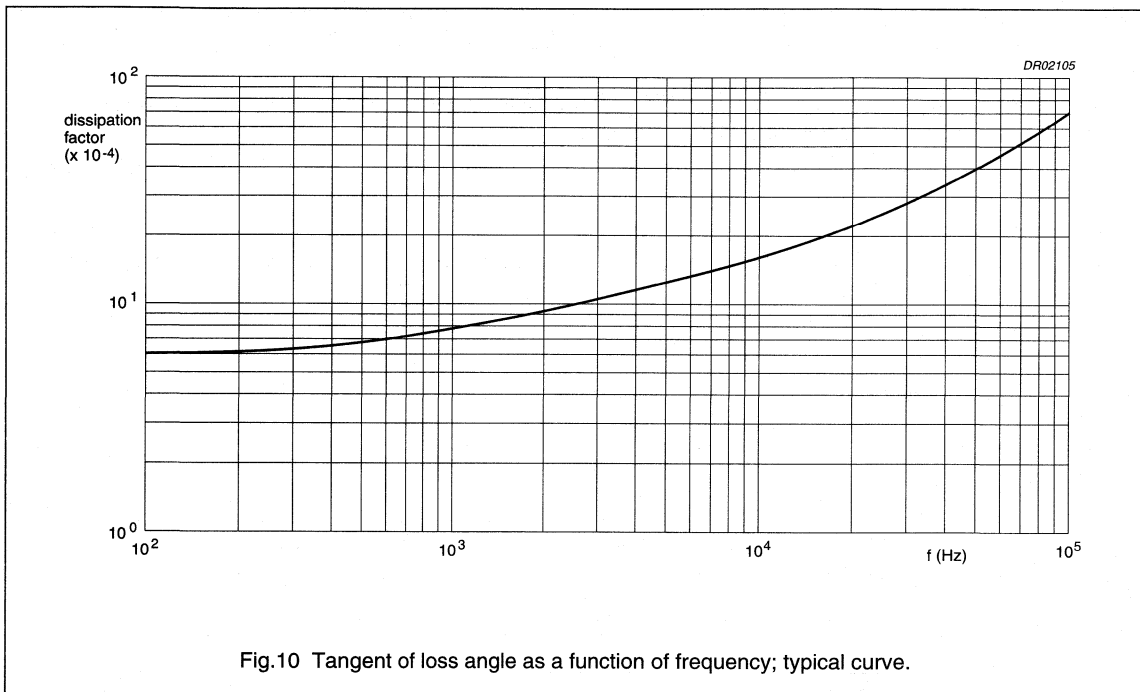


## Metallized Polycarbonate film capacitors

MKC 344

## Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE		
	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 0.1 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 60 \times 10^{-4}$	$\leq 130 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 1 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 60 \times 10^{-4}$	–
$C > 1 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 75 \times 10^{-4}$	–



## Temperature

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

## Voltage

- Category voltage:  $U_c = 0.8 \times U_{\text{Rdc}}$
- Test voltage between leads:  $1.6 \times U_{\text{Rdc}}$
- Test voltage between interconnected leads and case (foil method):  $2 \times U_{\text{Rdc}}$  (min. 200 V).

# Metallized Polycarbonate film capacitors

MKC 344

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

RATED VOLTAGE U <sub>R</sub> (V)	MAXIMUM RATED PULSE LOAD (V/μs) <sup>(1)(2)</sup>			
	P = 10.0 mm	P = 15.0 mm	P = 22.5 mm	P = 27.5 mm
100	60	26	12	9
250	90	36	16	14
400	140	60	26	22
630	200	90	36	30

### Notes

1. The maximum pulse load values are valid for voltages equal to the rated voltage. For lower voltages the given values may be multiplied by U<sub>Rdc</sub> and divided by the applied voltage.
2. If the pulse requirement is satisfied, a check must be made to ensure that the maximum dissipation is not exceeded.

### Insulation resistance

The insulation resistance is measured after a voltage has been applied for 1 minute ±5 seconds, the voltage being 100 ±15 V for the 100, 250 and 400 V versions and 500 ±50 V for the 630 V version:

- R between leads for C ≤ 0.33 μF: >30000 MΩ
- RC between leads for C > 0.33 μF: >10000 s
- R between interconnected leads and case (foil method): >30000 MΩ.

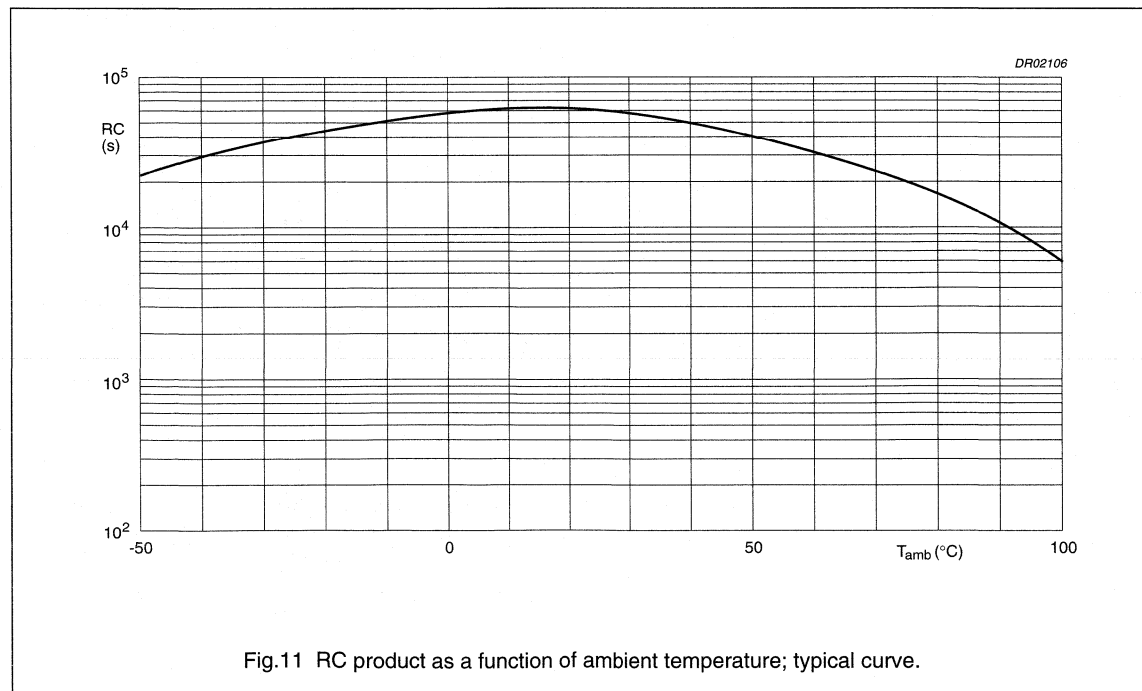


Fig.11 RC product as a function of ambient temperature; typical curve.

# Metallized Polycarbonate film capacitors

MKC 344

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Figs 12 and 13)

b <sub>max</sub> (mm)	PITCH (mm)			
	10	15	22.5	27.5
4.0	1	—	—	—
5.0	2	4	—	—
6.0	3	5	8	—
7.0	—	6	9	—
8.5	—	7	10	—
9.0	—	—	—	12
10.0	—	—	11	—
11.0	—	—	—	13
13.0	—	—	—	14

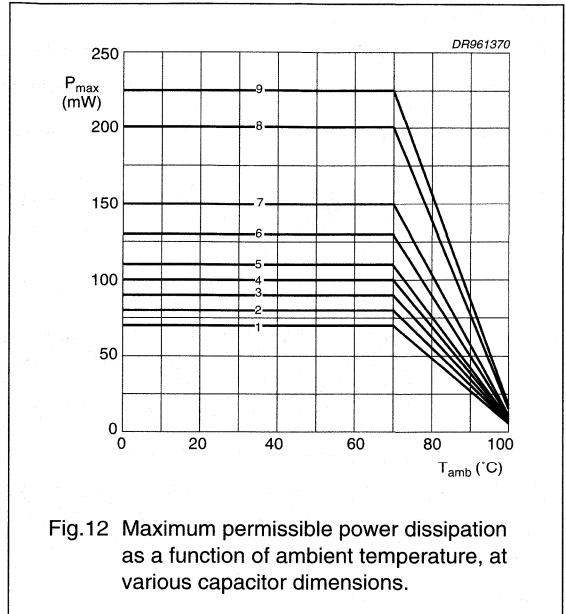


Fig.12 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

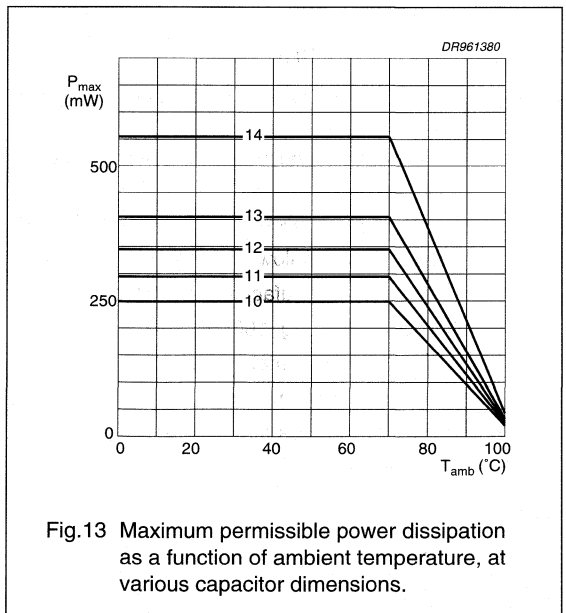


Fig.13 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

# Metallized Polycarbonate film capacitors

# MKC 344

## Application note

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance:

$$I_{p,max} = C \left( \frac{dU}{dt} \right)_{max}$$

Or the voltage pulse slope shall not exceed the rated voltage pulse slope. If the pulse voltage is lower than the rated voltage, the values (see Section "Rated voltage pulse slope ( $dU/dt$ )R" for more details) may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation stated in Figs 12 and 13.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.
6. Since all metallized polycarbonate film capacitors have an intrinsically active flammability risk after a capacitor breakdown (short circuit), it is recommended that the power to the component is limited to 10 times the maximum allowed power dissipation ( $P_{max}$ ) during the short circuit failure mode of the capacitor.

## MARKING

### Product marking

CAPACITORS WITH PITCH 10 mm

The capacitors are marked by laser print on the top with the following information:

1. Rated capacitance code in accordance with "IEC 62":  
 $n = nF$ ;  $\mu = \mu F$
2. Tolerance on rated capacitance: K =  $\pm 10\%$ ; J =  $\pm 5\%$ ;

and on the side with the following information:

1. Year and week of manufacture (e.g. 9110)
2. Rated voltage (DC) (e.g. 100 V)
3. Code for dielectric material (MKC)
4. Code for factory of origin (HQ)
5. Manufacturer's type designation (344)
6. Manufacturer (PH).

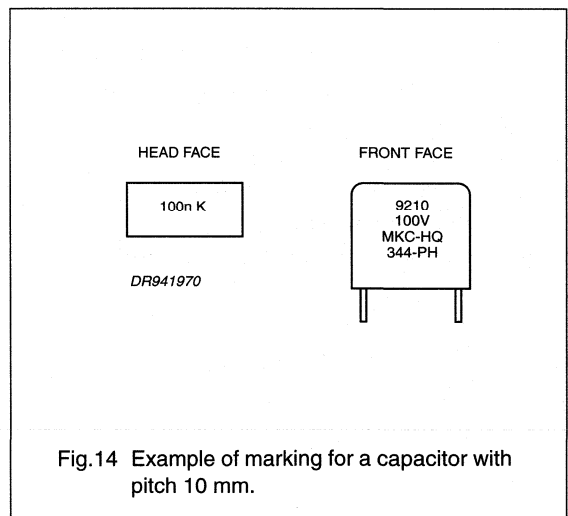


Fig.14 Example of marking for a capacitor with pitch 10 mm.

## Metallized Polycarbonate film capacitors

MKC 344

## CAPACITORS WITH PITCH 15 mm

The capacitors are marked by laser print on the top with the following information:

1. Rated capacitance code in accordance with "IEC 62":  
 $n = nF$ ;  $\mu = \mu F$
2. Tolerance on rated capacitance:  $K = \pm 10\%$ ;  $J = \pm 5\%$
3. Rated voltage (DC) (e.g. 400 V)
4. Manufacturer's type designation (344)
5. Code for dielectric material (MKC);

and on the side with the following information:

1. Manufacturer
2. Code for factory of origin (HQ)
3. Year and week of manufacture (e.g. 9210).

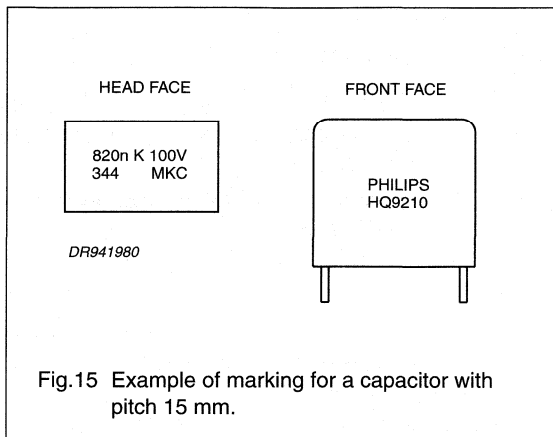


Fig.15 Example of marking for a capacitor with pitch 15 mm.

## CAPACITORS WITH PITCH 22.5 OR 27.5 mm

The capacitors are marked by laser print on the top with the following information:

1. Rated capacitance code in accordance with "IEC 62":  
 $n = nF$ ;  $\mu = \mu F$
2. Tolerance on rated capacitance:  $K = \pm 10\%$ ;  $J = \pm 5\%$
3. Rated voltage (DC) (e.g. 100 V)
4. Manufacturer.
5. Manufacturer's type designation (344)
6. Code for dielectric material (MKC)
7. Code for factory of origin (HQ)
8. Year and week of manufacture (e.g. 9210).

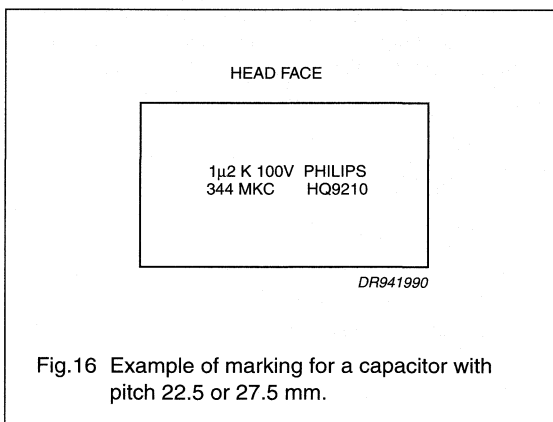


Fig.16 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.

## Metallized Polycarbonate film capacitors





MKC 344

## Package marking

The package containing the capacitors is marked as shown in Fig.17.

Barcode label explanation	
LINE	MARKING EXPLANATION
1.	Manufacturer's name
2.	Country of origin
3.	Sub-family
4.	Type description
5.	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")
6.	-
7.	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO
8.	Wage number of final inspection. (only for 4e products)
9.	Product type description
10.	Quantity and production period, year and week code
	Product code (12NC)

1.	<b>PHILIPS COMPONENTS</b>	
2.	MADE IN BELGIUM	
3.	METAL. POLYCARB. FILM CAPACITOR	
4.	MKC RADIAL POTTED TYPE	
5.	1 $\mu$ F	$\pm 10\%$ 250V= 55/100/56
6.		
7.	 WD: 12345678 ORIG A170 RPC HQ 1234	
8.	 TYPE MKC 344	
9.	 QTY 200 DATE 9625	
10.	 CODENO 2222 344 45105	

CCA324

Fig.17 Barcode label.

## Metallized Polycarbonate film capacitors

MKC 344

## 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  isopropyl alcohol: 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 1\%$
Component solvent resistance		$\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 2.5\%$
Shock: "IEC 68-2-27"		$\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 100 °C  2 hours; -55 °C	$ \Delta C/C  \leq 3\%$
Damp heat cyclic, test Db, first cycle: "IEC 68-2-30"		$\Delta \tan \delta \leq 50 \times 10^{-4}$ ; note 2
Cold: "IEC 68-2-1"		$R_{ins} \geq 50\%$ of specified value
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		
<b>Other applicable tests</b>		
Damp heat steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-6"	2000 hours; $1.25 \times U_{Rdc}$ ; 85 °C $1.25 \times U_{Cdc}$ ; 100 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2 $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-6"	2000 hours; 100 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
Resistance to soldering heat with preheating: "IEC 384-6"	body temperature: 80 °C; bath temperature: 260 °C; dwell time: 5 s	$ \Delta C/C  \leq 1\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ ; note 2
Passive flammability: "IEC 695-2-2"	class C	no burning

## Notes

- For detailed information, see "Type specification".
- Measuring frequency 10 kHz.



## Polyester film capacitors

KT 347

KT RADIAL PHENOLIC LACQUERED CAPACITORS

PITCH 10/15/22.5/27.5 mm

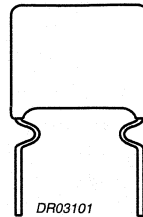


Fig.1 Simplified outline.

## FEATURES

- Low-inductive wound cell of metal foil and a polyethylene terephthalate film
- Lacquered, which is self-extinguishing
- Radial leads of solder-coated wire.

## APPLICATIONS

- Consumer and industrial
- Especially where high currents and/or steep pulses occur
- DC or AC voltage.

## QUICK REFERENCE DATA

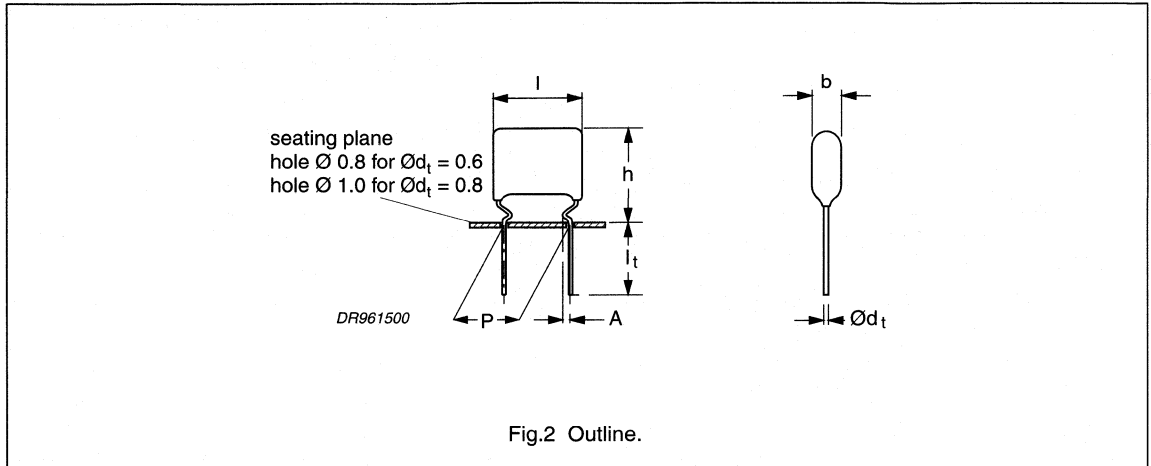
DESCRIPTION	VALUE
Capacitance range (E12 series)	0.001 to 1 $\mu$ F
Capacitance tolerance	$\pm 20\%$ ; $\pm 10\%$
Rated voltage (DC)	100 V; 250 V; 400 V; 630 V
Rated voltage (AC) at 50 to 60 Hz	50 V; 80 V; 125 V; 200 V
Climatic category	40/100/21
Rated temperature	85 °C
Maximum application temperature	100 °C
Reference specification	IEC 384-11

Polyester film capacitors

KT 347

KT 347 GENERAL DATA

PITCH 10/15/22.5/27.5 mm



Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 10 kHz
Tangent of loss angle	$\leq 60 \times 10^{-4}$	$\leq 110 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 50000 \text{ M}\Omega$	
RC between leads, for $C > 0.33 \mu\text{F}$	$> 16500 \text{ s}$	

Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 347 21...	preferred
		$\pm 20\%$	2222 347 20...	on request

## Polyester film capacitors

KT 347

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 50 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $d_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 347 ..... AND PACKAGING	
			LOOSE IN BOX; $l_t = 4.0 +1.0/-0.5 \text{ mm}$	
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ
			C-tol = $\pm 10\%$	
<b>Pitch = 10.16 <math>\pm 0.30</math> mm; <math>d_t = 0.60 \pm 0.06</math> mm; A = 2.5 <math>\pm 0.5</math> mm</b>				
0.015	4.5 $\times$ 12.5 $\times$ 14.0	0.4	21153	2000
0.018	5.0 $\times$ 12.5 $\times$ 14.0	0.5	21183	2000
0.022	5.5 $\times$ 13.0 $\times$ 14.0	0.6	21223	2000
0.027		0.7	21273	
0.033	6.0 $\times$ 13.5 $\times$ 14.0	0.7	21333	2000
0.039	6.5 $\times$ 14.0 $\times$ 14.0	0.8	21393	2000
0.047	7.0 $\times$ 14.5 $\times$ 14.0	0.9	21473	2000
<b>Pitch = 15.24 <math>\pm 0.30</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm; A = 3.5 <math>\pm 0.5</math> mm</b>				
0.056	5.5 $\times$ 14.0 $\times$ 19.0	1.2	21563	2000
0.068	6.0 $\times$ 14.5 $\times$ 19.0	1.3	21683	2000
0.082	7.0 $\times$ 15.5 $\times$ 19.0	1.5	21823	2000
0.1	7.5 $\times$ 16.0 $\times$ 19.0	1.7	21104	2000
0.12	8.0 $\times$ 16.5 $\times$ 19.0	1.9	21124	2000
0.15	8.5 $\times$ 17.0 $\times$ 19.0	2.3	21154	1000
<b>Pitch = 22.86 <math>\pm 0.30</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm; A = 3.5 <math>\pm 0.5</math> mm</b>				
0.18	7.5 $\times$ 18.0 $\times$ 27.0	2.8	21184	1000
0.22	7.5 $\times$ 18.5 $\times$ 27.0	3.2	21224	1000
0.27	8.0 $\times$ 19.5 $\times$ 27.0	3.8	21274	500
0.33	9.0 $\times$ 20.0 $\times$ 27.0	4.4	21334	500
0.39	10.0 $\times$ 21.0 $\times$ 27.0	5.1	21394	500
0.47	11.0 $\times$ 22.0 $\times$ 27.0	6.0	21474	500
<b>Pitch = 27.94 <math>\pm 0.30</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm; A = 3.5 <math>\pm 0.5</math> mm</b>				
0.56	10.5 $\times$ 22.5 $\times$ 32.0	7.0	21564	500
0.68	11.5 $\times$ 23.5 $\times$ 32.0	8.4	21684	500
0.82	12.5 $\times$ 24.5 $\times$ 32.5	10.2	21824	250
1	14.0 $\times$ 26.0 $\times$ 32.5	12.5	21105	250

## Note

1. The shading indicates preferred types.

## Polyester film capacitors

KT 347

## KT 347 GENERAL DATA

PITCH 10/15/22.5/27.5 mm

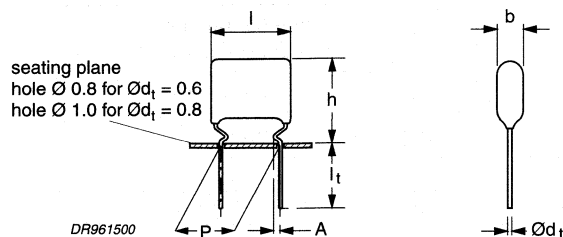


Fig.3 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 10 kHz
Tangent of loss angle	$\leq 60 \times 10^{-4}$	$\leq 110 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 50000 \text{ M}\Omega$	
RC between leads, for $C > 0.33 \mu\text{F}$	$> 16500 \text{ s}$	

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 347 41...	preferred
		$\pm 20\%$	2222 347 40...	on request

## Polyester film capacitors

KT 347

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 80 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 347 ..... AND PACKAGING	
			LOOSE IN BOX; $l_t = 4.0 +1.0/-0.5 \text{ mm}$	
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ
			C-tol = $\pm 10\%$	
<b>Pitch = <math>10.16 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.5 \pm 0.5 \text{ mm}</math></b>				
0.0082	$4.5 \times 12.0 \times 13.5$	0.4	41822	2000
0.01	$5.0 \times 12.5 \times 13.5$	0.5	41103	2000
0.012	$5.5 \times 13.0 \times 13.5$	0.5	41123	2000
0.015		0.6	41153	
0.018	$6.0 \times 13.5 \times 13.5$	0.7	41183	2000
0.022	$6.5 \times 14.0 \times 13.5$	0.8	41223	2000
0.027	$7.0 \times 14.5 \times 13.5$	0.9	41273	2000
<b>Pitch = <math>15.24 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.033	$5.5 \times 14.0 \times 19.0$	1.1	41333	2000
0.039	$6.0 \times 14.5 \times 19.0$	1.3	41393	2000
0.047	$7.0 \times 15.5 \times 19.0$	1.4	41473	2000
0.056	$7.5 \times 16.0 \times 19.0$	1.6	41563	2000
0.068	$8.0 \times 16.5 \times 19.0$	1.8	41683	2000
0.082	$8.5 \times 17.0 \times 19.0$	2.1	41823	1000
<b>Pitch = <math>22.86 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.1	$7.5 \times 18.0 \times 27.0$	2.7	41104	1000
0.12	$7.5 \times 18.5 \times 27.0$	3.0	41124	1000
0.15	$8.0 \times 19.5 \times 27.0$	3.5	41154	500
0.18	$9.0 \times 20.0 \times 27.0$	4.0	41184	500
0.22	$10.0 \times 21.0 \times 27.0$	4.5	41224	500
0.27	$11.0 \times 22.0 \times 27.0$	5.3	41274	500
<b>Pitch = <math>27.94 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.33	$10.5 \times 22.5 \times 32.0$	6.3	41334	500
0.39	$11.5 \times 23.5 \times 32.0$	7.6	41394	500
0.47	$12.5 \times 24.5 \times 32.5$	9.1	41474	250
0.56	$14.0 \times 26.0 \times 32.5$	10.8	41564	250
0.68	$15.5 \times 27.5 \times 32.5$	13.1	41684	250

## Note

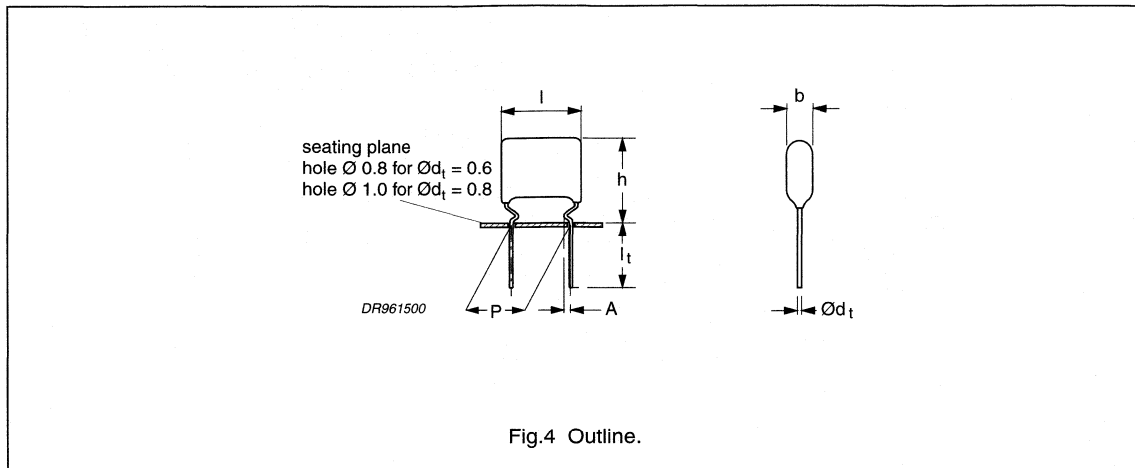
1. The shading indicates preferred types.

Polyester film capacitors

KT 347

KT 347 GENERAL DATA

PITCH 10/15/22.5/27.5 mm



Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 10 kHz
Tangent of loss angle	$\leq 60 \times 10^{-4}$	$\leq 110 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 50000 \text{ M}\Omega$	

Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 347 51...	preferred
		$\pm 20\%$	2222 347 50...	on request

## Polyester film capacitors

KT 347

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 125 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 347 ..... AND PACKAGING	
			LOOSE IN BOX; $l_t = 4.0 +1.0/-0.5 \text{ mm}$	
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ
			C-tol = $\pm 10\%$	
<b>Pitch = <math>10.16 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.5 \pm 0.5 \text{ mm}</math></b>				
0.0047	$4.5 \times 12.0 \times 13.5$	0.4	51472	2000
0.0056	$5.0 \times 12.5 \times 13.5$	0.5	51562	2000
0.0068	$5.5 \times 13.0 \times 13.5$	0.5	51682	2000
0.0082		0.6	51822	
0.01	$6.0 \times 13.5 \times 13.5$	0.7	51103	2000
0.012	$6.5 \times 14.0 \times 13.5$	0.8	51123	2000
0.015	$7.0 \times 14.5 \times 13.5$	0.9	51153	2000
<b>Pitch = <math>15.24 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.018	$5.5 \times 14.0 \times 19.0$	1.1	51183	2000
0.022	$6.0 \times 14.5 \times 19.0$	1.2	51223	2000
0.027	$7.0 \times 15.5 \times 19.0$	1.4	51273	2000
0.033	$7.5 \times 16.0 \times 19.0$	1.6	51333	2000
0.039	$8.0 \times 16.5 \times 19.0$	1.8	51393	2000
0.047	$8.5 \times 17.0 \times 19.0$	2.1	51473	1000
<b>Pitch = <math>22.86 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.056	$7.5 \times 18.0 \times 27.0$	2.5	51563	1000
0.068	$7.5 \times 18.5 \times 27.0$	2.9	51683	1000
0.082	$8.0 \times 19.5 \times 27.0$	3.2	51823	500
0.1	$9.0 \times 20.0 \times 27.0$	3.8	51104	500
0.12	$10.0 \times 21.0 \times 27.0$	4.4	51124	500
0.15	$11.0 \times 22.0 \times 27.0$	5.2	51154	500
<b>Pitch = <math>27.94 \pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.18	$10.5 \times 22.5 \times 32.0$	6.0	51184	500
0.22	$11.5 \times 23.5 \times 32.0$	6.9	51224	500
0.27	$12.5 \times 24.5 \times 32.5$	8.0	51274	250
0.33	$14.0 \times 26.0 \times 32.5$	9.5	51334	250

**Note**

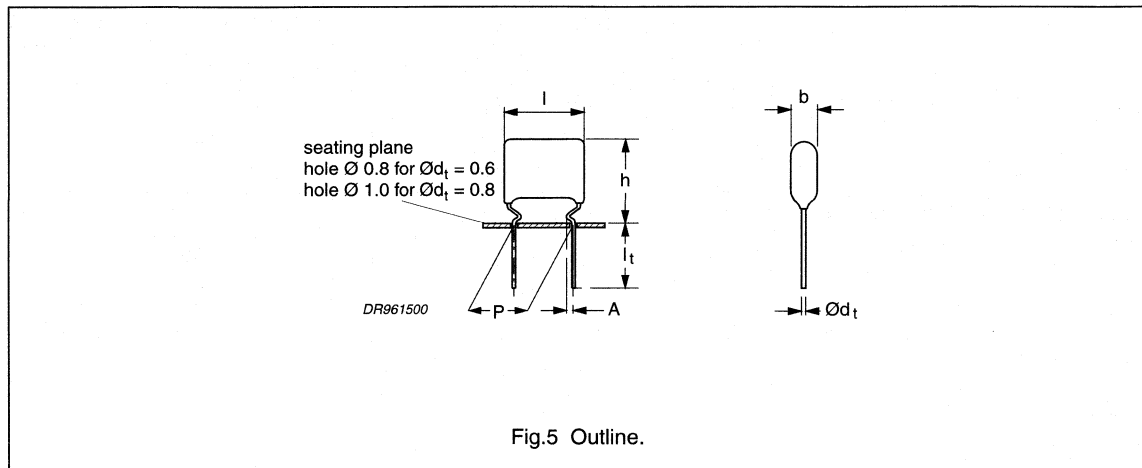
1. The shading indicates preferred types.

Polyester film capacitors

KT 347

KT 347 GENERAL DATA

PITCH 10/15/22.5/27.5 mm



Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 10 kHz
Tangent of loss angle	$\leq 60 \times 10^{-4}$	$\leq 110 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 50000 \text{ M}\Omega$	

Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 4.0 +1.0/-0.5 \text{ mm}$	$\pm 10\%$	2222 347 61...	preferred
		$\pm 20\%$	2222 347 60...	on request



## Polyester film capacitors

KT 347

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 347 ..... AND PACKAGING	
			LOOSE IN BOX; $l_t = 4.0 +1.0/-0.5 \text{ mm}$	
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ
			C-tol = $\pm 10\%$	
<b>Pitch = 10.16 <math>\pm 0.30 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.5 \pm 0.5 \text{ mm}</math></b>				
0.001	5.5 $\times$ 13.0 $\times$ 13.5	0.5	61102	2000
0.0012		0.5	61122	
0.0015		0.6	61152	
0.0018		0.7	61182	
0.0022		0.5	61222	
0.0027		0.6	61272	
0.0033		0.5	61332	
0.0039		0.6	61392	
0.0047		6.0 $\times$ 13.5 $\times$ 13.5	0.7	
0.0056	6.5 $\times$ 14.0 $\times$ 13.5	0.8	61562	2000
0.0068	7.0 $\times$ 14.5 $\times$ 13.5	0.9	61682	2000
<b>Pitch = 15.24 <math>\pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.0082	5.5 $\times$ 14.0 $\times$ 19.0	1.1	61822	2000
0.01	6.0 $\times$ 14.5 $\times$ 19.0	1.2	61103	2000
0.012	7.0 $\times$ 15.5 $\times$ 19.0	1.3	61123	2000
0.015	7.5 $\times$ 16.0 $\times$ 19.0	1.5	61153	2000
0.018	8.0 $\times$ 16.5 $\times$ 19.0	1.7	61183	2000
0.022	8.5 $\times$ 17.0 $\times$ 19.0	2.0	61223	1000
<b>Pitch = 22.86 <math>\pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.027	7.5 $\times$ 18.0 $\times$ 27.0	2.5	61273	1000
0.033	7.5 $\times$ 18.5 $\times$ 27.0	2.8	61333	1000
0.039	8.0 $\times$ 19.5 $\times$ 27.0	3.0	61393	500
0.047	9.0 $\times$ 20.0 $\times$ 27.0	3.5	61473	500
0.056	10.0 $\times$ 21.0 $\times$ 27.0	3.8	61563	500
0.068	11.0 $\times$ 22.0 $\times$ 27.0	4.4	61683	500
<b>Pitch = 27.94 <math>\pm 0.30 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 3.5 \pm 0.5 \text{ mm}</math></b>				
0.082	10.5 $\times$ 22.5 $\times$ 32.0	5.2	61823	500
0.1	11.5 $\times$ 23.5 $\times$ 32.0	6.2	61104	500
0.12	12.5 $\times$ 24.5 $\times$ 32.5	7.2	61124	250
0.15	14.0 $\times$ 26.0 $\times$ 32.5	8.7	61154	250

## Note

1. The shading indicates preferred types.

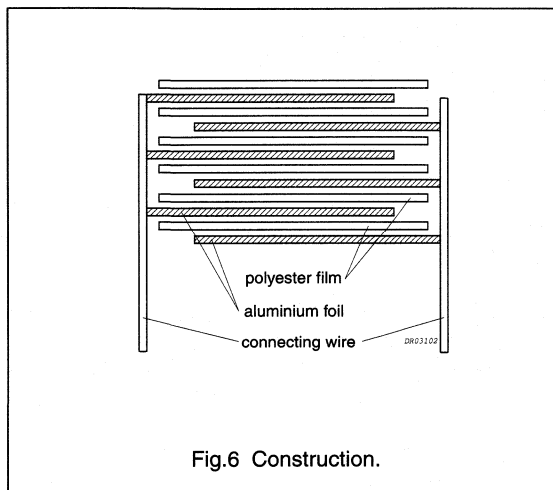
# Polyester film capacitors

# KT 347

## CONSTRUCTION

### Description

- Low-inductive wound cell of metal foil and a polyethylene terephthalate film
- Lacquered with self-extinguishing tan coloured lacquer
- Radial copper leads, solder-coated.



## Mounting

### NORMAL USE

The capacitors are designed for mounting on printed-circuit boards.

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

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

- For pitches  $\leq 15$  mm the capacitors shall be mechanically fixed by the leads
- For pitches  $> 15$  mm 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  $23 \pm 1$  °C, an atmospheric pressure of 86 to 106 kPa and a relative humidity of  $50 \pm 2\%$ .

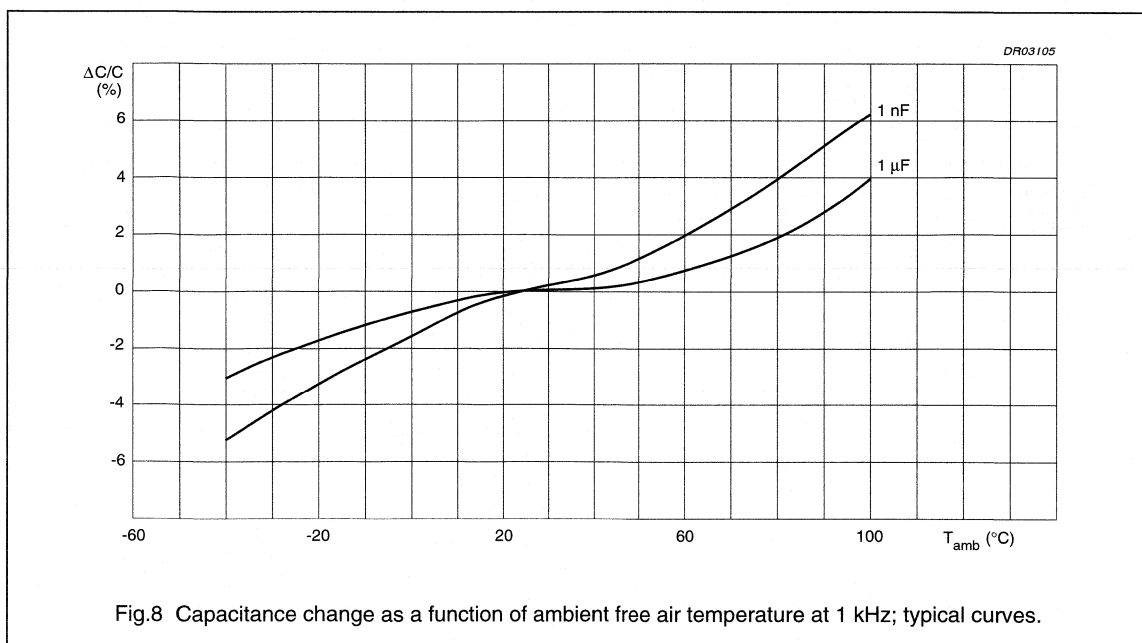
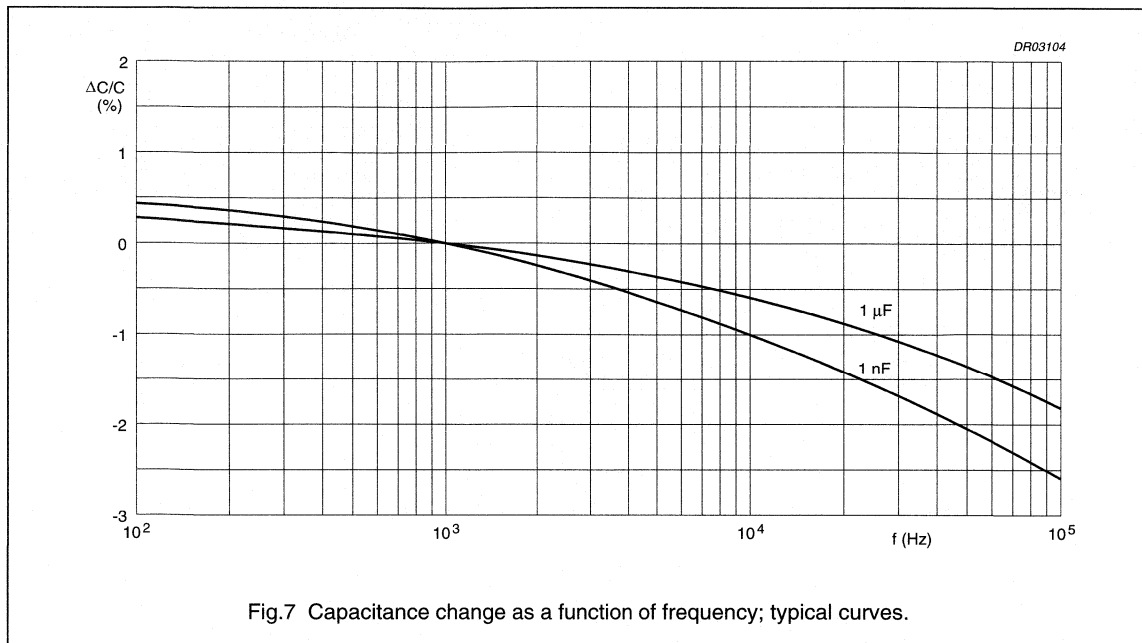
For reference testing, a conditioning period shall be applied of  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

## Polyester film capacitors

KT 347

## Capacitance

All capacitance values are specified at 1 kHz.

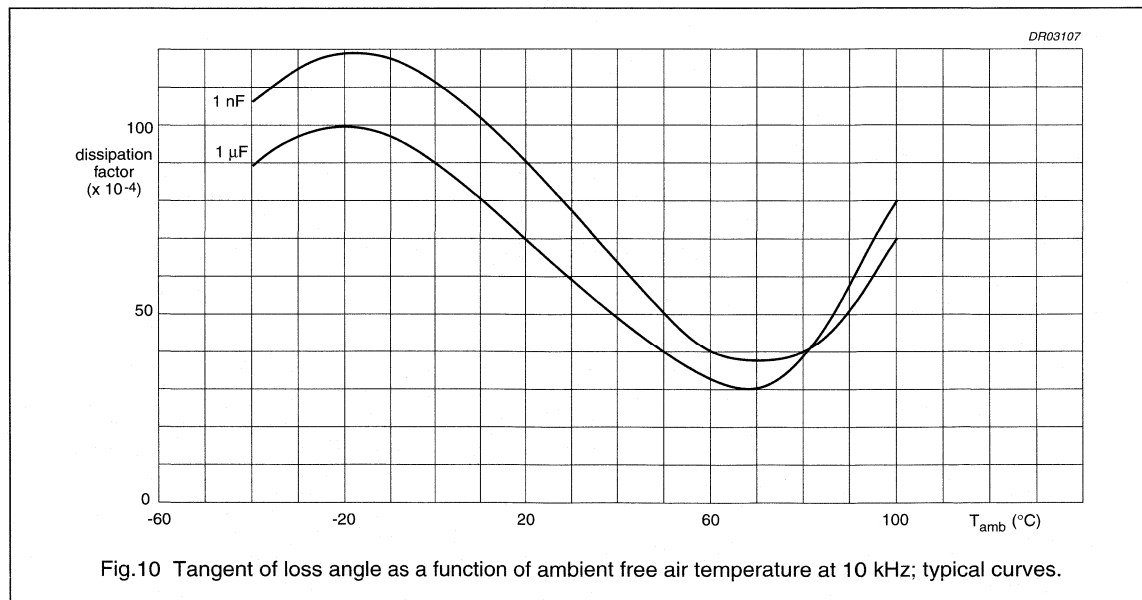
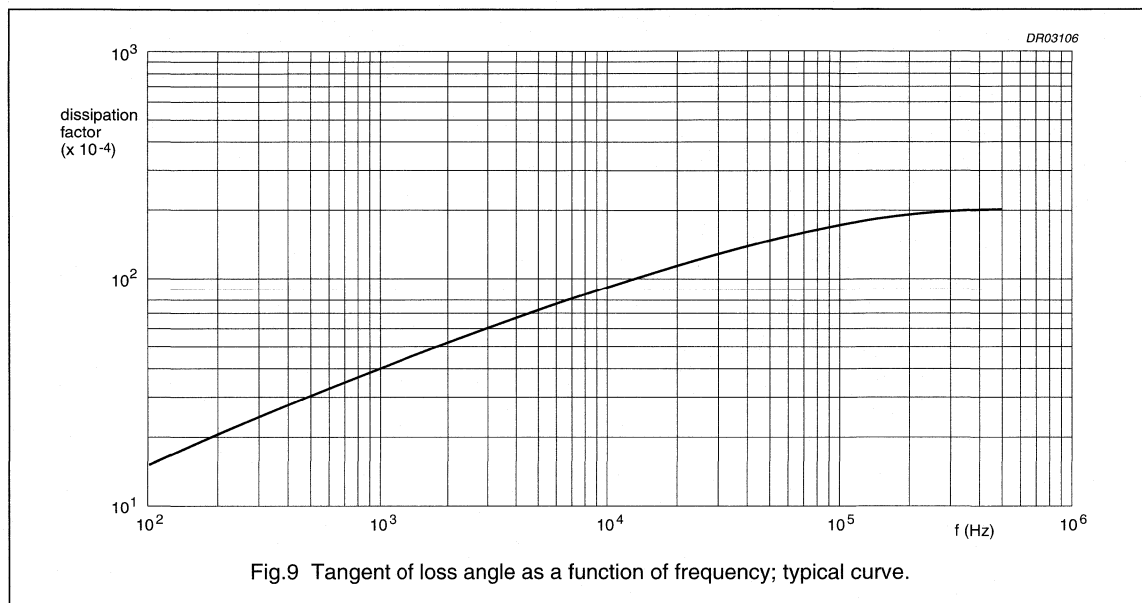


# Polyester film capacitors

KT 347

## Tangent of loss angle

TANGENT OF LOSS ANGLE	
at 10 kHz	at 1 kHz
$\leq 110 \times 10^{-4}$	$\leq 60 \times 10^{-4}$



## Polyester film capacitors

KT 347

**Temperature**

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

**Voltage**

- Category voltage:  $U_c = 0.8 \times U_{Rdc}$
- Test voltage between leads ("IEC 384-1"):  $2 \times U_{Rdc}$ .

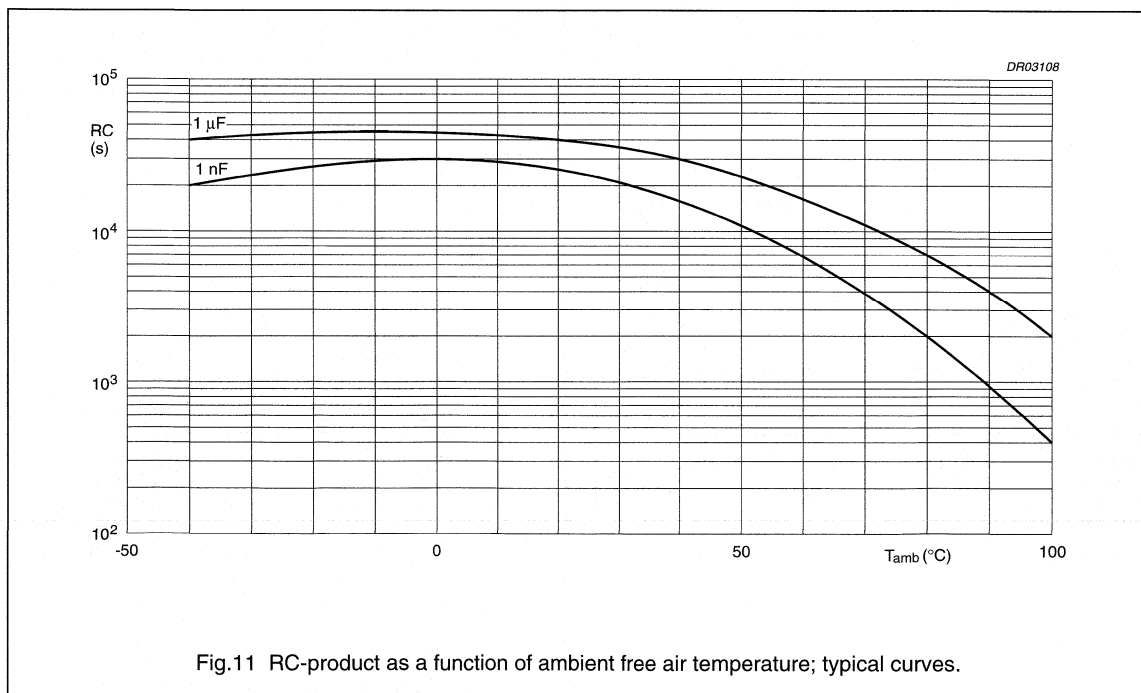
**Rated voltage pulse slope  $(dU/dt)_R$** 

- $>10000\text{ V}/\mu\text{s}$ .

**Insulation resistance**

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $100 \pm 15\text{ V}$  for the 100 V, 250 V and 400 V versions and  $500 \pm 50\text{ V}$  for the 630 V version:

- R between leads for  $C \leq 0.33\text{ }\mu\text{F}$ :  $>50000\text{ M}\Omega$
- RC between leads for  $C > 0.33\text{ }\mu\text{F}$ :  $>16500\text{ s}$ .



# Polyester film capacitors

KT 347

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Figs 12 and 13)

$b_{max}$ (mm)	PITCH (mm)			
	10	15	22.5	27.5
4.0	–	–	–	–
4.5	2	–	–	–
5.0	3	–	–	–
5.5	4	5	–	–
6.0	4	5	–	–
6.5	5	–	–	–
7.0	6	6	–	–
7.5	–	7	12	–
8.0	–	7	12	–
8.5	–	8	–	–
9.0	–	–	13	–
9.5	–	–	–	–
10.0	–	–	14	–
10.5	–	–	–	17
11.0	–	–	15	–
11.5	–	–	–	18
12.0	–	–	–	–
12.5	–	–	–	19
13.0	–	–	–	–
13.5	–	–	–	–
14.0	–	–	–	19
14.5	–	–	–	–
15.0	–	–	–	–
15.5	–	–	–	21
16.0	–	–	–	–

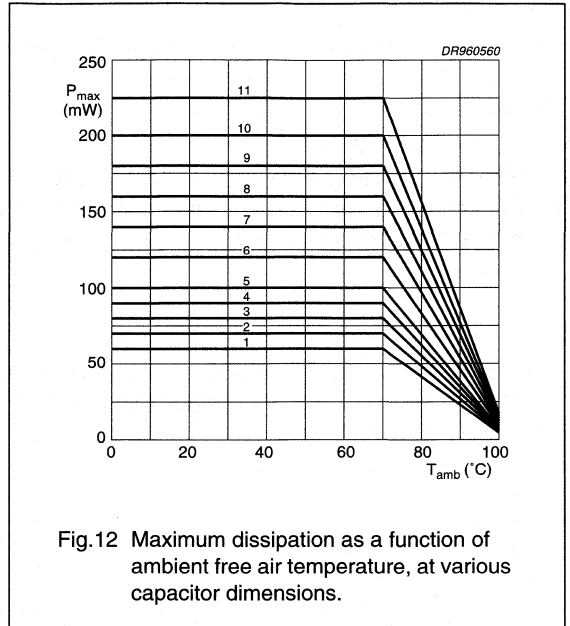


Fig.12 Maximum dissipation as a function of ambient free air temperature, at various capacitor dimensions.

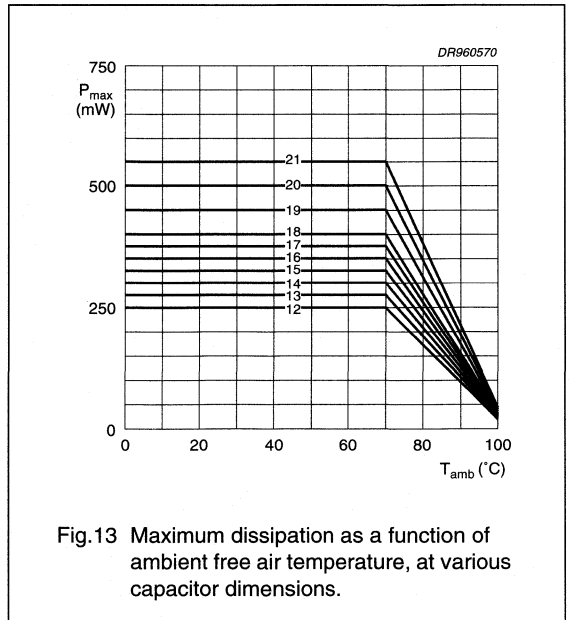


Fig.13 Maximum dissipation as a function of ambient free air temperature, at various capacitor dimensions.

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## Polyester film capacitors

KT 347

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### Application note

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. There is no limit for the peak current ( $I_p$ ) or voltage slope ( $dU/dt$ ) in the application.
4. The dissipated power shall not be greater than the maximum permissible power dissipation stated in Figs 12 and 13.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.

## Polyester film capacitors

KT 347

## MARKING

## Product marking

The capacitors are marked on the top in black ink with the following information:

1. Rated capacitance code in accordance with "IEC 62": pF or  $\mu\text{F}$
2. Tolerance on rated capacitance: M  $\pm 20\%$ ; K =  $\pm 10\%$
3. Rated voltage (DC) (e.g. 250 V)
4. Code for dielectric material (KT)
5. Manufacturer (PHILIPS)
6. Code for factory of origin (HQ).

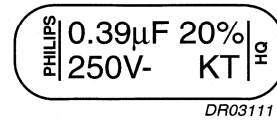


Fig.14 Example of marking.

## Package marking

The package containing the capacitors is marked as shown in Fig.15.

LINE	MARKING EXPLANATION
1.	PHILIPS COMPONENTS
2.	MADE IN BELGIUM
3.	PETP FILM-FOIL CAPACITOR
4.	KT RADIAL PHENOLIC LACQUERED TYPE
5.	0.47 $\mu\text{F}$ $\pm 10\%$ 250V= 40/100/21
6.	—
7.	ORIG A170 RPC HQ 1234
8.	TYPE KT 347
9.	QTY 1000 DATE 9625
10.	COOENO 2222 347 41474

CCA341

Fig.15 Barcode label.



## Polyester film capacitors

KT 347

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: "IEC 68-2-21" Resistance to soldering heat "IEC 68-2-20 A"	solder bath: 260 °C; 10 s	no visible damage legible marking $ \Delta C/C  \leq 2\%$
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6" Shock: "IEC 68-2-27"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 5\%$
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2" Damp heat cyclic, first cycle: "IEC 68-2-30" Cold: "IEC 68-2-1" Damp heat, remaining cycles: "IEC 68-2-30"	16 hours; 100 °C  2 hours; -40 °C	$ \Delta C/C  \leq 5\%$ $R_{ins} \geq 50\%$ of specified value
<b>Other applicable tests</b>		
Damp heat steady state: "IEC 68-2-3"	21 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 5\%$ $R_{ins} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-11"	1000 hours; $1.25 \times U_{Rdc}$ ; 85 °C $1.25 \times U_{Cdc}$ ; 100 °C	$ \Delta C/C  \leq 10\%$ $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-11"	1000 hours; 100 °C	$ \Delta C/C  \leq 5\%$
Resistance to soldering heat with preheating: "IEC 384-11"	body temperature: 100 °C; bath temperature: 260 °C; dwell time: 10 s	$ \Delta C/C  \leq 2\%$

**Note**

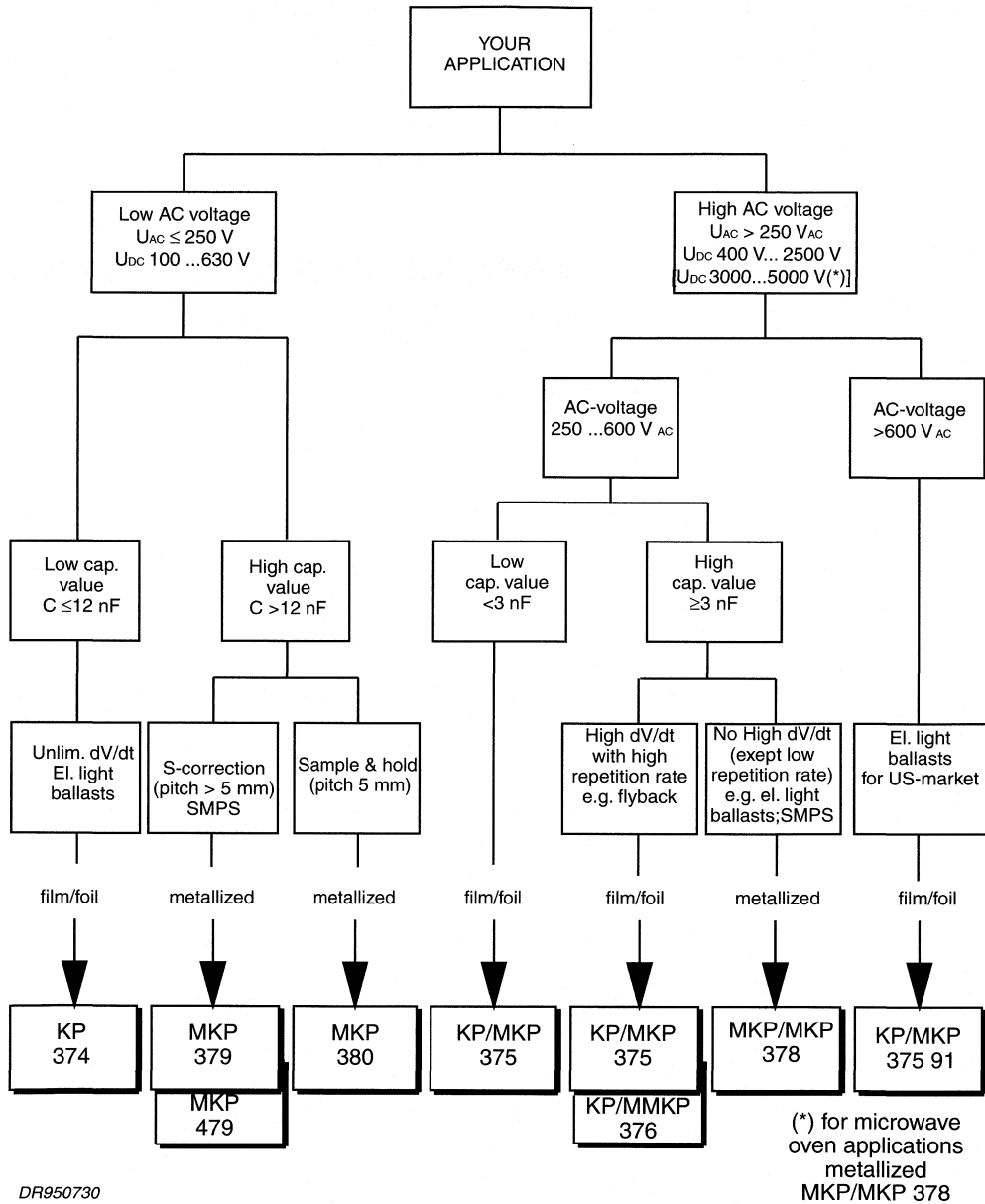
1. For detailed information, see "Type specification".



## **INTERFERENCE SUPPRESSION CAPACITORS**



# HOW TO SELECT

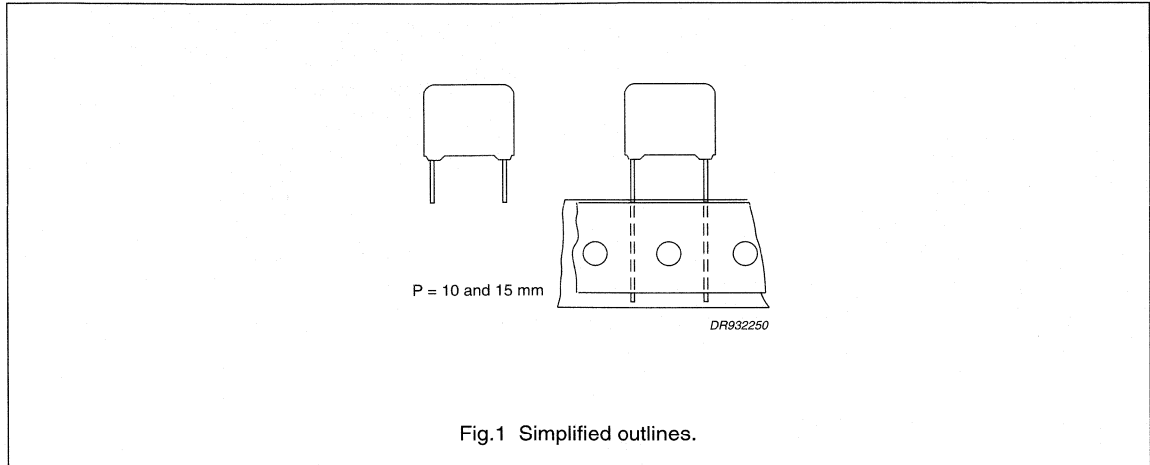


## Interference suppression film capacitors

MKP 336 6

MKP RADIAL POTTED CAPACITORS

PITCH 10/15 mm



## FEATURES

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

## APPLICATIONS

- For Y2-electromagnetic interference suppression
- Specially designed to meet the **NEW REQUIREMENTS** of the new "IEC 384-14 2<sup>nd</sup> edition, EN 132400", requiring a 5 kV peak pulse voltage test and both the UL1414 and CSA-C22.2 No. 1 specification.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series)	1 to 47 nF
Capacitance tolerance	±20%; ±10%; ±5%
Rated voltage (AC), 50 to 60 Hz	250 V
Climatic category	55/100/21/C
Rated temperature	100 °C
Maximum application temperature	100 °C
Reference specifications	IEC 384-14 2 <sup>nd</sup> edition, EN 132400; note 1
Safety approvals	UL1414; CSA-C22.2 No 1; SEV; VDE; FI; N; D; S; IMQ; ÖVE
Materials	qualified in accordance with UL94 V-0
Safety class	Y2

## Note

1. IEC 384-14 2<sup>nd</sup> edition = EN 132400.

## Interference suppression film capacitors

MKP 336 6

## MKP 336 6 GENERAL DATA

PITCH 10/15 mm

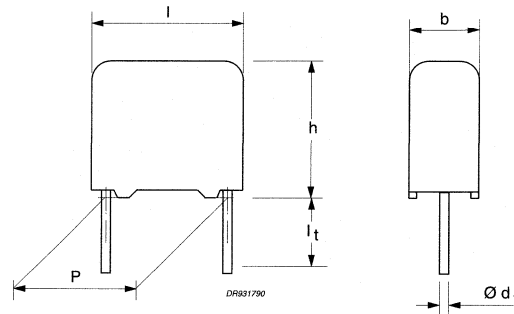


Fig.2 Outline.

## Specific reference data for the 250 V AC (Y2) capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$	200 V/ $\mu$ s	
R between leads, for $C \leq 0.33 \mu$ F	>15000 M $\Omega$	
Test voltage (DC)	2700 V; 1 s	

## Available 250 V AC (Y2) versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5$ mm; note 1	$\pm 20\%$	2222 336 60...	preferred
		$\pm 10\%$	2222 336 61...	on request
Loose in box	$l_t = 25.0 \pm 2.0$ mm	$\pm 20\%$	2222 336 66...	on request
		$\pm 10\%$	2222 336 67...	on request
Taped on reel	H = 18.5 mm; note 2	$\pm 20\%$	2222 336 63...	on request
		$\pm 10\%$	2222 336 64...	on request

## Notes

- $l_t = 3.5 \pm 0.3$  mm for pitch = 15 mm.
- H = in-tape height; for detailed specifications refer to this handbook, Chapter "Packaging".

## Available 250 V AC (Y2) versions on request

PACKAGING	DIMENSIONS	C-tol	VALUES	ORDERING
Ammopack	$l_t = 3.2$ to 35 mm	$\pm 5\%$	E12 series	on request

## Interference suppression film capacitors

MKP 336 6

## Safety approvals

SAFETY APPROVALS	FILE NUMBERS	SAFETY APPROVALS	FILE NUMBERS
UL1414	E112471	NEMKO	Pending
CSA-C22.2 No.1-M90	LR 94054-6	DEMKO	Pending
SEV	94,1 01167,02	SEMKO	Pending
VDE (EN132400)	83620	IMQ	Pending
FI	Pending	ÖVE	23138/R

 $U_{Rac} = 250 \text{ V (AC) Y2}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 336 .....			
			LOOSE IN BOX			REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}^{(1)}$		$l_t = 25.0 \pm 2.0 \text{ mm}$	H = 18.5 mm
			last 5 digits of catalogue number <sup>(2)</sup>	SPQ	SPQ	SPQ
Pitch = 10.0 $\pm$ 0.4 mm; $d_t = 0.60 \pm 0.06 \text{ mm}$						
0.001 0.0015 0.0022	4.0 $\times$ 10.0 $\times$ 12.5	0.6	60102 60152 60222	1000	1250	1400
0.0033	5.0 $\times$ 11.0 $\times$ 12.5	0.9	60332	1000	1000	1100
0.0047 0.0068	6.0 $\times$ 12.0 $\times$ 12.5	1.0	60472 60682	750	750	900
Pitch = 15.0 $\pm$ 0.4 mm; $d_t = 0.80 \pm 0.08 \text{ mm}$						
0.0068 0.0068 0.01	5.0 $\times$ 11.0 $\times$ 17.5	1.2	note 3 69005 60103	1000	1000	1100
0.015	6.0 $\times$ 12.0 $\times$ 17.5	1.4	60153	1000	1000	900
0.022	7.0 $\times$ 13.5 $\times$ 17.5	1.9	60223	1000	500	800
0.033	8.5 $\times$ 15.0 $\times$ 17.5	2.6	60333	1000	500	650
0.047	10.0 $\times$ 16.5 $\times$ 17.5	3.1	60473	500	500	600

## Notes

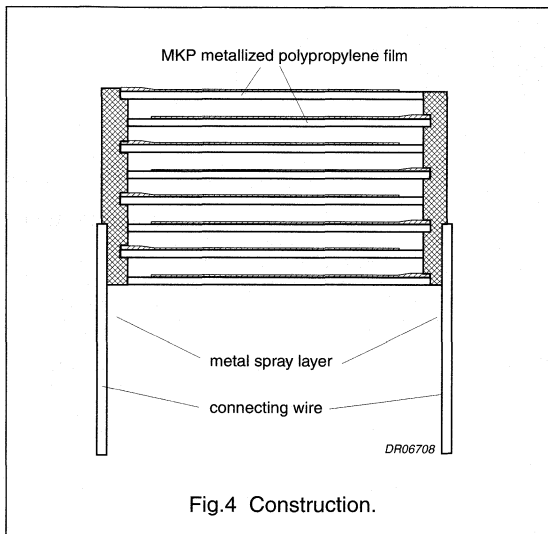
- $l_t = 3.5 \pm 0.3 \text{ mm}$  for pitch = 15 mm.
- The shading indicates preferred types.
- Other dimensions for 10% versions.

## Interference suppression film capacitors

MKP 336 6

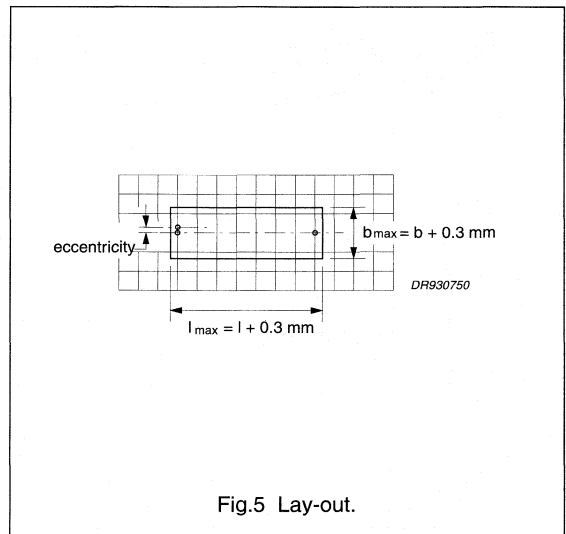
**CONSTRUCTION****Description**

- Low-inductive wound cell of metallized polypropylene (PP) film, potted with epoxy resin in a flame-retardant polypropylene case
- Radial copper clad steel wire, 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**

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

- The capacitors shall be mechanically fixed by the leads.

**RATINGS AND CHARACTERISTICS**

Unless otherwise specified, all electrical values apply at 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 rated temperature and a relative humidity not exceeding 20%.

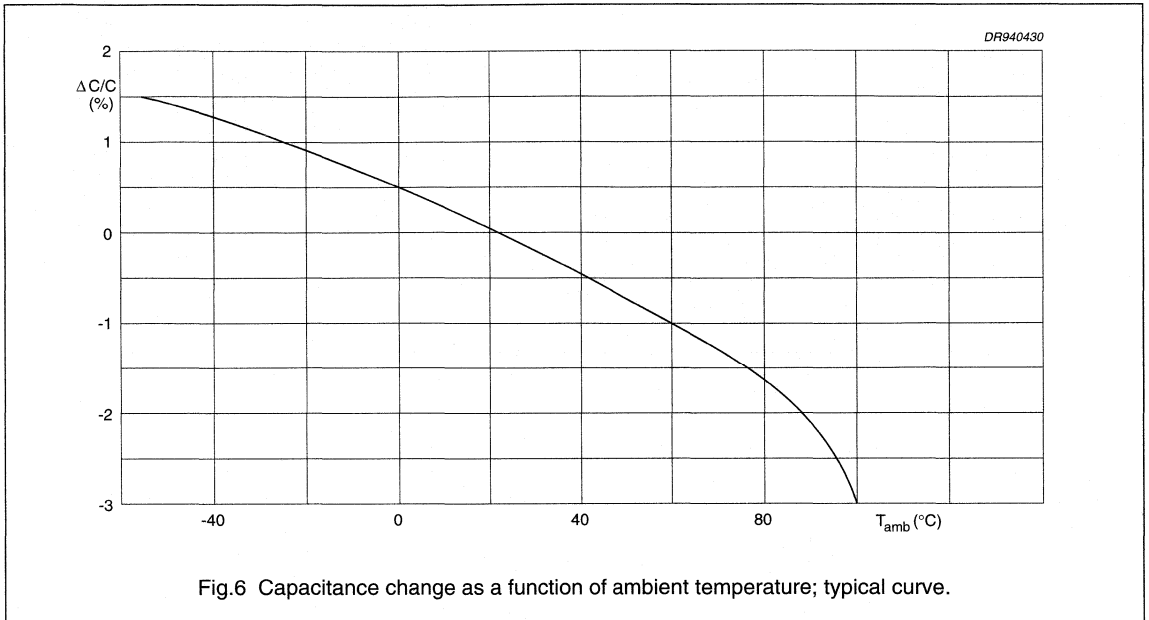


# Interference suppression film capacitors

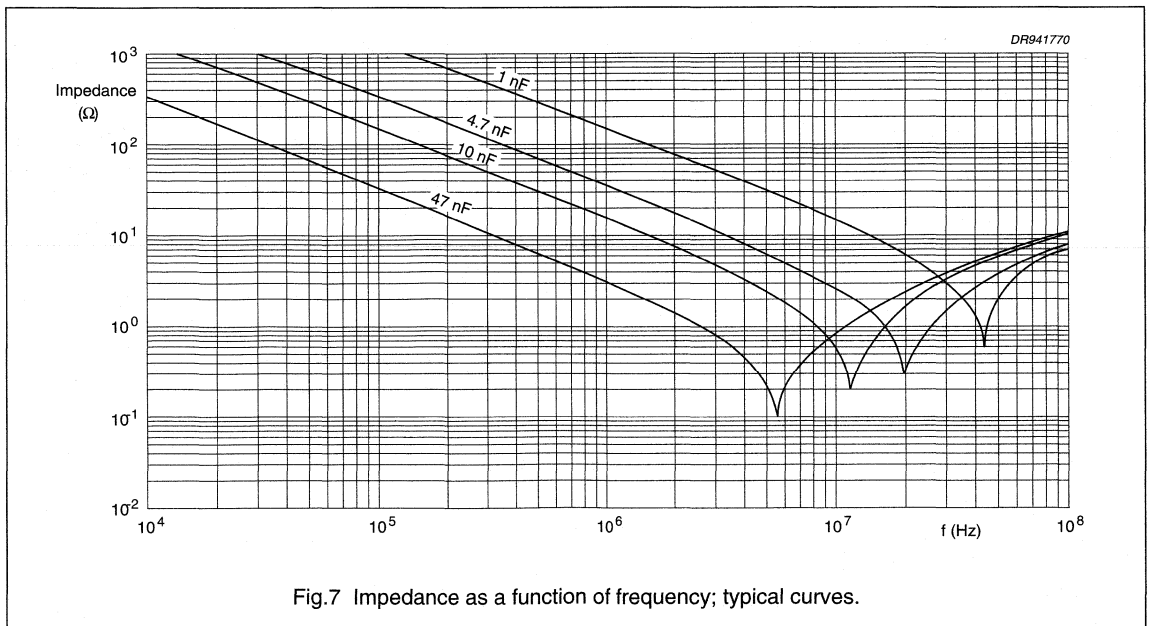
# MKP 336 6

## Capacitance

All capacitance values are specified at 1 kHz.



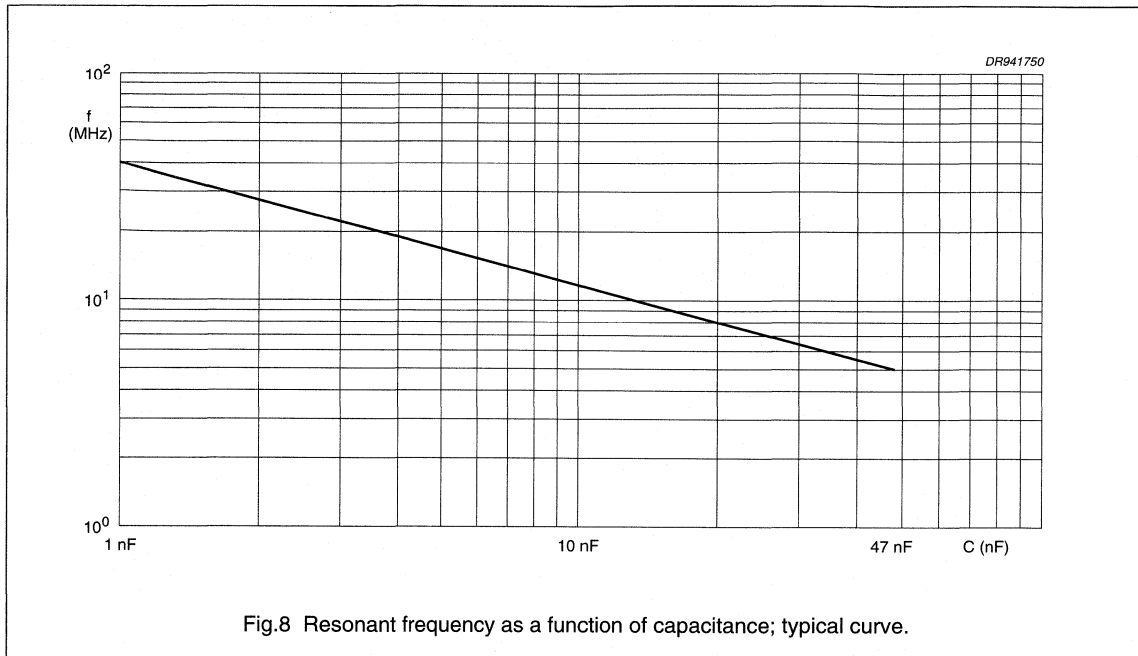
## Impedance



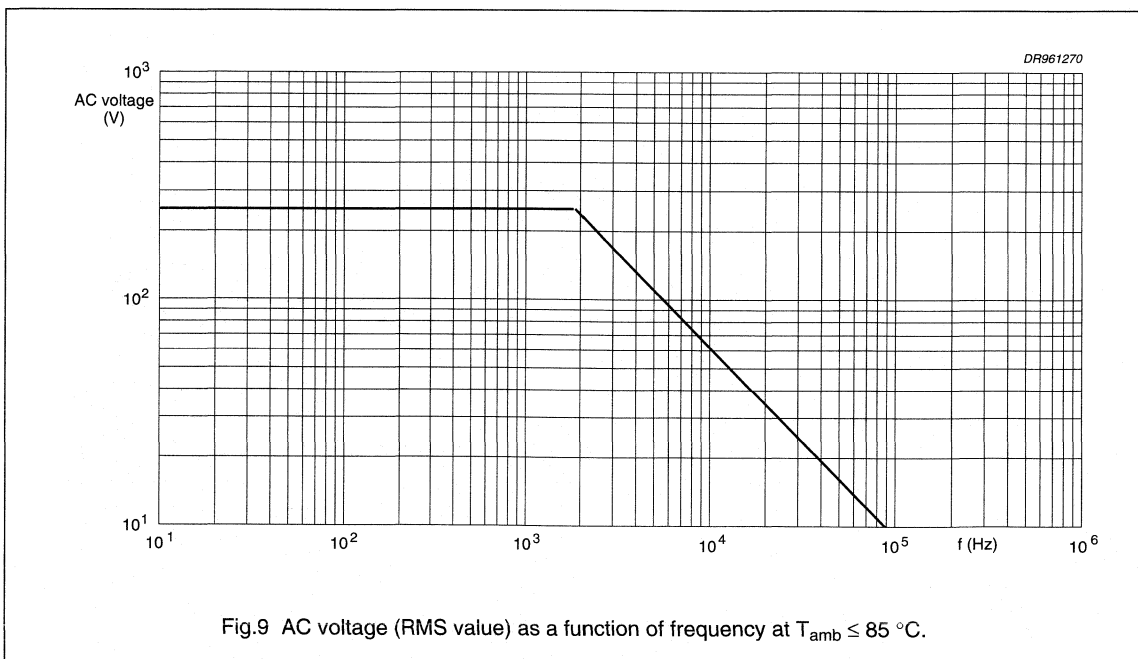
Interference suppression film capacitors

MKP 336 6

Resonant frequency



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



Interference suppression film capacitors

MKP 336 6

Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE	
	at 10 kHz	at 100 kHz
1 to 47 nF	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$

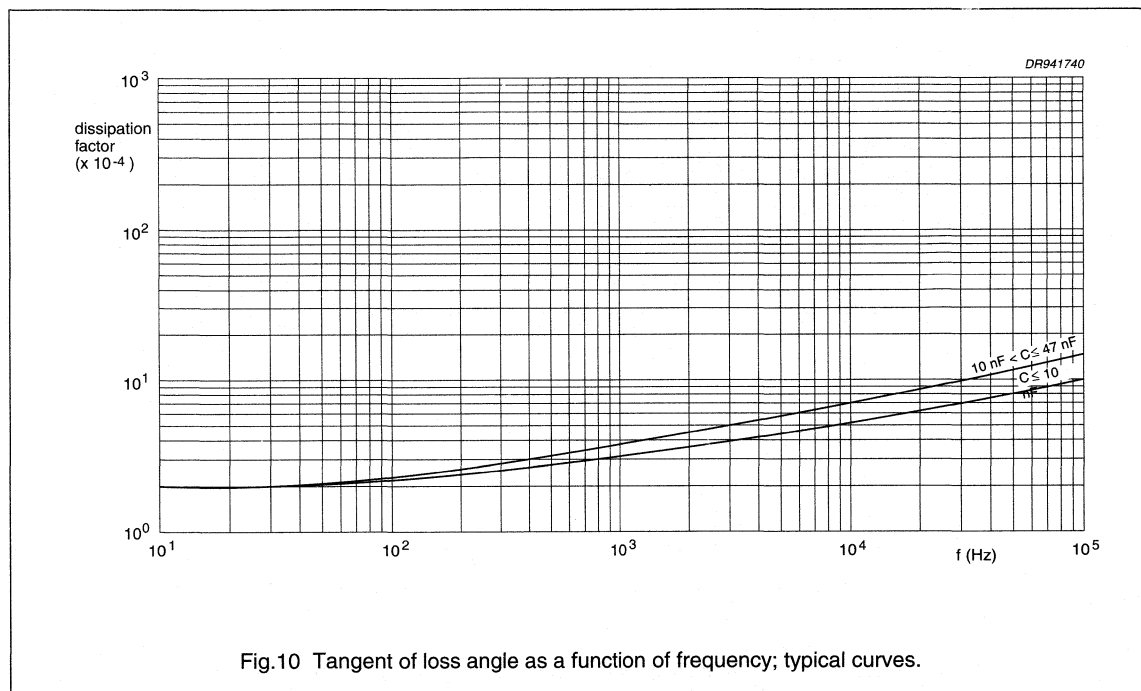


Fig.10 Tangent of loss angle as a function of frequency; typical curves.

Temperature

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

Voltage

- Test voltage between leads, 100% on line for 1 second: 2700 V (DC)
- Test voltage between interconnected leads and case (foil method): 2000 V (AC).

Rated voltage pulse slope  $(dU/dt)_R$

Maximum pulse load: 200 V/μs.

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.

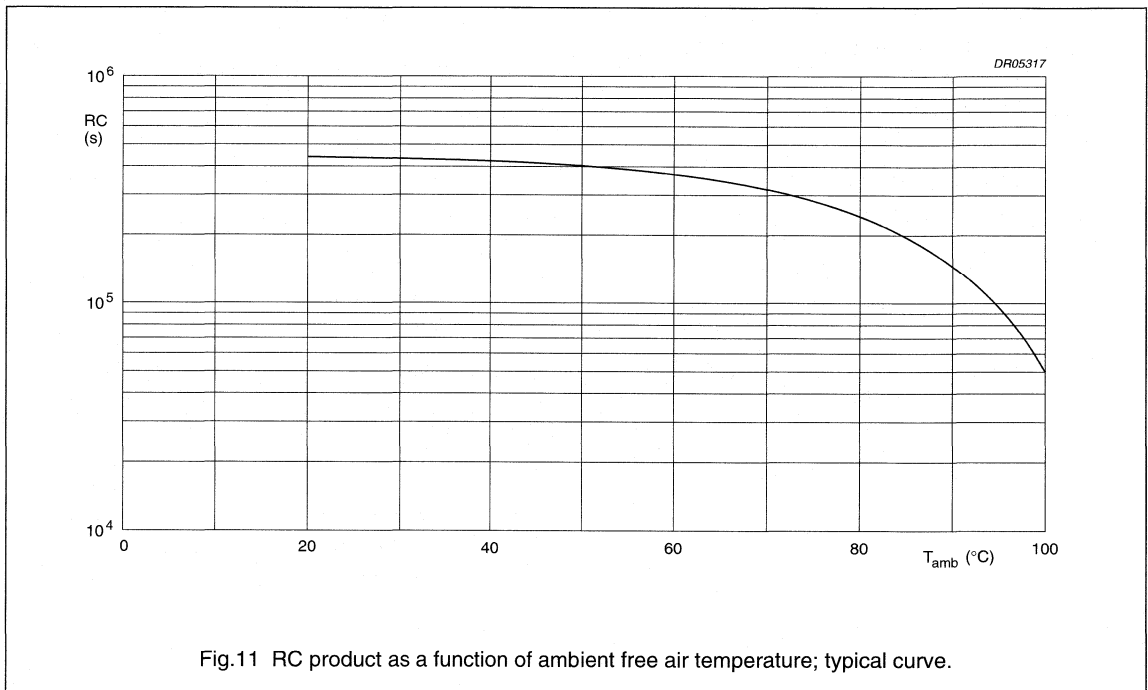
## Interference suppression film capacitors

MKP 336 6

**Insulation resistance**

The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm 5$  seconds at  $T_{\text{amb}} = 20$  °C:

- R between leads:  $>15000$  M $\Omega$
- R between interconnected leads and case (foil method):  $>30000$  M $\Omega$ .

**Application notes**

- For Y2 electromagnetic interference suppression between line and earth (50/60 Hz)
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse program must be used, such as: 2222 375 .....; 2222 376 .....; 2222 378 ..... or 2222 379 .....

# Interference suppression film capacitors

# MKP 336 6

## MARKING

### Product marking

CAPACITORS WITH PITCH 10 AND 15 mm

The capacitors are marked by laser print on the top and the side with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: M =  $\pm 20\%$ ; K =  $\pm 10\%$ ; J =  $\pm 5\%$
3. Rated (AC) voltage (250 V~)
4. Sub-class (Y2)
5. Manufacturer's type designation (336 6)
6. Code for dielectric material (MKP) only for pitch = 15 mm
7. Manufacturer (Philips)
8. Year and week of manufacture (e.g. 9417) for 15 mm pitch
9. Safety approvals: products will be marked with approvals depending on the available marking space per product.

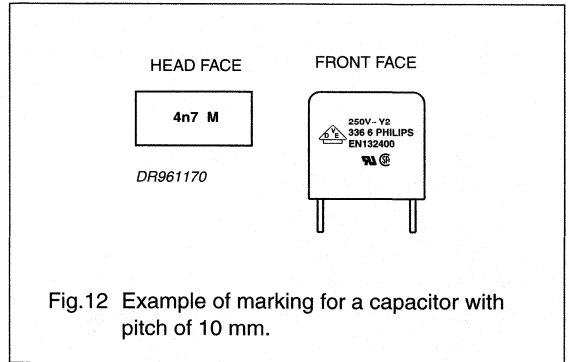


Fig.12 Example of marking for a capacitor with pitch of 10 mm.

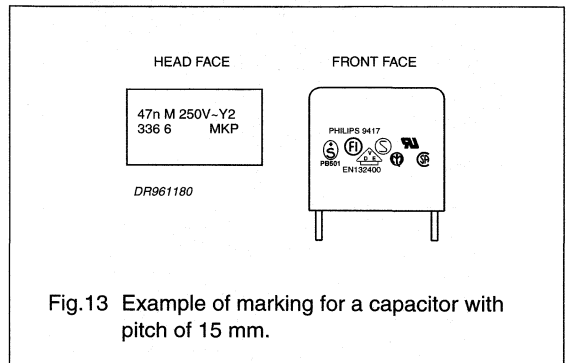


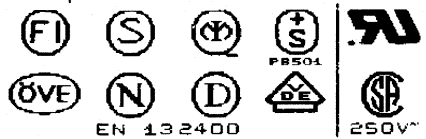

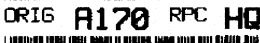


Fig.13 Example of marking for a capacitor with pitch of 15 mm.

Interference suppression film capacitors

MKP 336 6

Package marking

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

<ol style="list-style-type: none"> <li>1. PHILIPS COMPONENTS</li> <li>2. MADE IN BELGIUM</li> <li>3. INTERF. SUPPR. FILM CAPACITOR</li> <li>4. MKP RADIAL POTTED TYPE Y2</li> <li>5. 0.001<math>\mu</math>F <math>\pm</math>20% 250V<math>\sim</math> 55/100/21/C</li> <li>6. </li> <li>7.  ORIG A170 RPC HQ</li> <li>8.  TYPE MKP 336 6</li> <li>9.  QTY 1000 DATE 9632</li> <li>10.  CODENO 2222 336 60102</li> </ol>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description and sub class Y2</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>Safety approvals</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO</td> </tr> <tr> <td>8</td> <td>Wage number of final inspection (only for 4e products)</td> </tr> <tr> <td>9</td> <td>Product type description</td> </tr> <tr> <td>10</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>11</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description and sub class Y2	5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")	6	Safety approvals	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO	8	Wage number of final inspection (only for 4e products)	9	Product type description	10	Quantity and production period, year and week code	11	Product code (12NC)
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10	Quantity and production period, year and week code																								
11	Product code (12NC)																								

CCA326

Fig.14 Barcode label.

## Interference suppression film capacitors

MKP 336 6

## 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
Resistance to soldering heat: "IEC 68-2-20"		legible marking
Component solvent resistance		$ \Delta C/C  \leq 5\%$
	isopropyl alcohol; 23 °C; 5 minutes	$\Delta \tan \delta \leq 80 \times 10^{-4}$
<b>Robustness of component</b>		
Rapid change of temperature: "IEC 68-2-14"	5 cycles 1 cycle = 30 minutes at -55 °C and 30 minutes at 100 °C	$ \Delta C/C  \leq 5\%$
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm; 6 hours	$\Delta \tan \delta \leq 80 \times 10^{-4}$
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; 100 °C	$ \Delta C/C  \leq 5\%$
Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30"		$\Delta \tan \delta \leq 80 \times 10^{-4}$
Cold: "IEC 68-2-1"	2 hours; -55 °C	$R_{\text{ins}} \geq 50\%$ of specified value
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		
Voltage proof: "IEC 384-14"	$V_p = 2250$ V (DC); 1 minute	

## Interference suppression film capacitors

MKP 336 6

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 $V_p = 2250$ V (DC); 1 minute	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 80 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-14"	$3 \times 5$ kV pulse voltage; 1000 hours; $1.7 \times U_{Rac}$ at 100 °C; once per hour; 0.1 s; 1000 V (RMS) via resistor of 47 $\Omega$ ; $V_p = 2250$ V (DC); 1 minute	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 80 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Charge and discharge: "IEC 384-14"	10000 cycles; 5 ms; $1.5 \times dV/dt$	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 80 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Passive flammability: "IEC 695-2-2"	class C	no burning
Active flammability: "IEC 384-14"	$20 \times 5$ kV discharge	no burning
Heat storage: "IEC 384-14"	1000 hours; 100 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 80 \times 10^{-4}$
Resistance to soldering heat with preheating: "IEC 384-14"	preheating: 100 °C; solder bath: 260 °C; 10 s	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 80 \times 10^{-4}$

**Note**

1. For detailed information, see "Type specification".



## Interference suppression film capacitors

MKP 336 1/2

## MKP RADIAL POTTED CAPACITORS

PITCH 10/15/22.5/27.5 mm

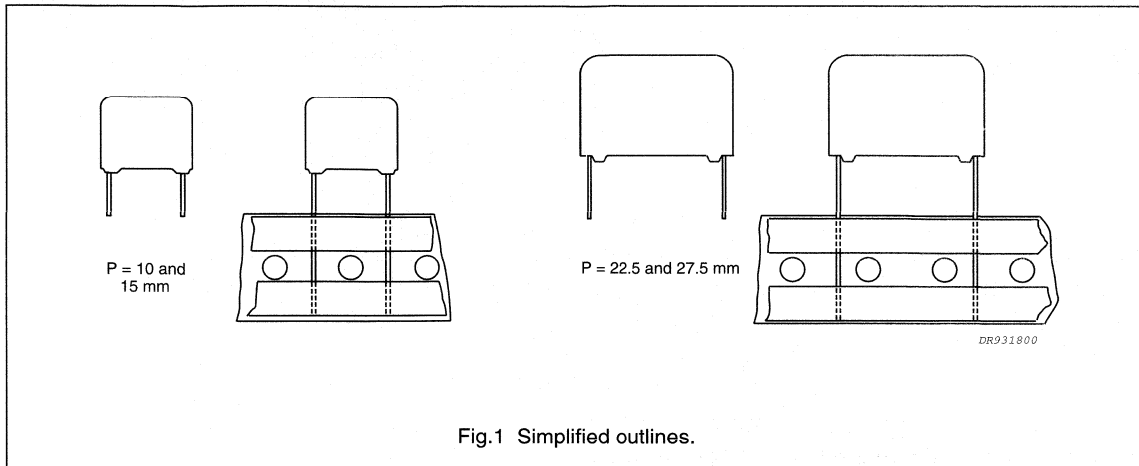


Fig.1 Simplified outlines.

## FEATURES

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

## APPLICATIONS

- For X1 and X2 electromagnetic interference suppression
- Specially designed to meet the NEW REQUIREMENTS of the new "IEC 384-14 2<sup>nd</sup> edition, EN 132400", requiring for X1 a 4 kV and for X2 a 2.5 kV peak pulse voltage test and both UL1414 and CSA-C22.2 No. 1 specifications.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE	
	MKP 336 1, X1	MKP 336 2, X2
Capacitance range (E12 series)	1 nF to 1 $\mu$ F	1 nF to 2.2 $\mu$ F
Capacitance tolerance	$\pm 20\%$ ; $\pm 10\%$ ; $\pm 5\%$	
Rated voltage (AC), 50 to 60 Hz	275 V	
Climatic category	55/100/21/C	
Rated temperature	100 °C	
Maximum application temperature	100 °C	
Reference specifications	IEC 384-14 2 <sup>nd</sup> edition, EN 132400; note 1	
Safety approvals	UL1414; CSA-C22.2 No 1 at (250 V); SEV; VDE; FI; N; D; S; IMQ; ÖVE	
Materials	qualified in accordance with UL94V-O	
Safety class	X1; X2	

## Note

1. IEC 384-14 2<sup>nd</sup> edition = EN 132400.

# Interference suppression film capacitors

MKP 336 1

**MKP 336 1 GENERAL DATA**

**PITCH 10/15 mm**

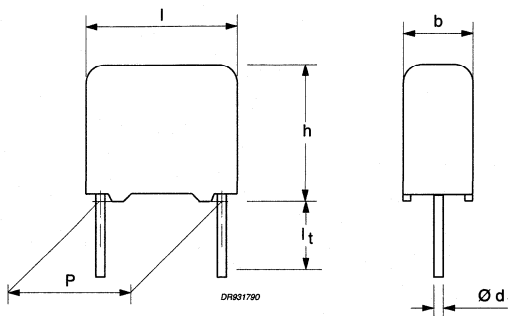


Fig.2 Outline.

**Specific reference data for the 275 V AC (X1) capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 100 nF	≤ 10 × 10 <sup>-4</sup>	≤ 50 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub>	200 V/μs	
R between leads, for C ≤ 0.33 μF	> 15000 MΩ	
Test voltage (DC) on line	3400 V; 1 s	

**Available 275 V AC (X1) versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ± 0.5 mm; note 1	±20%	2222 336 10...	preferred
		±10%	2222 336 11...	on request
	l <sub>t</sub> = 25.0 ± 2.0 mm	±20%	2222 336 16...	on request
		±10%	2222 336 17...	on request
Taped on reel	H = 18.5 mm; note 2	±20%	2222 336 13...	on request
		±10%	2222 336 14...	on request

**Notes**

- l<sub>t</sub> = 3.5 ± 0.3 mm for pitch = 15 mm.
- H = in-tape height; for detailed specifications refer to this handbook, Chapter "Packaging".

**Available 275 V AC (X1) versions on request**

PACKAGING	DIMENSIONS	C-tol	VALUES	ORDERING
Ammopack	l <sub>t</sub> = 3.2 to 35 mm	±5%	E12 series	on request

## Interference suppression film capacitors

MKP 336 1/2

## Safety approvals

SAFETY APPROVALS (X1)	FILE NUMBERS	SAFETY APPROVALS (X1)	FILE NUMBERS
UL1414	E 112471	NEMKO IEC 384 - 14 (2nd Ed.)	P94102557
CSA-C22.2 No.1-M90	LR 94054-6	DEMKO IEC 384 - 14 (2nd Ed.)	302086
SEV (EN132400)	96,770678	SEMKO IEC 384 - 14 (2nd Ed.)	9447024
VDE (EN132400)	CCA/DE 8926	IMQ (EN132400)	V 3731
FI IEC 384 - 14 (2nd Ed.)	178882-01	ÖVE	23137/R

 $U_{Rac} = 275 \text{ V (AC) X1}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 336 ..... AND PACKAGING								
			LOOSE IN BOX			REEL					
			$l_t = 3.5 \pm 0.5 \text{ mm}^{(1)}$		$l_t = 25.0 \pm 2.0 \text{ mm}$	H = 18.5 mm					
			last 5 digits of catalogue number <sup>(2)</sup>	SPQ	SPQ	SPQ					
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>											
0.001 0.0015 0.0022	4.0 × 10.0 × 12.5	0.6	10102 10152 10222	1000	1250	1400					
0.0033 0.0047 0.0068			5.0 × 11.0 × 12.5				0.9	10332 10472 10682	1000	1000	1100
0.01								6.0 × 12.0 × 12.5			
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>											
0.01 0.01 0.015 0.022	5.0 × 11.0 × 17.5	1.2	note 3 19001 10153 10223	1000	1000	1100					
0.022 0.033			6.0 × 12.0 × 17.5				1.4	note 3 10333	1000	1000	900
0.033 0.047								7.0 × 13.5 × 17.5			
0.047 0.068	8.5 × 15.0 × 17.5	2.6		note 3 10683	1000	500					
0.068 0.1			10.0 × 16.5 × 17.5	3.1			note 3 10104		500	500	600

## Notes

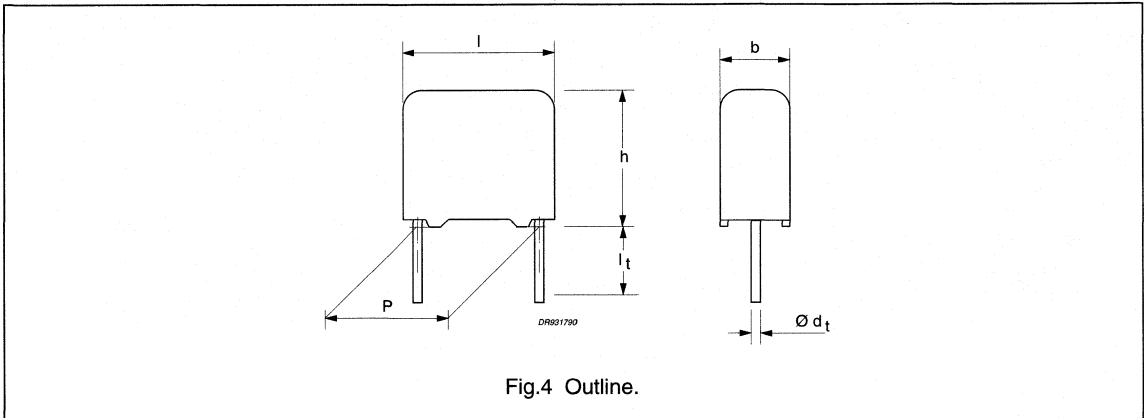
- $l_t = 3.5 \pm 0.3 \text{ mm}$  for pitch = 15 mm.
- The shading indicates preferred types.
- Other dimensions for 10% versions.

## Interference suppression film capacitors

MKP 336 1

## MKP 336 1 GENERAL DATA

PITCH 22.5/27.5 mm



## Specific reference data for the 275 V AC (X1) capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: 100 nF < C ≤ 470 nF C > 470 nF	≤ 20 × 10 <sup>-4</sup> ≤ 70 × 10 <sup>-4</sup>	≤ 100 × 10 <sup>-4</sup> -
Rated voltage pulse slope (dU/dt) <sub>R</sub>	200 V/μs	
R between leads, for C ≤ 0.33 μF	> 15000 MΩ	
RC between leads, for C > 0.33 μF	> 5000 s	
Test voltage (DC) on line	3400 V; 1 s	

## Available 275 V AC (X1) versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ± 0.3 mm	±20%	2222 336 10...	preferred
		±10%	2222 336 11...	on request
	l <sub>t</sub> = 25.0 ± 2.0 mm	±20%	2222 336 16...	on request
		±10%	2222 336 17...	on request
Taped on reel	H = 18.5 mm; note 1	±20%	2222 336 13...	on request
		±10%	2222 336 14...	on request

## Note

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

## Available 275 V AC (X1) versions on request

PACKAGING	DIMENSIONS	C-tol	VALUES	ORDERING
Ampopack	l <sub>t</sub> = 3.2 to 35 mm	±5%	E12 series	on request

## Interference suppression film capacitors

MKP 336 1/2

## Safety approvals

SAFETY APPROVALS (X1)	FILE NUMBERS	SAFETY APPROVALS (X1)	FILE NUMBERS
UL1414	E 112471	NEMKO IEC 384 - 14 (2nd Ed.)	P94102557
CSA-C22.2 No.1-M90	LR 94054-6	DEMKO IEC 384 - 14 (2nd Ed.)	302086
SEV (EN132400)	96,770678	SEMKO IEC 384 - 14 (2nd Ed.)	9447024
VDE (EN132400)	CCA/DE 8926	IMQ (EN132400)	V 3731
FI IEC 384 - 14 (2nd Ed.)	178882-01	ÖVE	23137/R

 $U_{Rac} = 275 \text{ V (AC) X1}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 336 ..... AND PACKAGING			
			LOOSE IN BOX			REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		$l_t = 25.0 \pm 2.0 \text{ mm}$	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ	SPQ
Pitch = 22.5 $\pm$ 0.4 mm; $d_t = 0.80 \pm 0.08 \text{ mm}$						
0.1	7.0 $\times$ 16.5 $\times$ 26.0	3.2	note 2	200	500	550
0.1			19003			
0.15	8.5 $\times$ 18.0 $\times$ 26.0	4.4	10154	200	500	450
0.22	10.0 $\times$ 19.5 $\times$ 26.0	5.5	10224	200	500	400
Pitch = 27.5 $\pm$ 0.4 mm; $d_t = 0.80 \pm 0.08 \text{ mm}$						
0.22	11.0 $\times$ 21.0 $\times$ 31.0	7.8	note 2	100	125	300
0.22			19005			
0.33	13.0 $\times$ 23.0 $\times$ 31.0	10.4	10334	100	125	250
0.47	15.0 $\times$ 25.0 $\times$ 31.0	12.8	10474	100	125	200
0.68	18.0 $\times$ 28.0 $\times$ 31.0	17.2	10684	100	125	150
1	21.0 $\times$ 31.0 $\times$ 31.0	20.4	10105	50	75	not available

## Notes

- The shading indicates preferred types.
- Other dimensions for 10% versions.

## Interference suppression film capacitors

MKP 336 2

## MKP 336 2 GENERAL DATA

PITCH 10/15 mm

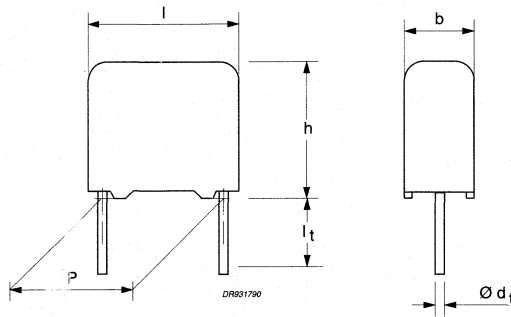


Fig.6 Outline.

## Specific reference data for the 275 V AC (X2) capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 100 nF 100 nF < C ≤ 220 nF	≤ 10 × 10 <sup>-4</sup> ≤ 20 × 10 <sup>-4</sup>	≤ 50 × 10 <sup>-4</sup> ≤ 100 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub>	100 V/μs	
R between leads, for C ≤ 0.33 μF	> 15000 MΩ	
Test voltage (DC) on line: C ≤ 1 μF	2200 V; 1 s	

## Available 275 V (AC) X2 versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ± 0.5 mm; note 1	±20%	2222 336 20...	preferred
		±10%	2222 336 21...	on request
	l <sub>t</sub> = 25.0 ± 2.0 mm	±20%	2222 336 26...	on request
		±10%	2222 336 27...	on request
Taped on reel	H = 18.5 mm; note 2	±20%	2222 336 23...	on request
		±10%	2222 336 24...	on request

## Notes

- l<sub>t</sub> = 3.5 ± 0.3 mm for pitch = 15 mm.
- H = in-tape height; for detailed specifications refer to this handbook, Chapter "Packaging".

## Available 275 V AC (X2) versions on request

PACKAGING	DIMENSIONS	C-tol	VALUES	ORDERING
Ammopack	l <sub>t</sub> = 3.2 to 35 mm	±5%	E12 series	on request

## Interference suppression film capacitors

MKP 336 1/2

## Safety approvals

SAFETY APPROVALS (X2)	FILE NUMBERS	SAFETY APPROVALS (X2)	FILE NUMBERS
UL1414 <sup>(1)</sup>	E 112471	NEMKO IEC 384 - 14 (2nd Ed.)	P94101881
CSA-C22.2 No.1-M90 <sup>(1)</sup>	LR 94054-6	DEMKO IEC 384 - 14 (2nd Ed.)	302811
SEV (EN132400) <sup>(1)</sup>	96.770678	SEMKO IEC 384 - 14 (2nd Ed.)	9439096
VDE (EN132400)	CCA/DE 8926	IMQ (EN132400)	V 3732
FI IEC 384 - 14 (2nd Ed.)	176515.01	OVE	23136/R

## Note

- Only for 1 nF up to and including 1  $\mu$ F.

 $U_{Rac} = 275 \text{ V (AC) X2}$ 

loose and taped

C ( $\mu$ F)	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 336 ..... AND PACKAGING			
			LOOSE IN BOX			REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}^{(1)}$		$l_t = 25.0 \pm 2.0 \text{ mm}$	H = 18.5 mm
			last 5 digits of catalogue number <sup>(2)</sup>	SPQ	SPQ	SPQ
<b>Pitch = 10.0 <math>\pm</math>0.4 mm; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
0.001 0.0015 0.0022	4.0 $\times$ 10.0 $\times$ 12.5	0.6	20102 20152 20222	1000	1250 1400	
0.0033 0.0047 0.0068 0.01 0.015 0.022	5.0 $\times$ 11.0 $\times$ 12.5	0.9	20332 20472 20682 20103 20153 20223	1000	1000 1100	
0.033	6.0 $\times$ 12.0 $\times$ 12.5	1.0	20333	750	750 900	
<b>Pitch = 15.0 <math>\pm</math>0.4 mm; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>						
0.01 0.015 0.022 0.033 0.047 0.068	5.0 $\times$ 11.0 $\times$ 17.5	1.2	29001 29011 29021 29031 20473 20683	1000	1000 1100	
0.068 0.1	6.0 $\times$ 12.0 $\times$ 17.5	1.4	note 3 20104	1000	1000 900	
0.1 0.15 0.22	7.0 $\times$ 13.5 $\times$ 17.5 8.5 $\times$ 15.0 $\times$ 17.5 10.0 $\times$ 16.5 $\times$ 17.5	1.9 2.6 3.1	note 3 20154 20224	1000 1000 500	500 650 600	

## Notes

- $l_t = 3.5 \pm 0.3 \text{ mm}$  for pitch = 15 mm.
- The shading indicates preferred types.
- Other dimensions for 10% versions.

## Interference suppression film capacitors

MKP 336 2

## MKP 336 2 GENERAL DATA

PITCH 22.5/27.5 mm

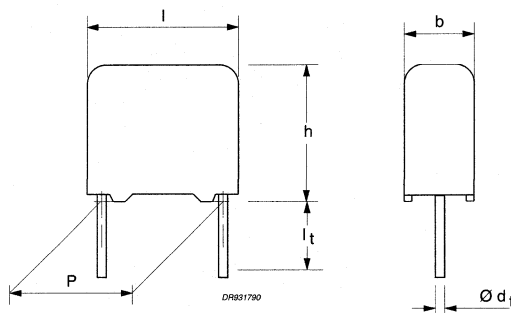


Fig.8 Outline.

## Specific reference data for the 275 V AC (X2) capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: 150 nF < C ≤ 470 nF C > 470 nF	≤ 20 × 10 <sup>-4</sup> ≤ 70 × 10 <sup>-4</sup>	≤ 100 × 10 <sup>-4</sup> -
Rated voltage pulse slope (dU/dt) <sub>R</sub>	100 V/μs	
R between leads, for C ≤ 0.33 μF	> 15000 MΩ	
RC between leads, for C > 0.33 μF	> 5000 s	
Test voltage (DC) on line: C ≤ 1 μF C > 1 μF	2200 V; 1 s 2200 V/√C (C in μF); 1 s	

## Available 275 V (AC) X2 versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ± 0.3 mm	±20%	2222 336 20...	preferred
		±10%	2222 336 21...	on request
	l <sub>t</sub> = 25.0 ± 2.0 mm	±20%	2222 336 26...	on request
		±10%	2222 336 27...	on request
Taped on reel	H = 18.5 mm; note 1	±20%	2222 336 23...	on request
		±10%	2222 336 24...	on request

## Note

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

## Available 275 V AC (X2) versions on request

PACKAGING	DIMENSIONS	C-tol	VALUES	ORDERING
Ammopack	l <sub>t</sub> = 3.2 to 35 mm	±5%	E12 series	on request



## Interference suppression film capacitors

MKP 336 1/2

## Safety approvals

SAFETY APPROVALS (X2)	FILE NUMBERS	SAFETY APPROVALS (X2)	FILE NUMBERS
UL1414 <sup>(1)</sup>	E 112471	NEMKO IEC 384 - 14 (2nd Ed.)	P94101881
CSA-C22.2 No.1-M90 <sup>(1)</sup>	LR 94054-6	DEMKO IEC 384 - 14 (2nd Ed.)	302811
SEV (EN132400) <sup>(1)</sup>	96,770678	SEMKO IEC 384 - 14 (2nd Ed.)	9439096
VDE (EN132400)	CCA/DE 8926	IMQ (EN132400)	V 3732
FI IEC 384 - 14 (2nd Ed.)	176515.01	ÖVE	23136/R

## Note

- Only for 1 nF up to and including 1  $\mu$ F.

 $U_{Rac} = 275 \text{ V (AC) X2}$ 

loose and taped

C ( $\mu$ F)	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 336 ..... AND PACKAGING			
			LOOSE IN BOX			REEL
			$l_t =$ 3.5 $\pm$ 0.3 mm		$l_t =$ 25.0 $\pm$ 2.0 mm	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ	SPQ
<b>Pitch = 22.5 <math>\pm</math> 0.4 mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>						
0.15	6.0 $\times$ 15.5 $\times$ 26.0	2.9	29041	200	500	600
0.22	7.0 $\times$ 16.5 $\times$ 26.0	3.2	29051	200	500	550
0.33	8.5 $\times$ 18.0 $\times$ 26.0	4.4	20334	200	500	450
0.47	10.0 $\times$ 19.5 $\times$ 26.0	5.5	20474	200	500	400
<b>Pitch = 27.5 <math>\pm</math> 0.4 mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>						
0.47	9.0 $\times$ 19.0 $\times$ 31.0	5.5	29055	100	150	400
0.68	11.0 $\times$ 21.0 $\times$ 31.0	7.8	20684	100	125	300
1	13.0 $\times$ 23.0 $\times$ 31.0	10.4	20105	100	125	250
1	15.0 $\times$ 25.0 $\times$ 31.0	12.8	note 2	100	125	200
1.5	18.0 $\times$ 28.0 $\times$ 31.0	17.2	20155	100	125	150
2.2	21.0 $\times$ 31.0 $\times$ 31.0	20.4	20225	50	75	not available

## Notes

- The shading indicates preferred types.
- Other dimensions for 10% versions.

## Interference suppression film capacitors

## MKP 336 1/2

**CONSTRUCTION****Description**

- Low-inductive wound cell of metallized polypropylene (PP) film, potted with epoxy resin in a flame-retardant polypropylene case
- Radial leads, solder-coated:
  - Copper clad steel wire (pitch = 4e and 6e)
  - Copper wire (pitch = 9e and 11e)
- Small stand-off pips allow removal of solder flux etc. during cleaning of the printed-circuit board.

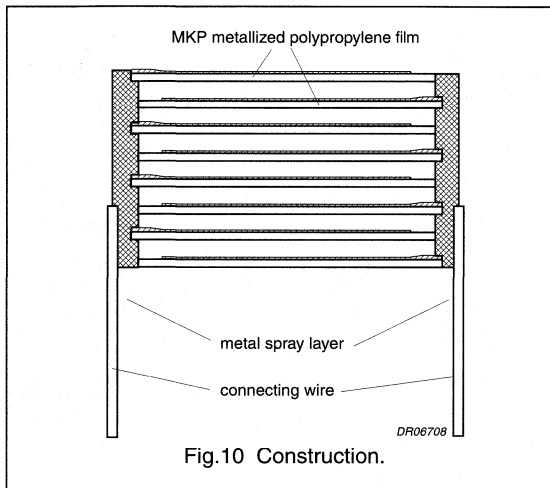


Fig.10 Construction.

**SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD**

The maximum length and width of film capacitors is shown in Fig.11:

- Eccentricity as in Fig.11. 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:  $h_{max} \leq h + 0.3 \text{ mm}$ .

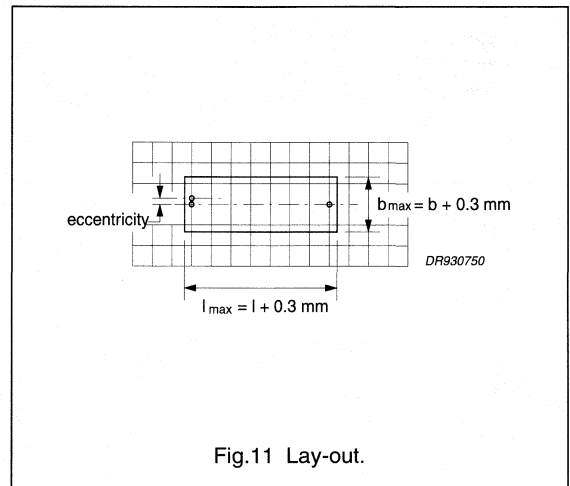


Fig.11 Lay-out.

**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 this handbook, Chapter "Packaging".

**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  $\leq 15 \text{ mm}$  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 temperature of  $23 \pm 1 \text{ }^\circ\text{C}$ , an atmospheric pressure of 86 to 106 kPa and a relative humidity of  $50 \pm 2\%$ .

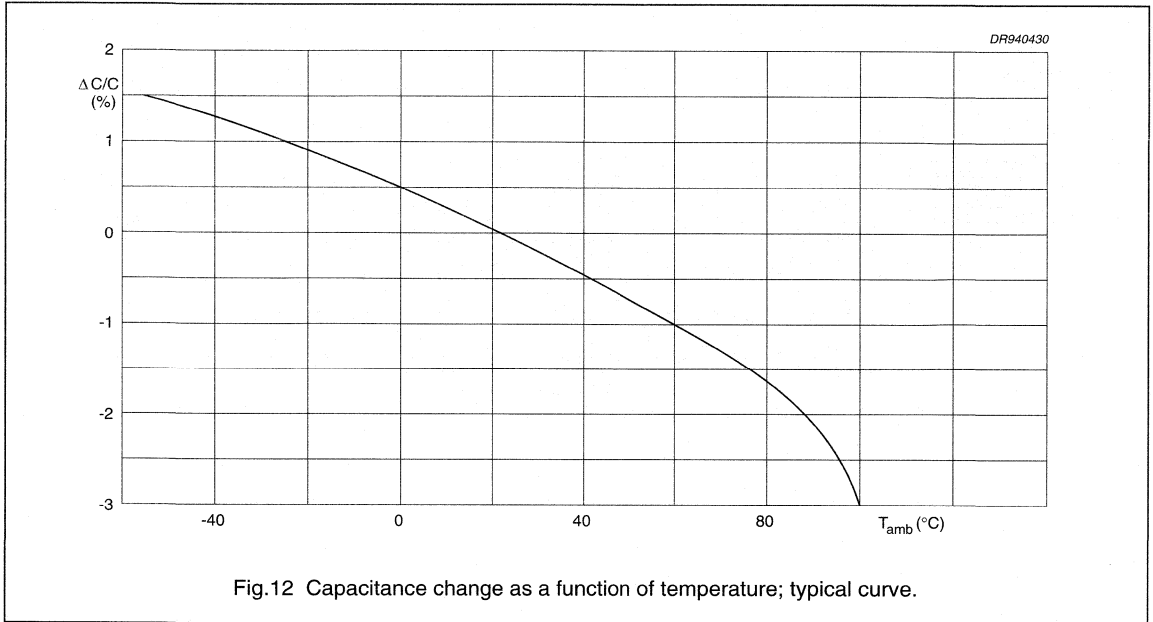
For reference testing, a conditioning period shall be applied of  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

# Interference suppression film capacitors

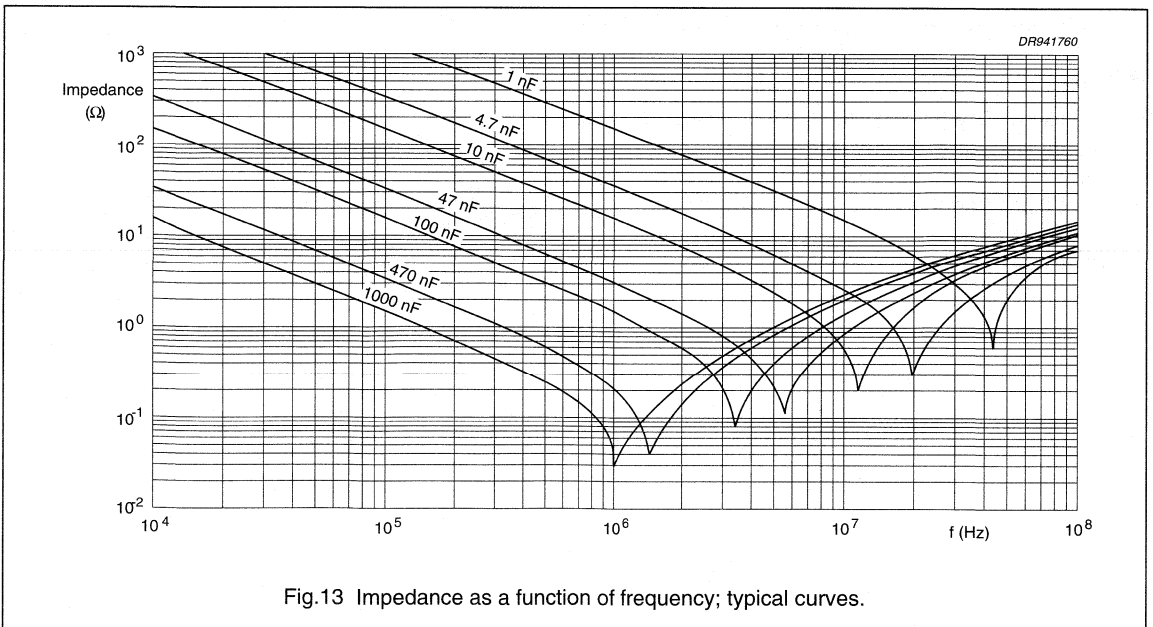
# MKP 336 1/2

## Capacitance

All capacitance values are specified at 1 kHz.



## Impedance



## Interference suppression film capacitors

MKP 336 1/2

## Resonant frequency

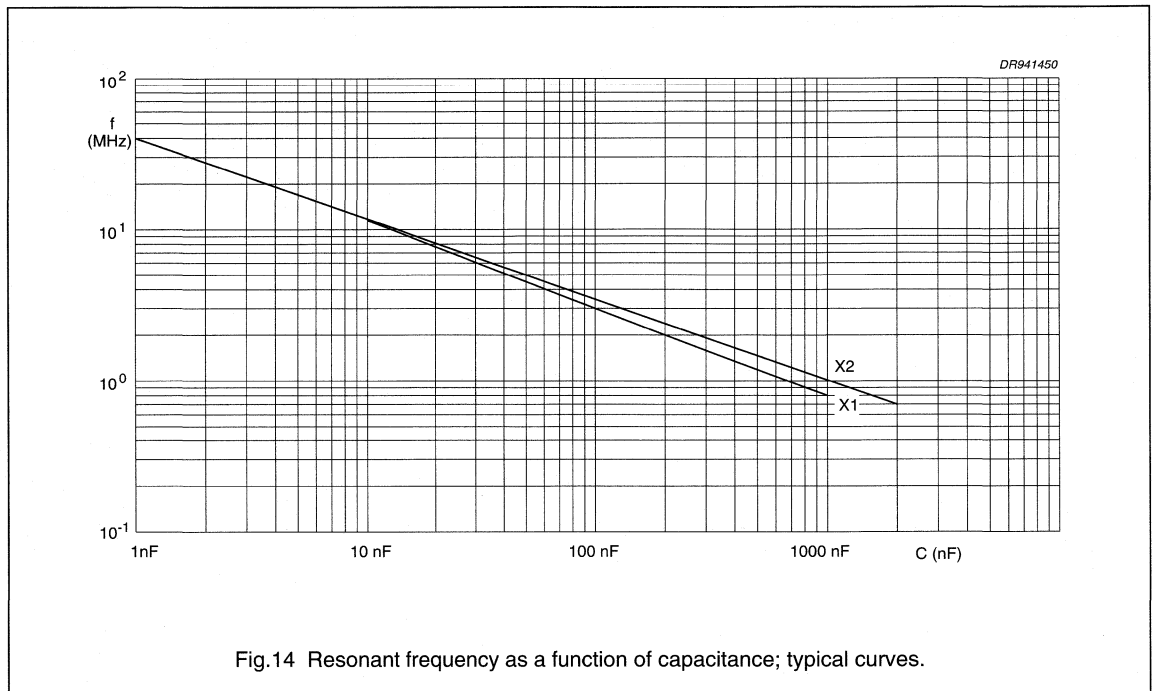


Fig.14 Resonant frequency as a function of capacitance; typical curves.

## Temperature

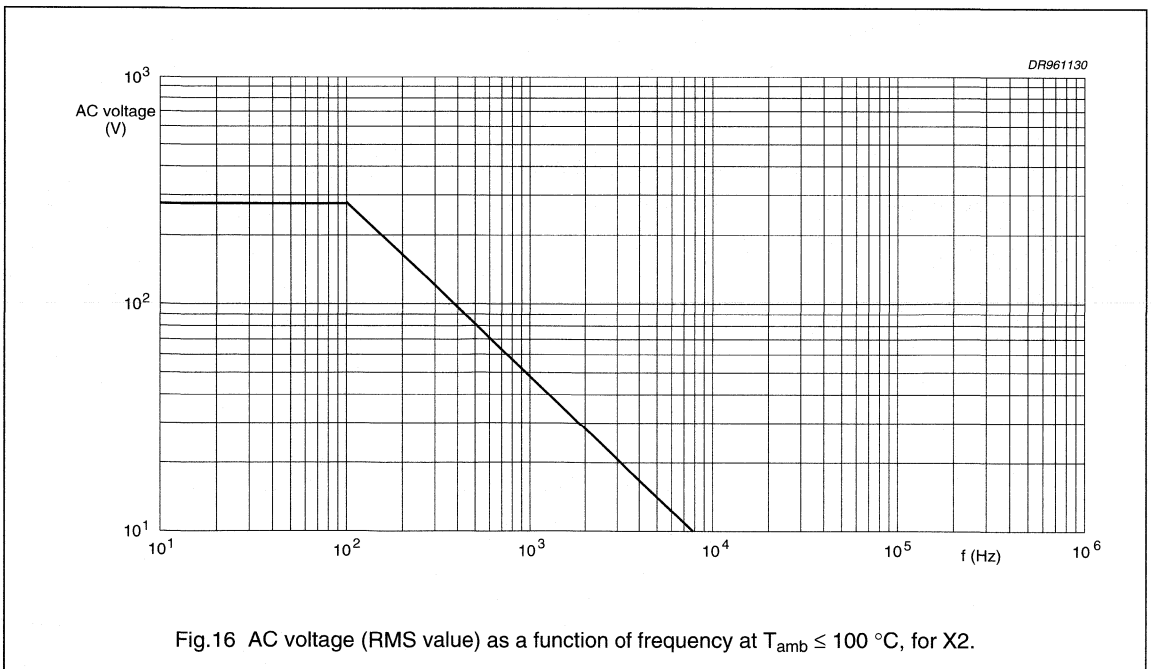
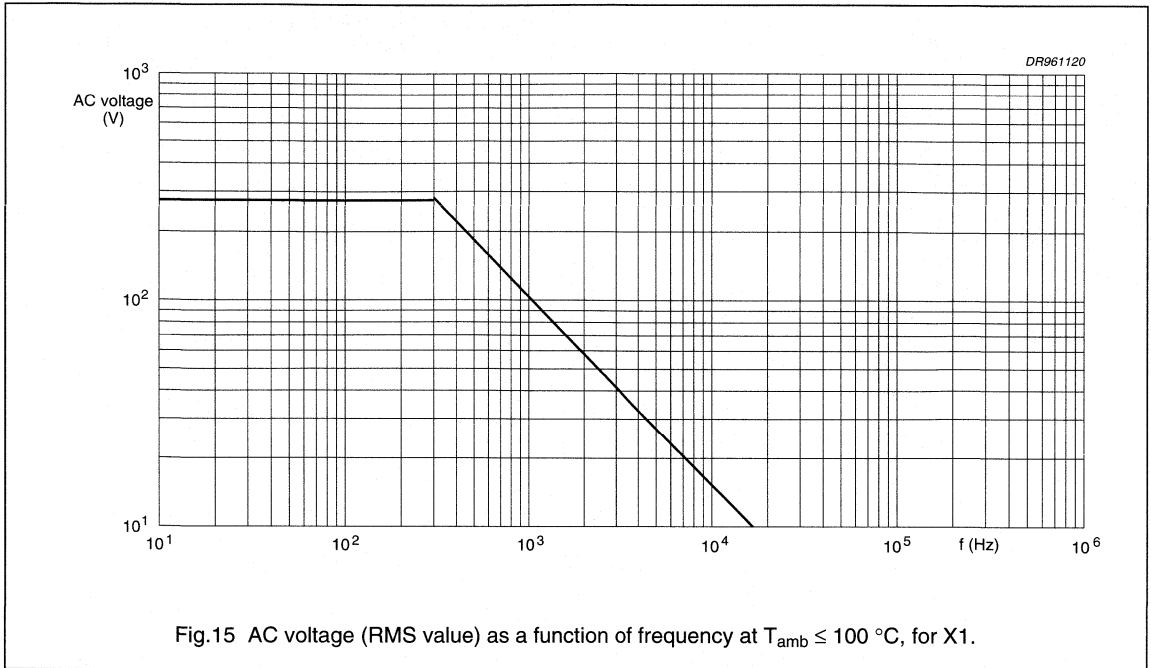
- Storage temperature:  $T_{stg} = -25$  to  $+40$  °C with RH maximum 80% without condensation.

## Voltage

- Test voltage (DC) between leads, 100% on line for 1 second:
  - for X1 capacitors: 3400 V
  - for X2 capacitors with  $C \leq 1\mu\text{F}$ : 2200 V and for  $C > 1\mu\text{F}$ :  $\frac{2200 \text{ V}}{\sqrt{C}} \text{ (C in } \mu\text{F)}$
- Test voltage (AC) between interconnected leads and case (foil method): 2050 V.

## Interference suppression film capacitors

MKP 336 1/2

Maximum RMS voltage (sinewave) as a function of frequency for  $T_{amb} \leq 100\text{ }^{\circ}\text{C}$ 

Interference suppression film capacitors

MKP 336 1/2

Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE	
	at 10 kHz	at 100 kHz
$C \leq 100 \text{ nF}$	$\leq 10 \times 10^{-4}$	$\leq 50 \times 10^{-4}$
$100 \text{ nF} < C \leq 470 \text{ nF}$	$\leq 20 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
$C > 470 \text{ nF}$	$\leq 70 \times 10^{-4}$	–

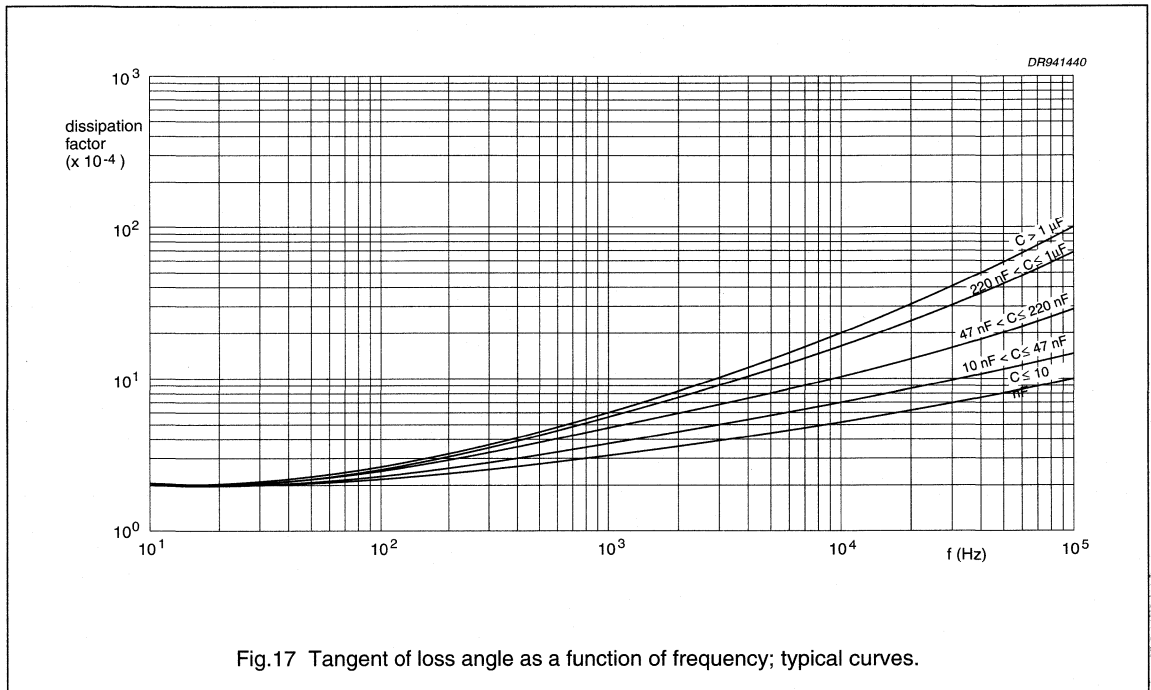


Fig.17 Tangent of loss angle as a function of frequency; typical curves.

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

Maximum pulse load: 100 V/μs for X2; 200 V/μs for X1

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.

Interference suppression film capacitors

MKP 336 1/2

**Insulation resistance**

The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm 5$  seconds, at  $T_{amb} = 20$  °C:

- R between leads for  $C \leq 0.33 \mu\text{F}$ :  $>15000 \text{ M}\Omega$
- RC between leads for  $C > 0.33 \mu\text{F}$ :  $>5000 \text{ s}$
- R between interconnected leads and case (foil method):  $>30000 \text{ M}\Omega$ .

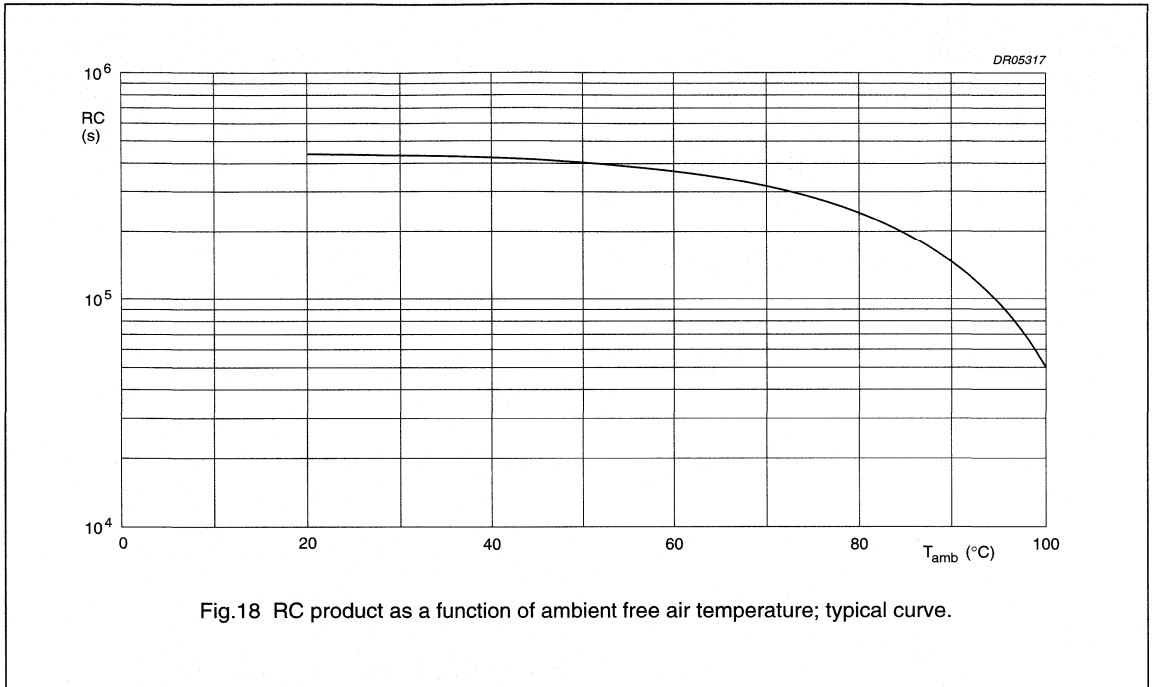


Fig.18 RC product as a function of ambient free air temperature; typical curve.

**Application notes**

- For X1 and X2 electromagnetic interference suppression in across the line applications (50/60 Hz)
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse program must be used, such as: 2222 375 .....; 2222 376 .....; 2222 378 ..... or 2222 379 .....

## Interference suppression film capacitors

## MKP 336 1/2

## MARKING

## Product marking

CAPACITORS WITH PITCH 10 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  $\leq 15$  mm) with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance; M =  $\pm 20\%$ ; K =  $\pm 10\%$ ; J =  $\pm 5\%$
3. Rated (AC) voltage (275 V)
4. Sub-class (e.g. X1)
5. Manufacturer's type designation (e.g. 336 1)
6. Code for dielectric material (MKP) for pitch  $\geq 15$  mm
7. Manufacturer (PHILIPS)
8. Year and week of manufacture (e.g. 9401) for pitch  $\geq 15$  mm
9. Safety approvals: products will be marked with approvals depending on the available marking space per product.

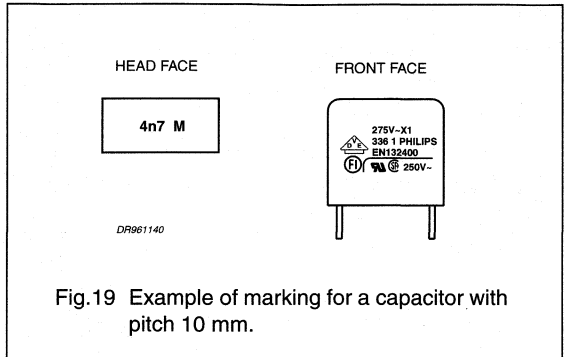


Fig.19 Example of marking for a capacitor with pitch 10 mm.

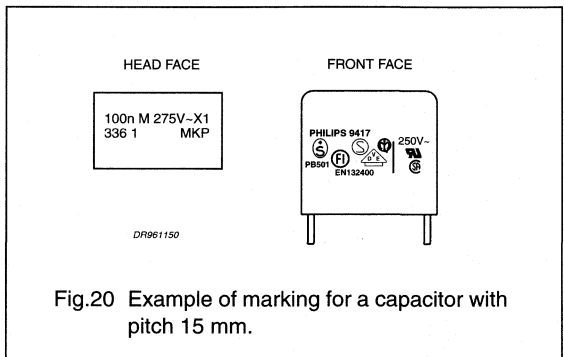


Fig.20 Example of marking for a capacitor with pitch 15 mm.

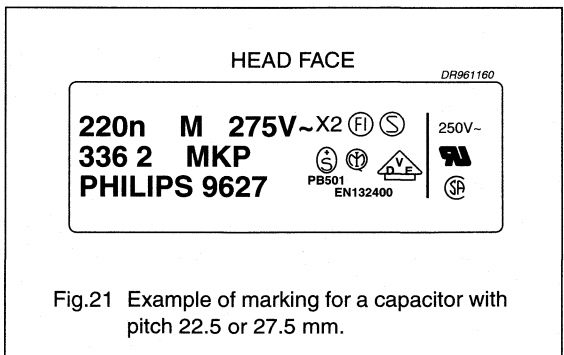


Fig.21 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.



Interference suppression film capacitors

MKP 336 1/2

Package marking

The package containing the capacitors is marked as shown Fig.22.

<p>1. PHILIPS COMPONENTS</p> <p>2. MADE IN BELGIUM</p> <p>3. INTERF. SUPPR. FILM CAPACITOR</p> <p>4. MKP RADIAL POTTED TYPE X1</p> <p>5. 0.1<math>\mu</math>F <math>\pm</math>20% 275V<math>\sim</math> 55/100/21/C</p> <p>6. </p> <p>7.  GRIG A170 RPC HQ</p> <p>8. TYPE MKP 336 1</p> <p>9.  QTY 500 DATE 9632</p> <p>10.  CODENO 2222 336 10104</p> <p style="text-align: right; font-size: small;">CCA328</p>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description and sub class</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>Safety approvals</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO Wage number of final inspection (only for 4e products)</td> </tr> <tr> <td>8</td> <td>Product type description</td> </tr> <tr> <td>9</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>10</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description and sub class	5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")	6	Safety approvals	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO Wage number of final inspection (only for 4e products)	8	Product type description	9	Quantity and production period, year and week code	10	Product code (12NC)
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Fig.22 Barcode label.

## Interference suppression film capacitors

## MKP 336 1/2

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: "IEC 68-2-21" Resistance to soldering heat: "IEC 68-2-20" Component solvent resistance	solder bath: 260 °C; 10 s  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking $ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2
<b>Robustness of component</b>		
Rapid change of temperature: "IEC 68-2-14" Vibration: "IEC 68-2-6" Shock: "IEC 68-2-27"	5 cycles 1 cycle = 30 minutes at -55 °C and 30 minutes at 100 °C 10 to 55 Hz; amplitude 0.75 mm; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2" Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30" Cold: "IEC 68-2-1" Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30" Voltage proof: "IEC 384-14"	16 hours; 100 °C   2 hours; -55 °C   $V_p = 1200$ V (DC); 1 minute	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value

## Interference suppression film capacitors

MKP 336 1/2

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 $V_p = 1200$ V (DC); 1 minute.	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-14"	$3 \times 4.0$ kV pulse voltage for X1; $3 \times 2.5$ kV pulse voltage for X2  1000 hours; $1.25 \times U_{Rac}$ at 100 °C; once per hour; 0.1 s; 1000 V (RMS) via resistor of 47 $\Omega$ ; $V_p = 1200$ V (DC); 1 minute.	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Charge and discharge: "IEC 384-14"	10000 cycles; 5 ms; $1.5 \times dV/dt$	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Passive flammability: "IEC 695-2-2"	class C	no burning
Active flammability: "IEC 384-14"	$20 \times 4$ kV discharge for X1; $20 \times 2.5$ kV discharge for X2	no burning
Heat storage: "IEC 384-14"	1000 hours; 100 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2
Resistance to soldering heat with preheating: "IEC 384-14"	preheating: 100 °C; solder bath: 260 °C; 10 s	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2

**Notes**

- For detailed information, see "Type specification".
- Measuring frequency 100 kHz for  $C \leq 470$  nF and 10 kHz for  $C > 470$  nF.



## Interference suppression film capacitors

MP-KT 333 4

MP-KT RADIAL POTTED CAPACITORS

PITCH 15/22.5/27.5 mm

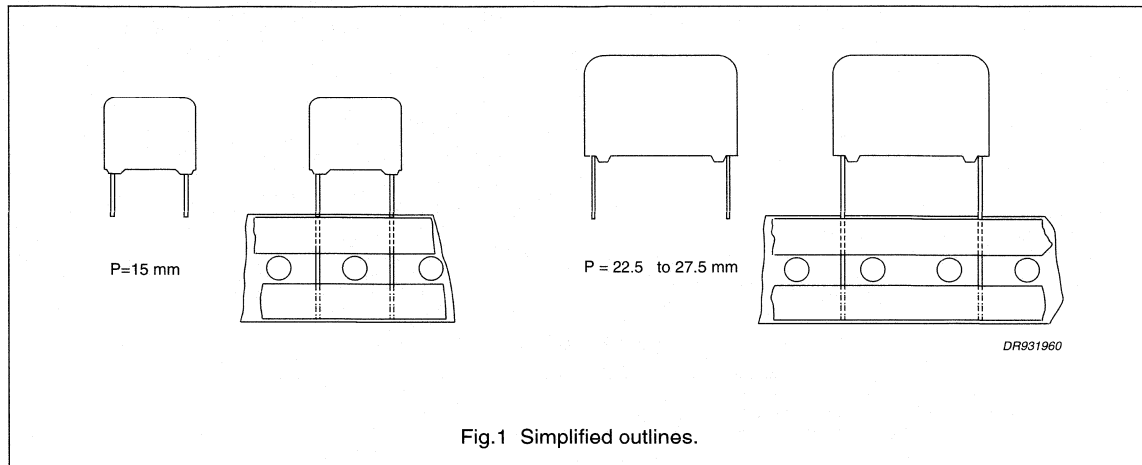


Fig.1 Simplified outlines.

## FEATURES

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

## APPLICATIONS

- For X2 electromagnetic interference suppression
- The capacitors can be used safely in these applications, where the equipment is connected continuously to the mains.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E6 series)	10 to 1 $\mu$ F
Capacitance tolerance	$\pm 10\%$
Rated voltage (AC), 50 to 60 Hz	275 V
Climatic category	40/085/21/C
Rated temperature	85 °C
Maximum application temperature	85 °C
Reference specifications	IEC 384-14, 2 <sup>nd</sup> edition; EN 132400; note 1
Safety approvals	UL1414; CSA-C22.2 no 1 at 250 V~; FI; N; D; S; VDE; SEV; IMQ
Materials	qualified in accordance with UL94V-O(3.2), UL94V-1(1.6)
Safety class	X2

## Note

1. IEC 384-14 2<sup>nd</sup> edition = EN 132400.

## Interference suppression film capacitors

MP-KT 333 4

MP-KT 333 4 GENERAL DATA

PITCH 15/22.5/27.5 mm

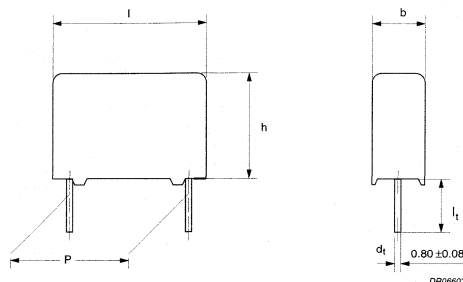


Fig.2 Outline.

## Specific reference data for the 275 V AC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: 0.47 $\mu\text{F}$ < C $\leq$ 1.0 $\mu\text{F}$ C $\leq$ 0.47 $\mu\text{F}$	$\leq 100 \times 10^{-4}$ –	$\leq 200 \times 10^{-4}$ –	– $\leq 350 \times 10^{-4}$
Rated voltage pulse slope (dU/dt) <sub>R</sub> : P = 15.0 mm P = 22.5 mm P = 27.5 mm: 220 nF < C $\leq$ 330 nF P = 27.5 mm: 330 nF < C $\leq$ 1.0 $\mu\text{F}$		1500 V/ $\mu\text{s}$ 1000 V/ $\mu\text{s}$ 500 V/ $\mu\text{s}$ 250 V/ $\mu\text{s}$	
R between leads, for C $\leq$ 0.33 $\mu\text{F}$		>15000 M $\Omega$	
RC between leads, for C > 0.33 $\mu\text{F}$		>5000 s	
Test voltage (DC)		2200 V; 1 s	

## Available 275 V AC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0$ mm	$\pm 10\%$	2222 333 41...	preferred
	$l_t = 3.5 \pm 0.3$ mm	$\pm 10\%$	2222 333 48...	on request
	$l_t = 25.0 + 2.0$ mm	$\pm 10\%$	2222 333 45...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 10\%$	2222 333 43...	on request
<b>100 nF, pitch P = 15.0 <math>\pm 0.4</math> mm, b <math>\times</math> h <math>\times</math> l = 10.0 mm <math>\times</math> 16.5 mm <math>\times</math> 17.5 mm</b>				
Loose in box; SPQ = 500	$l_t = 5.0 \pm 1.0$ mm	$\pm 20\%$	2222 333 94001	on request
	$l_t = 25.0 + 2.0$ mm	$\pm 20\%$	2222 333 94004	on request
	$l_t = 3.5 \pm 0.3$ mm	$\pm 20\%$	2222 333 94015	on request
Taped on reel; SPQ = 600	H = 18.5 mm; note 1	$\pm 20\%$	2222 333 94006	on request
<b>220 nF, pitch P = 22.5 <math>\pm 0.4</math> mm, b <math>\times</math> h <math>\times</math> l = 10.0 mm <math>\times</math> 19.5 mm <math>\times</math> 26.0 mm</b>				
Loose in box; SPQ = 200	$l_t = 5.0 \pm 1.0$ mm	$\pm 20\%$	2222 333 94002	on request
Loose in box; SPQ = 500	$l_t = 25.0 + 2.0$ mm	$\pm 20\%$	2222 333 94005	on request
Loose in box; SPQ = 200	$l_t = 3.5 \pm 0.3$ mm	$\pm 20\%$	2222 333 94016	on request
Taped on reel; SPQ = 400	H = 18.5 mm; note 1	$\pm 20\%$	2222 333 94007	on request

## Note

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

## Interference suppression film capacitors

MP-KT 333 4

## Safety approvals

SAFETY APPROVALS	FILE NUMBERS	SAFETY APPROVALS	FILE NUMBERS
UL1414	E 112471	NEMKO (EN132400)	1995 30152 and 1995 30152001
CSA-C22.2 no 1 at 250 V~	LR 94054	DEMKO (EN132400)	304224
SEV (EN132400)	96,770671	SEMKO (EN132400)	9527057
VDE (EN132400)	94630	IMQ (EN132400)	V3105
FI (EN132400)	CCA/FI 881	ÖVE	Pending



DR06602a

Fig.3 Safety approvals.

 $U_{Rac} = 275 \text{ V (AC) X2}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 333 ..... 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 = $\pm$ 10%						
<b>Pitch = 15.0 <math>\pm</math> 0.4 mm; dt = 0.80 <math>\pm</math> 0.08 mm</b>						
0.01	5.0 $\times$ 11.0 $\times$ 17.5	1.4	41103	1000	1000	1100
0.015			41153			
0.022			41223			
0.033	6.0 $\times$ 12.0 $\times$ 17.5	1.8	41333	1000	1000	900
0.047	7.0 $\times$ 13.5 $\times$ 17.5	2.4	41473	1000	500	800
0.068	8.5 $\times$ 15.0 $\times$ 17.5	3.1	41683	1000	500	650
<b>Pitch = 22.5 <math>\pm</math> 0.4 mm; dt = 0.80 <math>\pm</math> 0.08 mm</b>						
0.1	7.0 $\times$ 16.5 $\times$ 26.0	3.7	41104	200	500	550
0.15	8.5 $\times$ 18.0 $\times$ 26.0	5.0	41154	200	500	450
<b>Pitch = 27.5 <math>\pm</math> 0.40 mm; dt = 0.80 <math>\pm</math> 0.08 mm</b>						
0.22	11.0 $\times$ 21.0 $\times$ 31.0	8.0	41224	100	125	300
0.33	13.0 $\times$ 23.0 $\times$ 31.0	11.0	41334	100	125	250
0.47	15.0 $\times$ 25.0 $\times$ 31.0	13.7	41474	100	125	200
0.68	18.0 $\times$ 28.0 $\times$ 31.0	19.1	41684	100	125	150
1	21.0 $\times$ 31.0 $\times$ 31.0	26.0	41105	50	75	not available

## Note

1. The shading indicates preferred types.

## Available 275 V AC versions on request

DIMENSIONS	C-tol	VALUES	ORDERING
$l_t = 3.2$ to 35 mm	-	E12 series	on request

# Interference suppression film capacitors

# MP-KT 333 4

## CONSTRUCTION

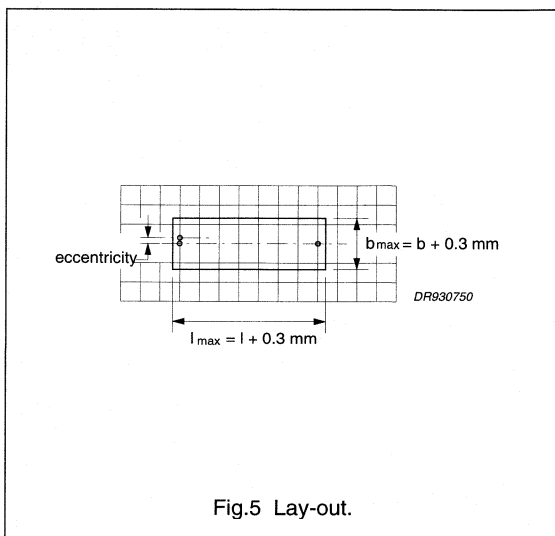
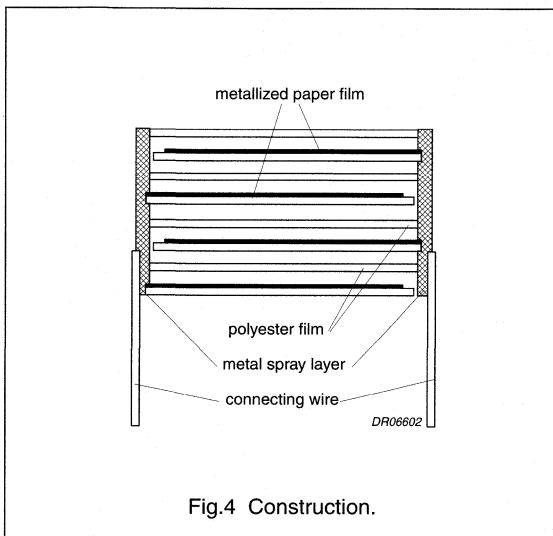
### Description

- Low-inductive wound cell of metallized paper film and polyethylene terephthalate (PETP) 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 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 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.

## 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%.

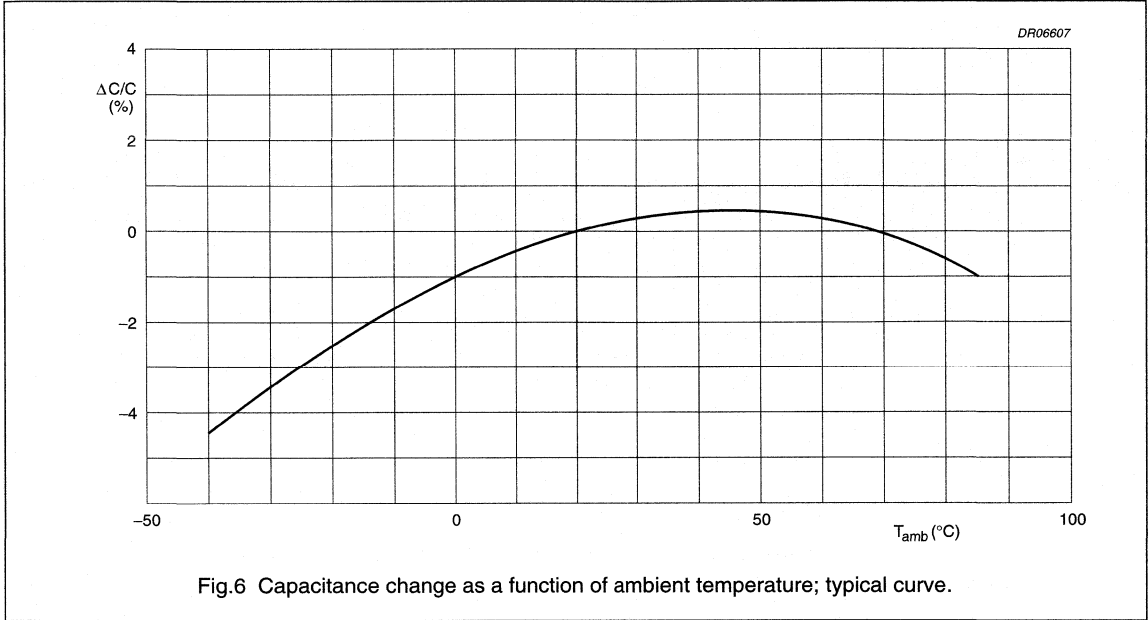


# Interference suppression film capacitors

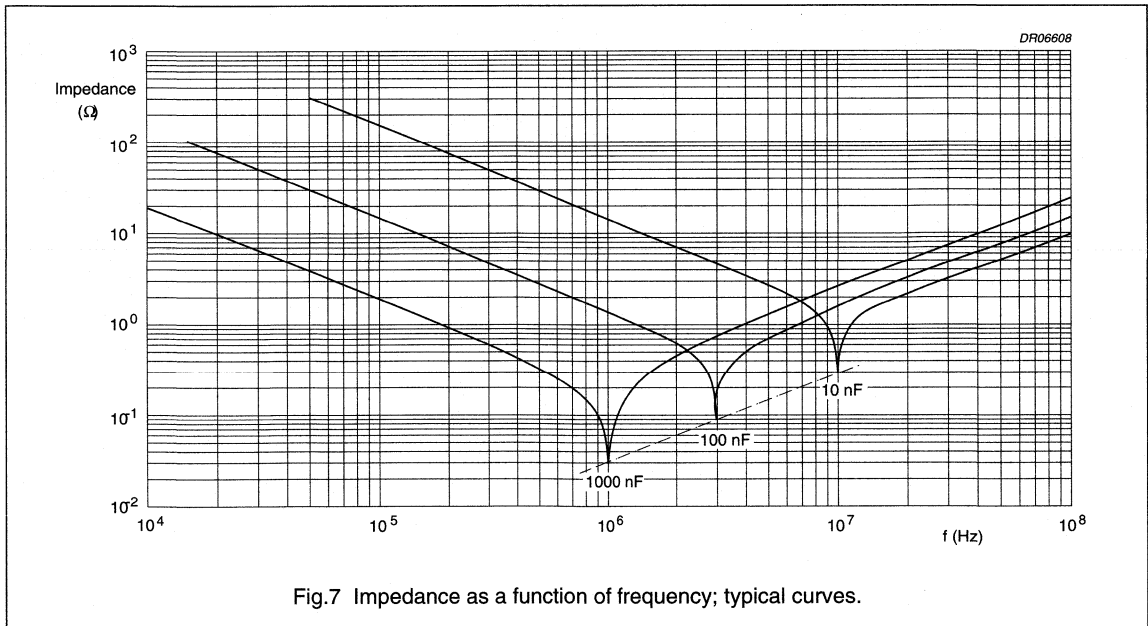
# MP-KT 333 4

## Capacitance

All capacitance values are specified at 1 kHz.



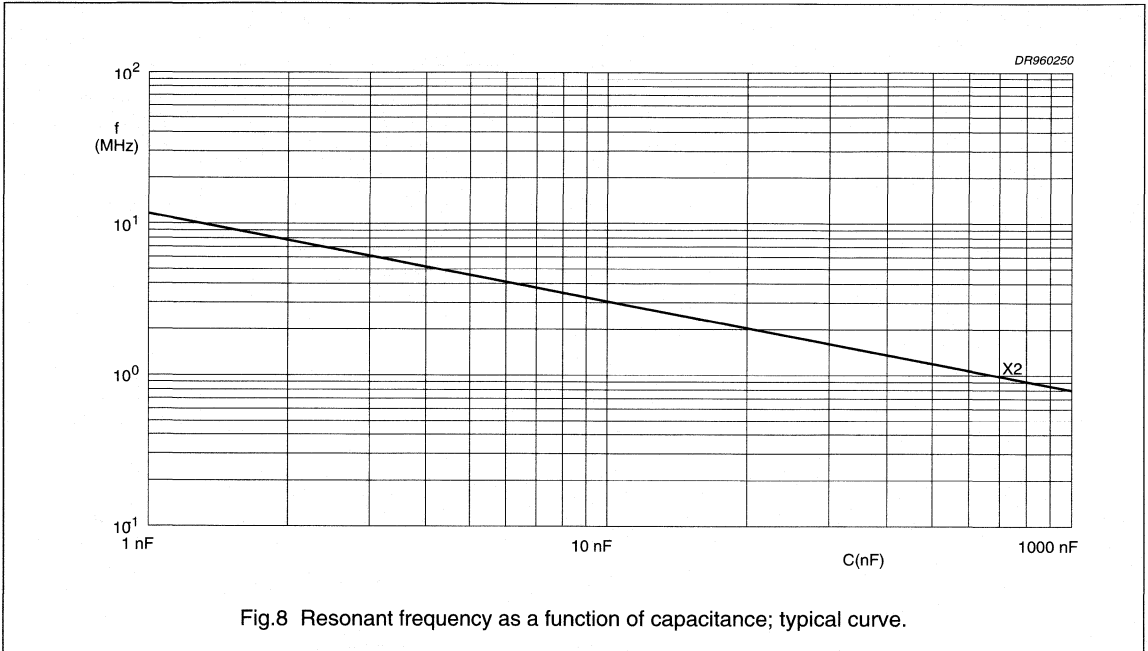
## Impedance



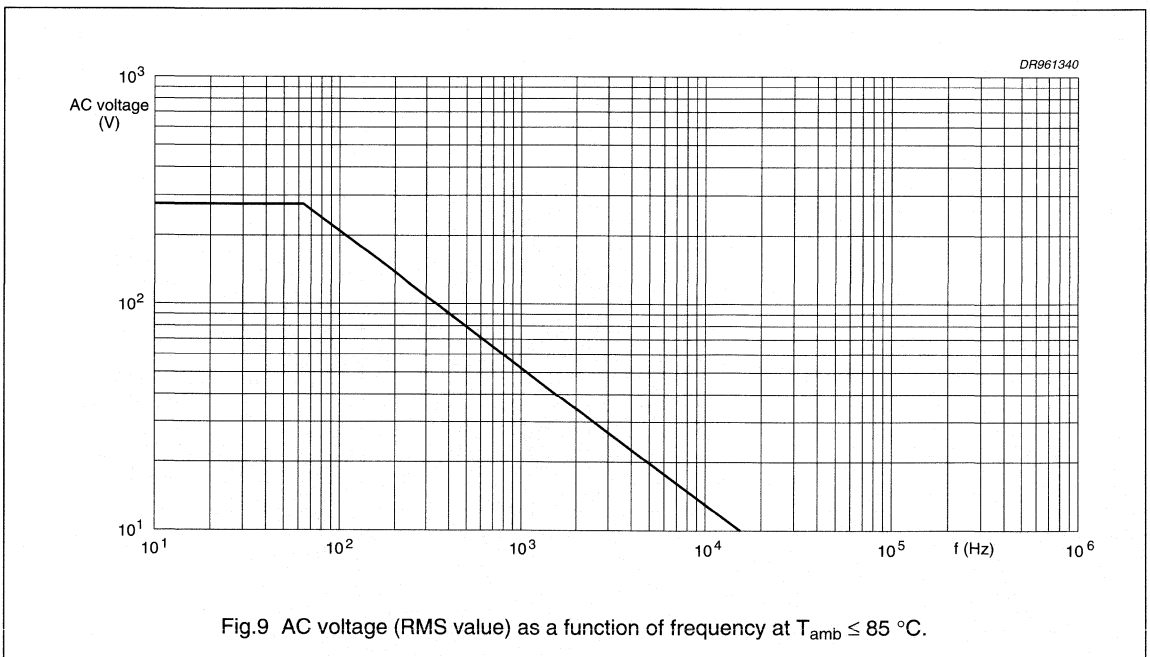
Interference suppression film capacitors

MP-KT 333 4

Resonant frequency



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

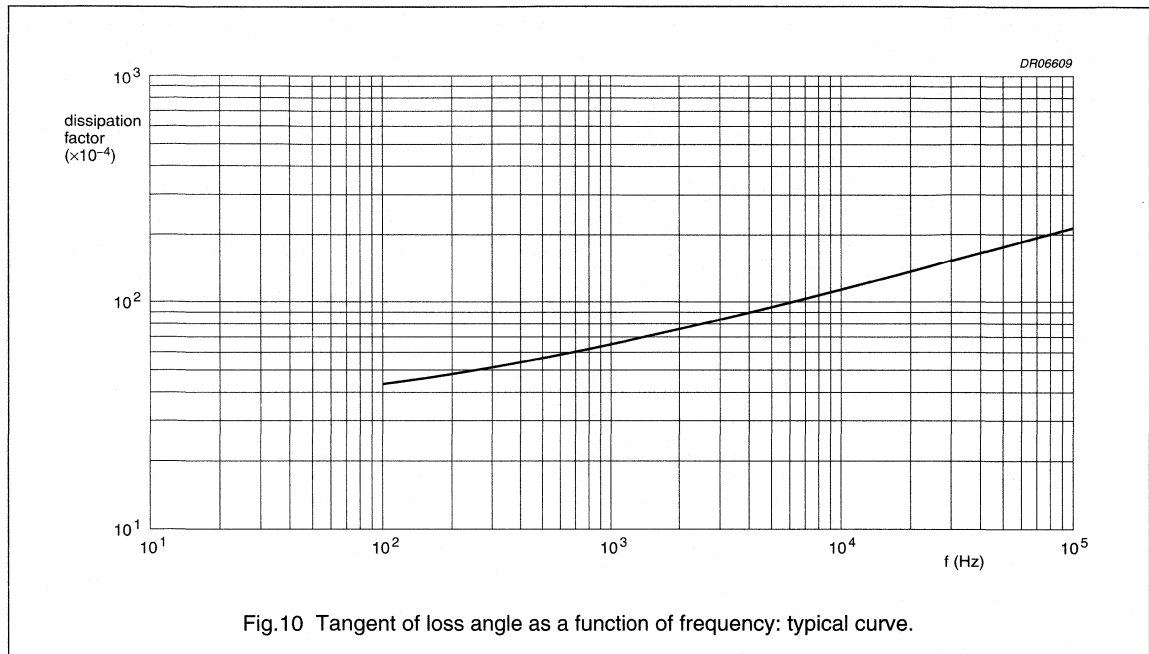


## Interference suppression film capacitors

MP-KT 333 4

## Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE		
	at 1 kHz	at 10 kHz	at 100 kHz
$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 100 \times 10^{-4}$	$\leq 200 \times 10^{-4}$	—
$C \leq 0.47 \mu\text{F}$	—	—	$\leq 350 \times 10^{-4}$



## Temperature

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

## Voltage

- Test voltage between leads, 100% on line for 1 second: 2200 V (DC)
- Test voltage between interconnected leads and case (foil method): 2000 V (AC).

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

RATED VOLTAGE $U_R$ (V)	MAXIMUM PULSE LOAD (V/ $\mu\text{s}$ )		
	P = 15.0 mm	P = 22.5 mm	P = 27.5 mm
275	1500	1000	500 for $220 \text{ nF} < C \leq 330 \text{ nF}$ 250 for $330 \text{ nF} < C \leq 1.0 \mu\text{F}$

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

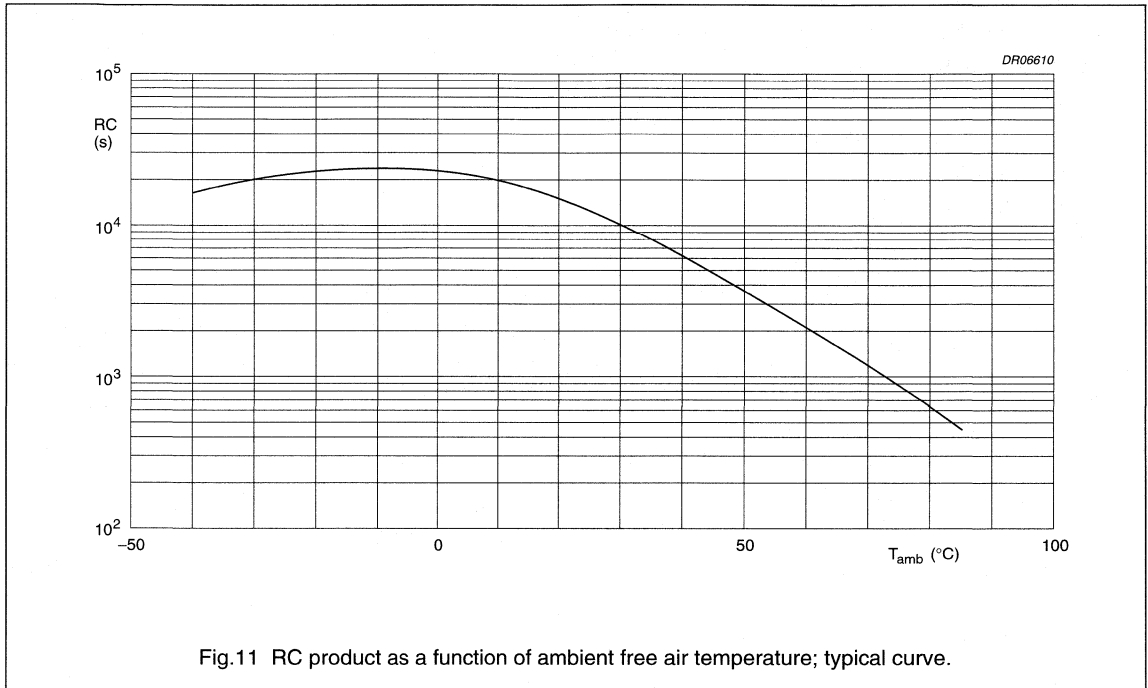
## Interference suppression film capacitors

MP-KT 333 4

**Insulation resistance**

The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm 5$  seconds, at  $T_{\text{amb}} = 20$  °C:

- R between leads for  $C \leq 0.33$   $\mu\text{F}$ :  $>15000$   $\text{M}\Omega$
- RC between leads for  $C > 0.33$   $\mu\text{F}$ :  $>5000$  s
- R between interconnected leads and case (foil method):  $>30000$   $\text{M}\Omega$ .



## Interference suppression film capacitors

MP-KT 333 4

## 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  $\leq 15$  mm), with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance; M =  $\pm 20\%$ ; K =  $\pm 10\%$
3. Rated voltage (AC) (275 V~)
4. Sub-class (X2)
5. Manufacturer's type designation (333 4)
6. Code for dielectric material (MP-KT)
7. Manufacturer (PHILIPS)
8. Code for factory of origin (HQ)
9. Year and week of manufacture (e.g. 9016)
10. Safety approvals:
  - a) 15 mm products will not be marked with (N and D) symbols.
  - b) 22.5 mm products will not be marked with (N, D, ÖVE and IMQ) symbols.

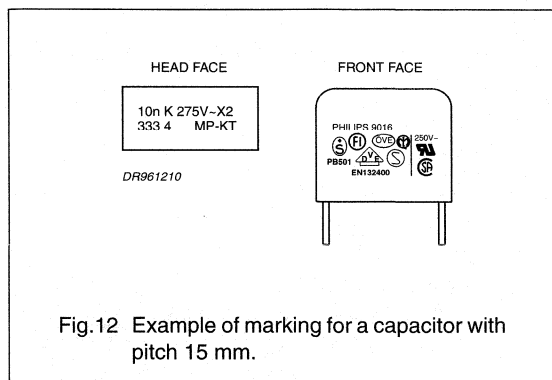


Fig.12 Example of marking for a capacitor with pitch 15 mm.

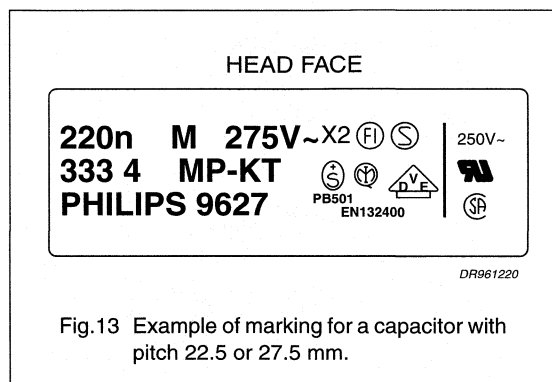


Fig.13 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.

Interference suppression film capacitors

MP-KT 333 4

Package marking

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

<ol style="list-style-type: none"> <li>1. PHILIPS COMPONENTS</li> <li>2. MADE IN BELGIUM</li> <li>3. INTERF. SUPPR. FILM CAPACITOR</li> <li>4. MP-KT RADIAL POTTED TYPE X2</li> <li>5. 0.068<math>\mu</math>F <math>\pm</math>10% 275V<math>\sim</math> 40/065/21/C</li> <li>6. </li> <li>7.  ORIG A170 RPC HQ</li> <li>8.  TYPE MP-KT 333 4</li> <li>9.  QTY 500 DATE 9632</li> <li>10.  CODENO 2222 333 45683</li> </ol> <p style="text-align: right; font-size: small;">CCA327</p>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description and safety class X2</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>Safety approvals</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO</td> </tr> <tr> <td>8</td> <td>Product type description</td> </tr> <tr> <td>9</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>10</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description and safety class X2	5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")	6	Safety approvals	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO	8	Product type description	9	Quantity and production period, year and week code	10	Product code (12NC)
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9	Quantity and production period, year and week code																						
10	Product code (12NC)																						

Fig.14 Barcode label.

## Interference suppression film capacitors

MP-KT 333 4

## 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  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 2\%$
Component solvent resistance		$\Delta \tan \delta \leq 150 \times 10^{-4}$ (C ≤ 470 nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ (C > 470 nF); note 2
<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\%$ $\Delta \tan \delta \leq 150 \times 10^{-4}$ (C ≤ 470 nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ (C > 470 nF); note 2
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	
Voltage proof: "IEC 384-14"	V <sub>p</sub> = 1200 V (DC); 1 minute	
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 85 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 150 \times 10^{-4}$ (C ≤ 470 nF) $\Delta \tan \delta \leq 50 \times 10^{-4}$ (C > 470 nF); note 2
Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30"	2 hours; -40 °C	R <sub>ins</sub> ≥ 50% of specified value
Cold: "IEC 68-2-1"		
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		

## Interference suppression film capacitors

## MP-KT 333 4

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 $V_p = 1200$ V (DC); 1 minute	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C \leq 470$ nF) $\Delta \tan \delta \leq 50 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-14"	$3 \times 2.5$ kV pulse voltage; 1000 hours; $1.25 \times U_{Rdc}$ at 85 °C; once per hour; 0.1 s; 1000 V (RMS) via resistor of 47 $\Omega$ ; $V_p = 1200$ V (DC); 1 minute.	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C \leq 470$ nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Charge and discharge: "IEC 384-14"	10000 cycles; 5 ms; $2.5 \times dV/dt$	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C \leq 470$ nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Passive flammability: "IEC 695-2-2"	class C	no burning
Active flammability: "IEC 384-14"	$20 \times 2.5$ kV discharge	no burning
Heat storage: "IEC 384-14"	1000 hours; 85 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C \leq 470$ nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ ( $C > 470$ nF); note 2
Resistance to soldering heat with preheating: "IEC 384-14"	preheating: 85 °C; solder bath: 260 °C; 10 s	$ \Delta C/C  \leq 2\%$ $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C \leq 470$ nF) $\Delta \tan \delta \leq 30 \times 10^{-4}$ ( $C > 470$ nF); note 2

**Notes**

- For detailed information, see "Type specification".
- Measuring frequency 100 kHz for  $C \leq 470$  nF and 10 kHz for  $C > 470$  nF.



## Interference suppression film capacitors

MKT/MKT 331 6

MKT/MKT RADIAL POTTED CAPACITORS

PITCH 15/22.5/27.5 mm

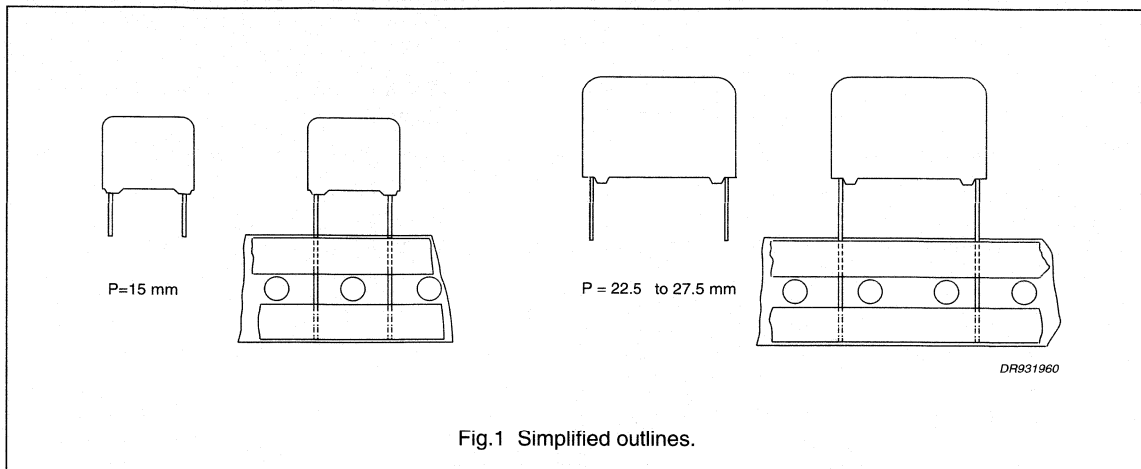


Fig.1 Simplified outlines.

## FEATURES

- 15 to 27.5 mm lead pitch
- Supplied loose in box and taped on reel
- Consists of a low-inductive wound cell with a series construction metallized polyester film, potted in a flame-retardant case
- SEV approved for 3 kV pulse test.

## APPLICATIONS

- For X2-electromagnetic interference suppression
- Specially designed to meet the NEW REQUIREMENTS of "IEC 384-14 2<sup>nd</sup> edition, N 132400", requiring a 2.5 kV peak pulse voltage test
- Designed for 300 V AC applications.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E 6 series)	10 nF to 330 nF
Capacitance tolerance	±20%; ±10%
Rated voltage (AC), 50 to 60 Hz	300 V
Climatic category	55/100/56/C
Rated temperature	100 °C
Maximum application temperature	100 °C
Reference specifications	IEC 384-14 2 <sup>nd</sup> edition, EN 132400; note 1
Safety approvals	UL1283; CSA C22.2 No.8-M1986; SEV; VDE; FI; N; D; S; IMQ; ÖVE
Materials	qualified in accordance with UL94V-O
Safety class	X2

## Note

1. IEC 384-14 2<sup>nd</sup> edition = EN 132400.

Interference suppression film capacitors

MKT/MKT 331 6

MKT/MKT 331 6 GENERAL DATA

PITCH 15/22.5/27.5 mm

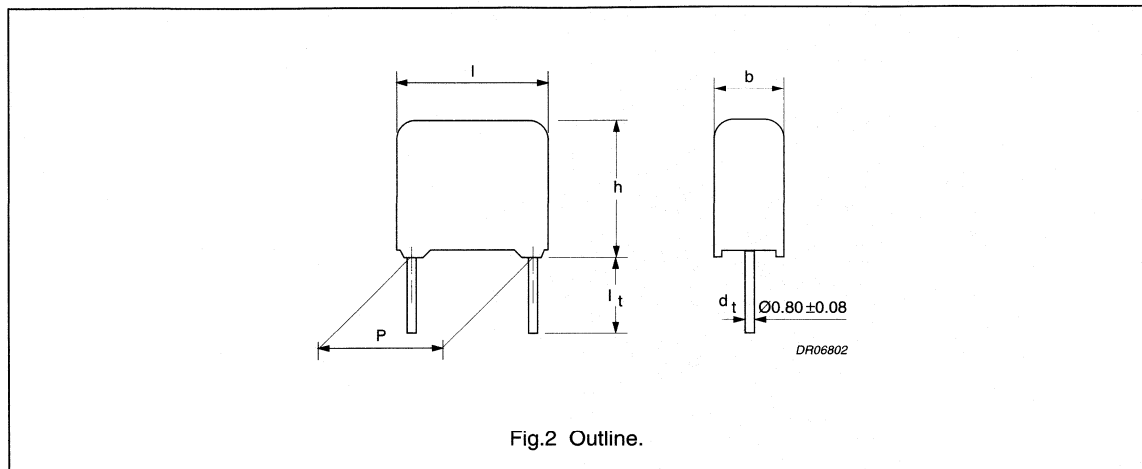


Fig.2 Outline.

Specific reference data for the 300 V AC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 330 nF	≤75 × 10 <sup>-4</sup>	≤130 × 10 <sup>-4</sup>	≤300 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> : P = 15 mm P = 22.5 mm P = 27.5 mm		200 V/μs 120 V/μs 100 V/μs	
R between leads		>30000 MΩ	
Test voltage (DC)		1290 V; 2 s	

Available 300 V AC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ±0.3 mm	±20%	2222 331 60...	preferred
		±10%	2222 331 61...	on request
	l <sub>t</sub> = 5.0 +1/-0 mm	±20%	2222 331 66...	on request
		±20%	2222 331 64...	on request
		±10%	2222 331 65...	on request
Taped on reel	H = 18.5 mm; note 1	±20%	2222 331 62...	on request
		±10%	2222 331 63...	on request

Note

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

Available 300 V AC versions on request

DIMENSIONS	C-tol	VALUES	ORDERING
l <sub>t</sub> = 3.2 to 35 mm	-	E12 series	on request

## Interference suppression film capacitors

MKT/MKT 331 6

## Safety approvals

SAFETY APPROVALS	FILE NUMBERS	SAFETY APPROVALS	FILE NUMBERS
CSA-C22.2 No.8-M1986	LR 94054 - 7	SEMKO (EN132400)	9311171
VDE (EN132400)	94631	IMQ (EN132400)	V 3416
FI (EN132400)	CCA/FI 879	UL12383	E109565
SEV (EN132400)	96,770672	DEMKO (EN132400)	111658 EC/121
NEMKO (EN132400)	M 69945	ÖVE	A855-000-00



DR0602a

Fig.3 Safety approvals.

 $U_{Rac} = 300 \text{ V (AC) X2}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 331 6.... AND PACKAGING			
			LOOSE IN BOX			REEL
			short leads		long leads	H = 18.5 mm
			$l_t =$ $3.5 \pm 0.3 \text{ mm}$	SPQ	$l_t =$ $25.0 \pm 2.0 \text{ mm}$	SPQ
last 5 digits of catalogue number <sup>(1)</sup>	SPQ					
C-tol = $\pm 20\%$						
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>						
0.01	5.0 × 11.0 × 17.5	1.3	60103	1000	1000	1100
0.015			60153			
0.022			60223			
0.033			60333			
0.047	6.0 × 12.0 × 17.5	1.6	60473	1000	1000	900
0.068	7.0 × 13.5 × 17.5	2.0	60683	1000	500	800
0.1	8.5 × 15.0 × 17.5	3.0	60104	1000	500	650
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>						
0.15	7.0 × 16.5 × 26.0	3.8	60154	200	100	550
0.22	8.5 × 18.0 × 26.0	5.4	60224	200	100	450
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>						
0.33	11.0 × 21.0 × 31.0	9.0	60334	100	125	300

## Note

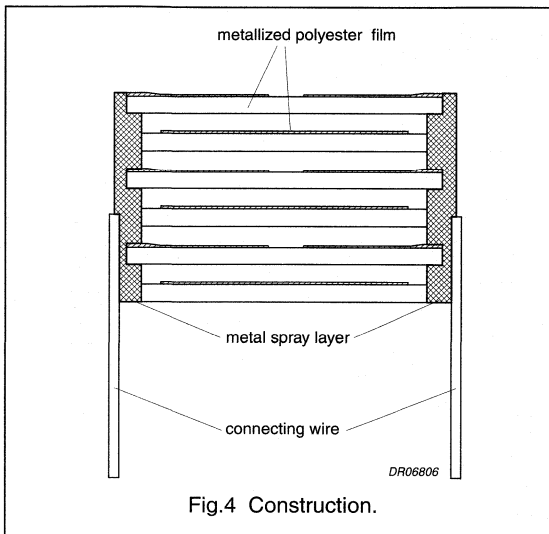
1. The shading indicates preferred types.

## Interference suppression film capacitors

MKT/MKT 331 6

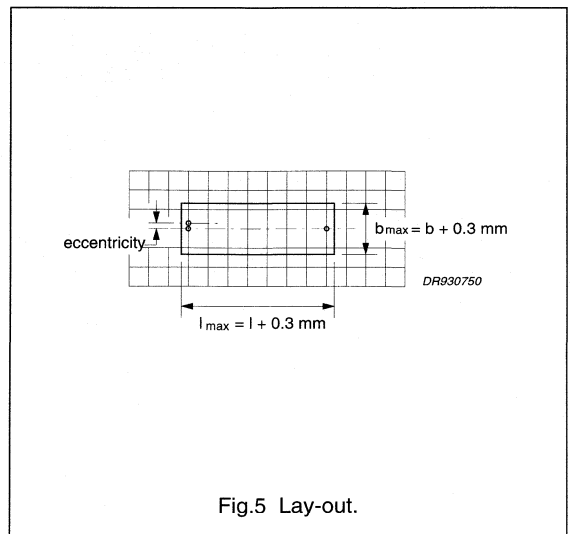
**CONSTRUCTION****Description**

- Low-inductive wound cell of metallized polyethylene terephthalate (PETP) 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**

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 of 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.

**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

MKT/MKT 331 6

**Capacitance**

All capacitance values are specified at 1 kHz.

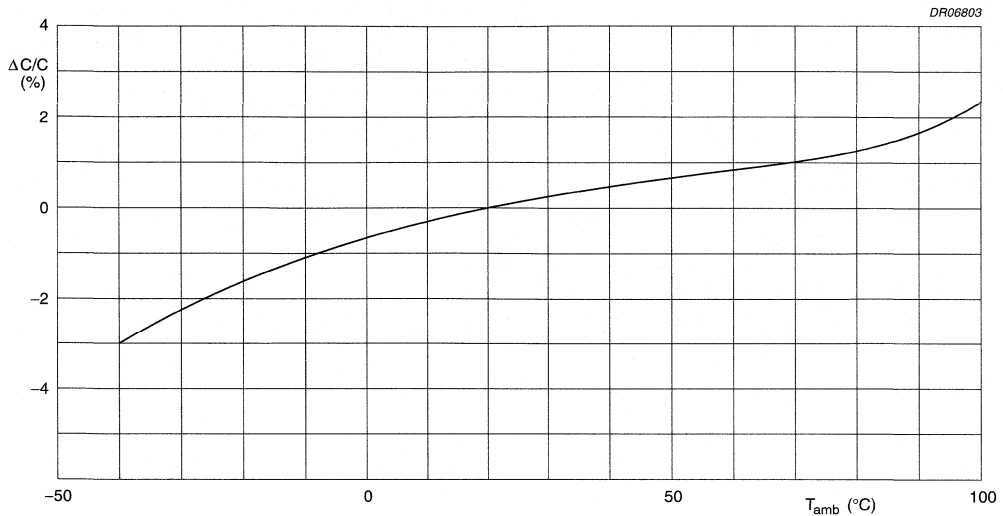


Fig.6 Capacitance change as a function of ambient free air temperature; typical curve.

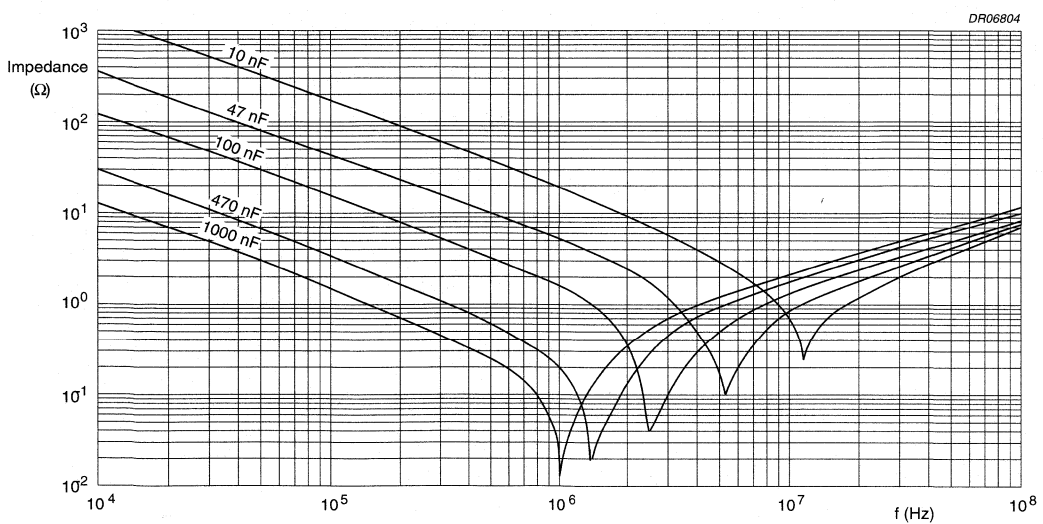
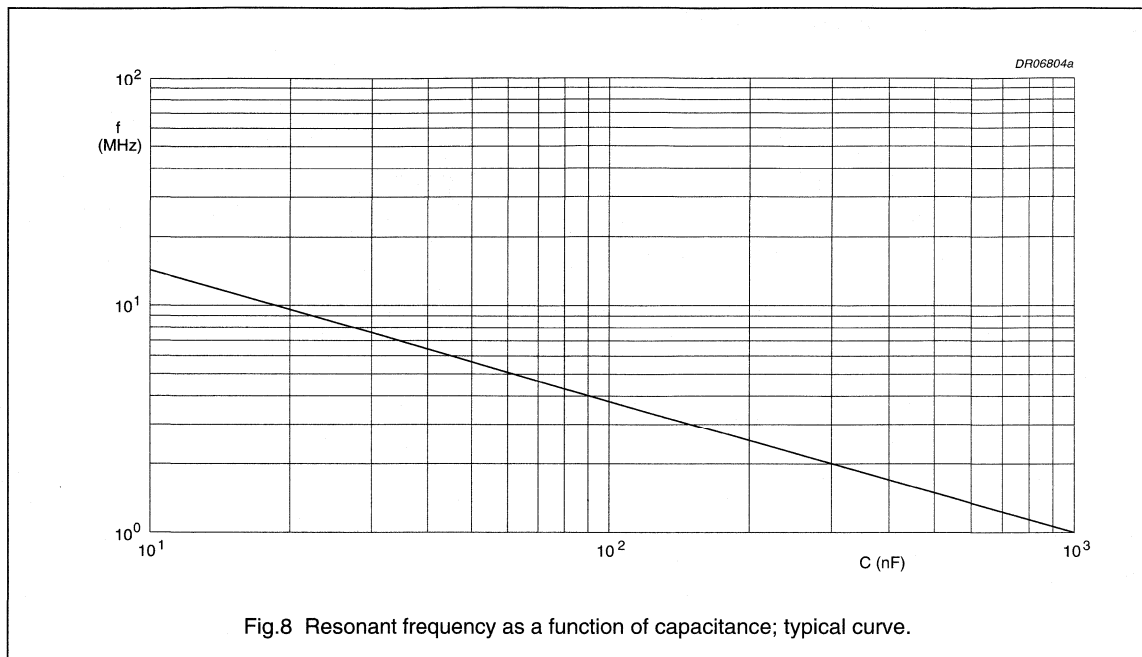
**Impedance**

Fig.7 Impedance as a function of frequency; typical curves.

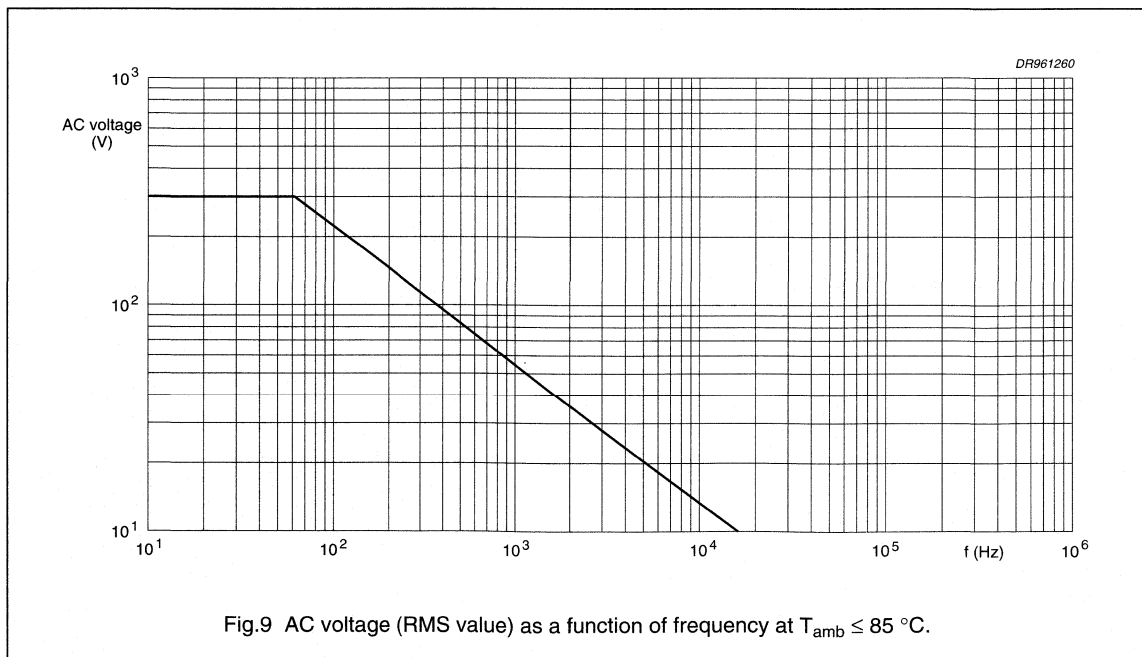
Interference suppression film capacitors

MKT/MKT 331 6

**Resonant frequency**



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



# Interference suppression film capacitors

MKT/MKT 331 6

## Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE		
	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 330 \text{ nF}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 300 \times 10^{-4}$

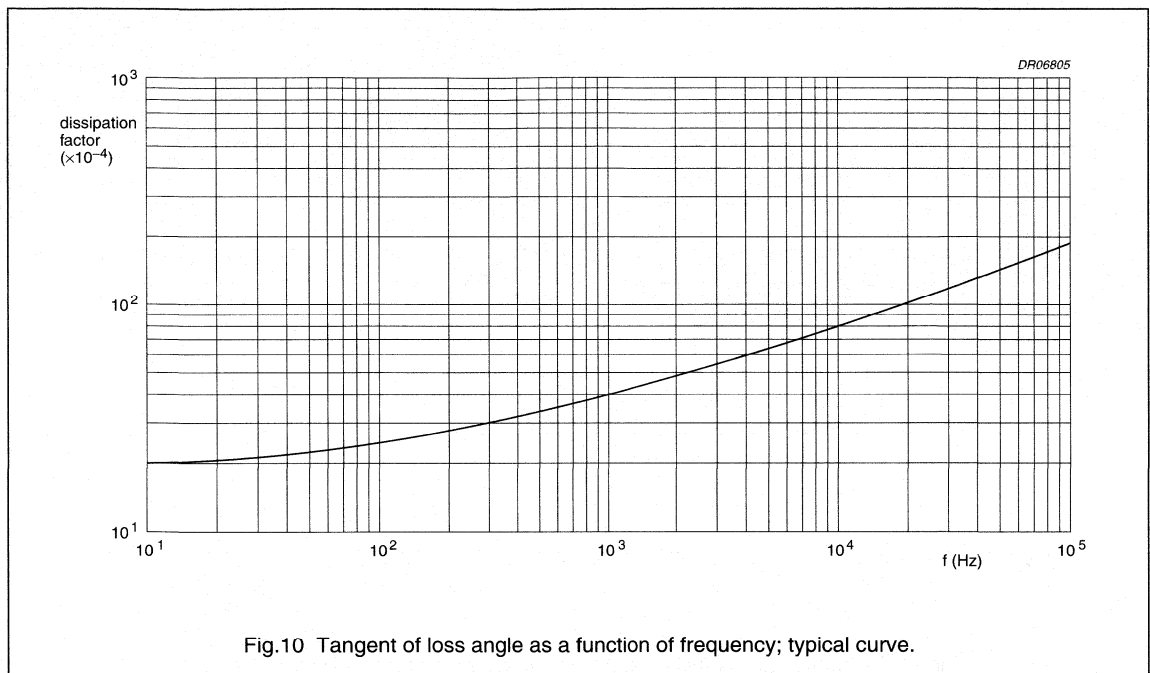


Fig.10 Tangent of loss angle as a function of frequency; typical curve.

## Temperature

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

## Voltage

- Test voltage between leads, 100% on line for 1 second: 1400 V (DC)
- Test voltage between interconnected leads and case (foil method): 2100 V (AC).

## Rated voltage pulse slope $(dU/dt)_R$

RATED VOLTAGE $U_R$ (V)	MAXIMUM PULSE LOAD (V/ $\mu$ s)		
	P = 15.0 mm	P = 22.5 mm	P = 27.5 mm
300	200	120	100

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.

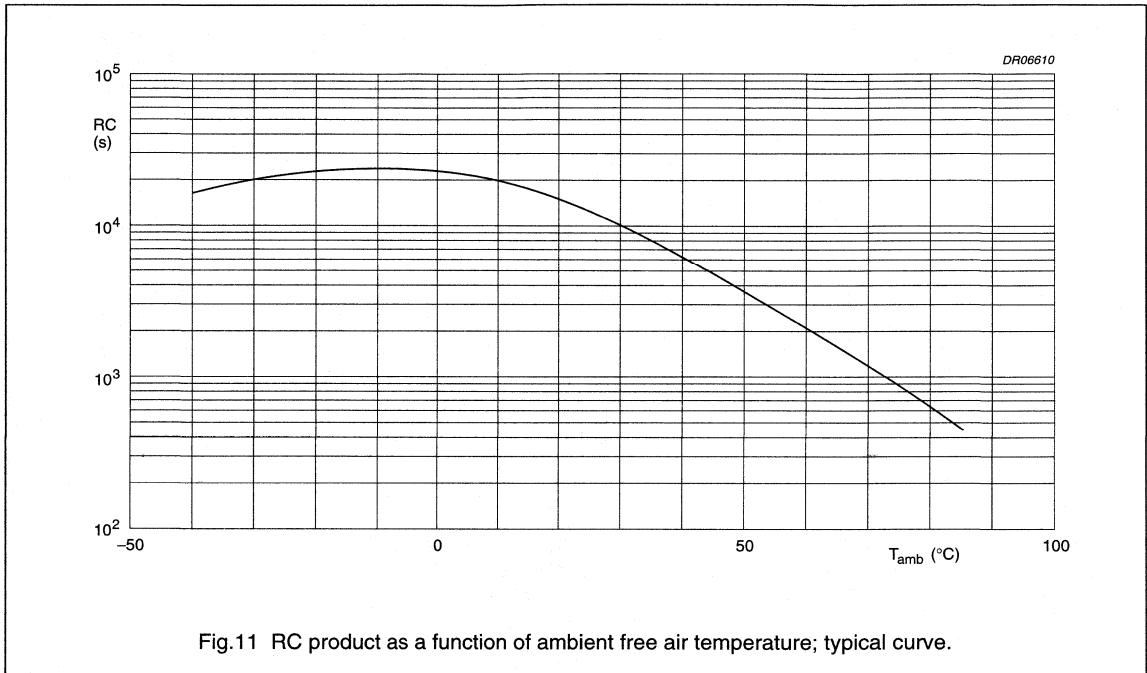
## Interference suppression film capacitors

MKT/MKT 331 6

**Insulation resistance**

The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm 5$  seconds, at  $T_{\text{amb}} = 20$  °C:

- R between leads:  $>30000$  M $\Omega$
- R between interconnected leads and case (foil method):  $>30000$  M $\Omega$ .





## Interference suppression film capacitors

MKT/MKT 331 6

## 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  $\leq 15$  mm), with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance; M =  $\pm 20\%$ ; K =  $\pm 10\%$
3. Rated voltage (AC) (300 V~)
4. Sub-class (X2)
5. Manufacturer's type designation (331 6)
6. Code for dielectric material (MKT/MKT)
7. Manufacturer (PHILIPS)
8. Year and week of manufacture (e.g. 9416)
9. Safety approvals.  
The products will not be marked with (N, D, and ÖVE) symbols.

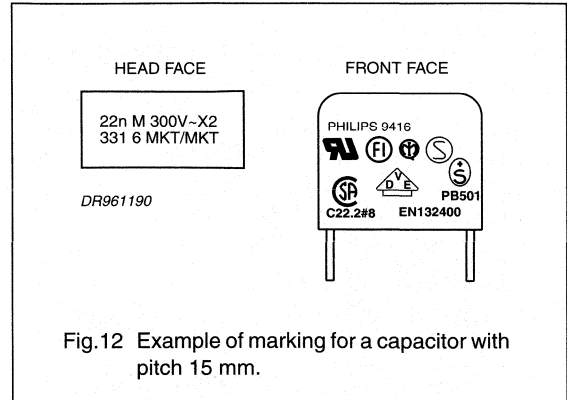


Fig.12 Example of marking for a capacitor with pitch 15 mm.

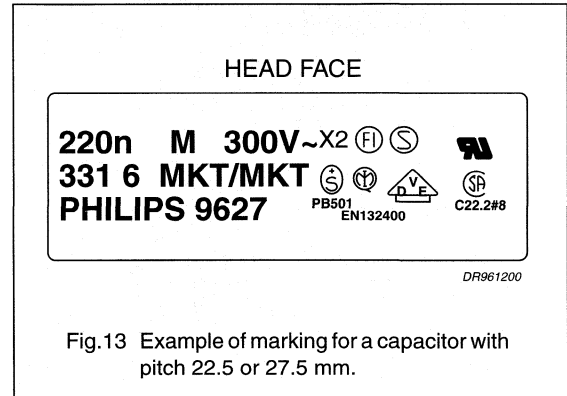


Fig.13 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.

Interference suppression film capacitors

MKT/MKT 331 6

Package marking

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

Barcode label marking	
LINE	MARKING EXPLANATION
1.	Manufacturer's name
2.	Country of origin
3.	Sub-family
4.	Type description and safety class X2
5.	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")
6.	Safety approvals
7.	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO
8.	Product type description
9.	Quantity and production period, year and week code
10.	Product code (12NC)

The barcode label contains the following information:

- 1.** PHILIPS COMPONENTS
- 2.** MADE IN BELGIUM
- 3.** INTERF. SUPPR. FILM CAPACITOR
- 4.** MKT/MKT RADIAL POTTED TYPE X2
- 5.** 0.033µF ±20% 300V~ 55/100/56/C
- 6.** Safety approvals: FI, S, Q, S (P8504), RU, OVE, N, D, DE, SP (C22.2#8)
- 7.** ORIG A170 RPC HQ; WO: C22.2#8
- 8.** TYPE MKT/MKT 331 6
- 9.** QTY 1000 DATE 9632
- 10.** CODENO 2222 331 60333

CCA331

Fig.14 Barcode label.

## Interference suppression film capacitors

MKT/MKT 331 6

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: "IEC 68-2-21" Resistance to soldering heat: "IEC 68-2-20" Component solvent resistance	solder bath: 260 °C; 10 s  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking $ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ (C ≤ 100 nF) $\Delta \tan \delta \leq 150 \times 10^{-4}$ (C > 100 nF)
<b>Robustness of component</b>		
Rapid change of temperature: "IEC 68-2-14"  Vibration  Shock: "IEC 68-2-27"	5 cycles 1 cycle = 30 minutes at -55 °C and 30 minutes at 100 °C  10 to 55 Hz; amplitude 0.75 mm; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ (C ≤ 100 nF) $\Delta \tan \delta \leq 150 \times 10^{-4}$ (C > 100 nF)
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2" Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30" Cold: "IEC 68-2-1" Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30" Voltage proof: "IEC 384-14"	16 hours; 100 °C      2 hours; -55 °C       V <sub>p</sub> = 1290 V (DC); 1 minute	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ (C ≤ 100 nF) $\Delta \tan \delta \leq 150 \times 10^{-4}$ (C > 100 nF)       R <sub>ins</sub> ≥ 50% of specified value

## Interference suppression film capacitors

MKT/MKT 331 6

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 95 to 98% RH no load $V_p = 1290$ V (DC); 1 minute	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C > 100$ nF) $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-14"	$3 \times 2.5$ kV pulse voltage; 1000 hours; $1.25 \times U_{Rac}$ at 100 °C; once per hour; 0.1 s; 1000 V (RMS) via resistor of 47 $\Omega$ ; $V_p = 1290$ V (DC); 1 minute	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C > 100$ nF) $R_{ins} \geq 50\%$ of specified value
Charge and discharge: "IEC 384-14"	10000 cycles; 5 ms; $1.5 \times dV/dt$	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C > 100$ nF) $R_{ins} \geq 50\%$ of specified value
Passive flammability: "IEC 695-2-2"	class C	no burning
Active flammability: "IEC 695-2-2"	$20 \times 2.5$ kV discharge	no burning
Heat storage: "IEC 384-14"	1000 hours; 100 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C > 100$ nF)
Resistance to soldering heat with preheating: "IEC 384-14"	preheating: 100 °C; solder bath: 260 °C; 10 s	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 150 \times 10^{-4}$ ( $C > 100$ nF)

**Note**

- For detailed information, see "Type specification".

## Interference suppression film capacitors

MKP 335 1

MKP RADIAL POTTED CAPACITORS

PITCH 15/22.5/27.5 mm

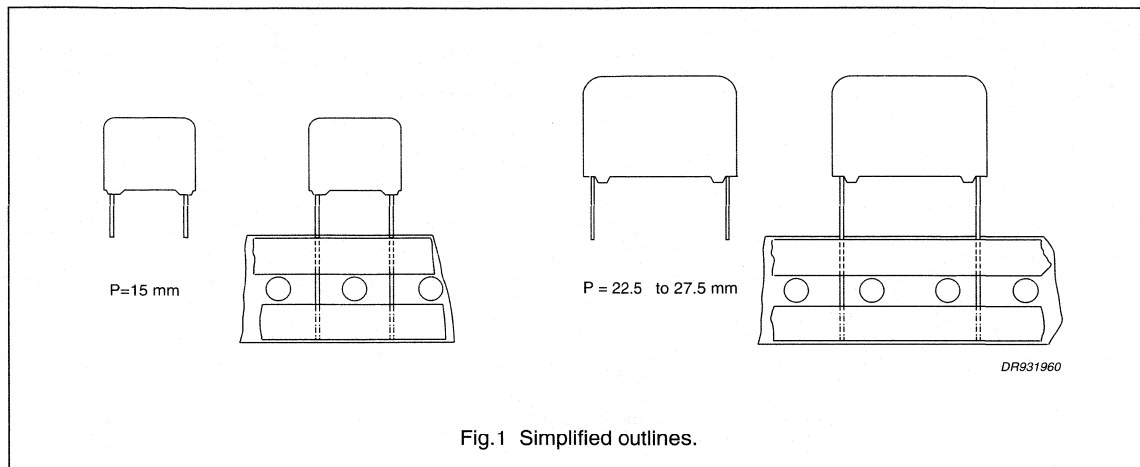


Fig.1 Simplified outlines.

## 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 polypropylene film, potted in a flame-retardant case.

## APPLICATIONS

- For X2-electromagnetic interference suppression
- Specially designed to meet the **NEW REQUIREMENTS** of the new "IEC 384-14 2<sup>nd</sup> edition, EN 132400", requiring a 2.5 kV peak pulse voltage test.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E6 series)	10 nF to 1 $\mu$ F
Capacitance tolerance	$\pm 10\%$ , $\pm 20\%$
Rated voltage (AC), 50 to 60 Hz	250 V
Climatic category	40/085/21/C
Rated temperature	85 °C
Maximum application temperature	85 °C
Reference specifications	IEC 384-14 2 <sup>nd</sup> edition, EN 132400; note 1
Safety approvals	UL1283, CSA-C22.2 No 8, SEV, VDE, FI, N, D, S, IMQ, ÖVE
Materials	qualified in accordance with UL94V-O
Safety class	X2

## Note

1. IEC 384-14 2<sup>nd</sup> edition = EN 132400.

## Interference suppression film capacitors

MKP 335 1

## MKP 335 1 GENERAL DATA

PITCH 15/22.5/27.5 mm

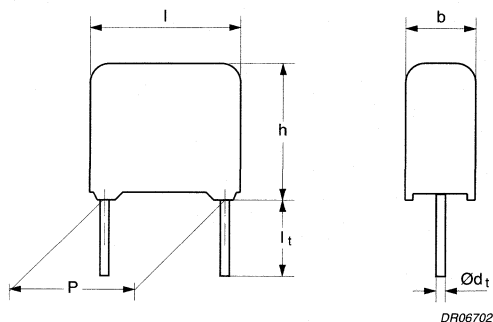


Fig.2 Outline.

## Specific reference data for the 250 V AC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 100 nF 100 nF < C ≤ 470 nF C > 470 nF	≤ 10 × 10 <sup>-4</sup> ≤ 20 × 10 <sup>-4</sup> ≤ 70 × 10 <sup>-4</sup>	≤ 30 × 10 <sup>-4</sup> ≤ 70 × 10 <sup>-4</sup> -
Rated voltage pulse slope (dU/dt) <sub>R</sub>	100 V/μs	
R between leads, for C ≤ 0.33 μF	> 30000 MΩ	
RC between leads, for C > 0.33 μF	> 10000 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 <sub>t</sub> = 3.5 ± 0.3 mm	±20%	2222 335 10...	preferred
		±10%	2222 335 11...	on request
	l <sub>t</sub> = 5.0 ± 1.0 mm	±20%	2222 335 16...	on request
		±10%	2222 335 17...	on request
	l <sub>t</sub> = 25.0 ± 2.0 mm	±20%	2222 335 14...	on request
		±10%	2222 335 15...	on request
Taped on reel	H = 18.5 mm; note 1	±20%	2222 335 12...	on request
		±20%	2222 335 13...	on request

## Note

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

## Available 250 V AC versions on request

DIMENSIONS	C-tol	VALUES	ORDERING
l = 3.2 to 35 mm	-	E12 series	on request

## Interference suppression film capacitors

MKP 335 1

## Safety approvals

SAFETY APPROVALS	FILE NUMBERS	SAFETY APPROVALS	FILE NUMBERS
UL1283	E 109565	NEMKO (EN132400)	P941017.59
CSA-C22.2 No.8-M1986	LR 94054-7	DEMKO (EN132400)	108282EC121
SEV (EN132400)	96,770673	SEMKO (EN132400)	9439122
VDE (EN132400)	94632	IMQ (EN132400)	V 3205
FI (EN132400)	CCA/FI 880	ÖVE	PA21441/R



Fig.3 Safety approvals.

DR941920

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

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 335 ..... AND PACKAGING			
			LOOSE IN BOX			REEL
			short leads		long leads	H = 18.5 mm
			$l_t =$ 3.5 $\pm$ 0.3 mm	SPQ	$l_t =$ 25.0 $\pm$ 2.0 mm	SPQ
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	
C-tol = $\pm$ 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	10103 10153 10223 10333	1000	1000	1100
0.033 0.047	6.0 $\times$ 12.0 $\times$ 17.5	1.4	note 2 10473	1000	1000	900
0.068	7.0 $\times$ 13.5 $\times$ 17.5	1.9	10683	1000	500	800
0.1	8.5 $\times$ 15.0 $\times$ 17.5	2.6	10104	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	3.2	10154	200	500	550
0.22	8.5 $\times$ 18.0 $\times$ 26.0	4.4	10224	200	500	450
0.33	10.0 $\times$ 19.5 $\times$ 26.0	5.5	10334	200	500	350
<b>Pitch = 27.5 <math>\pm</math> 0.40 mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>						
0.47	11.0 $\times$ 21.0 $\times$ 31.0	7.8	10474	100	125	300
0.68	15.0 $\times$ 25.0 $\times$ 31.0	12.8	10684	100	125	200
1	18.0 $\times$ 28.0 $\times$ 31.0	17.2	10105	100	125	150

## Notes

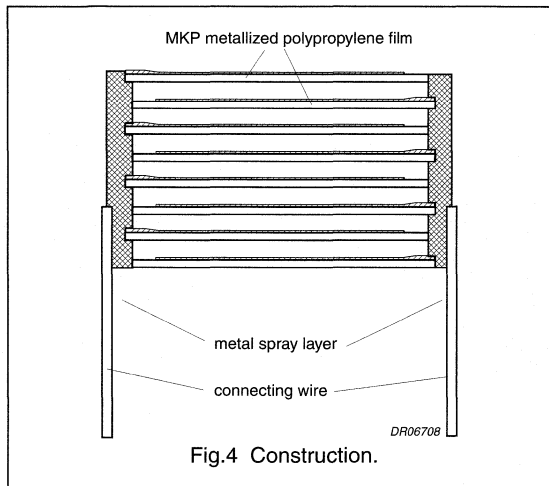
1. The shading indicates preferred types.
2. Other dimensions for 10% versions.

## Interference suppression film capacitors

MKP 335 1

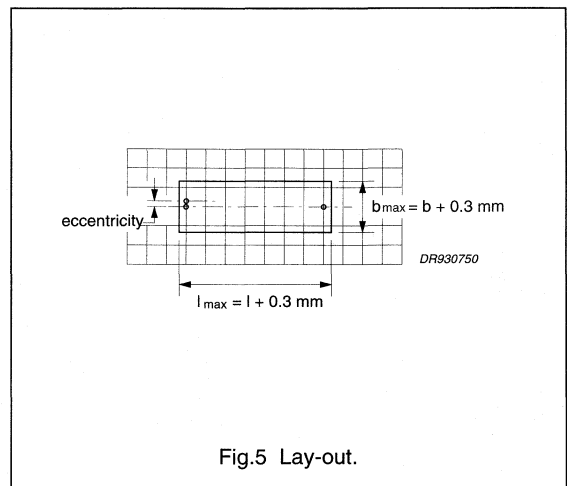
**CONSTRUCTION****Description**

- Low-inductive wound cell of metallized polypropylene (PP) film, potted with epoxy resin in a flame-retardant polypropylene case
- Radial leads, solder-coated
  - Copper clad steel wire (pitch = 6e)
  - Copper wire (pitch = 9e and 11e)
- 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 means of automatic insertion machines.

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

**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 of 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.

**RATINGS AND CHARACTERISTICS**

Unless otherwise specified, all electrical values apply at 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%.

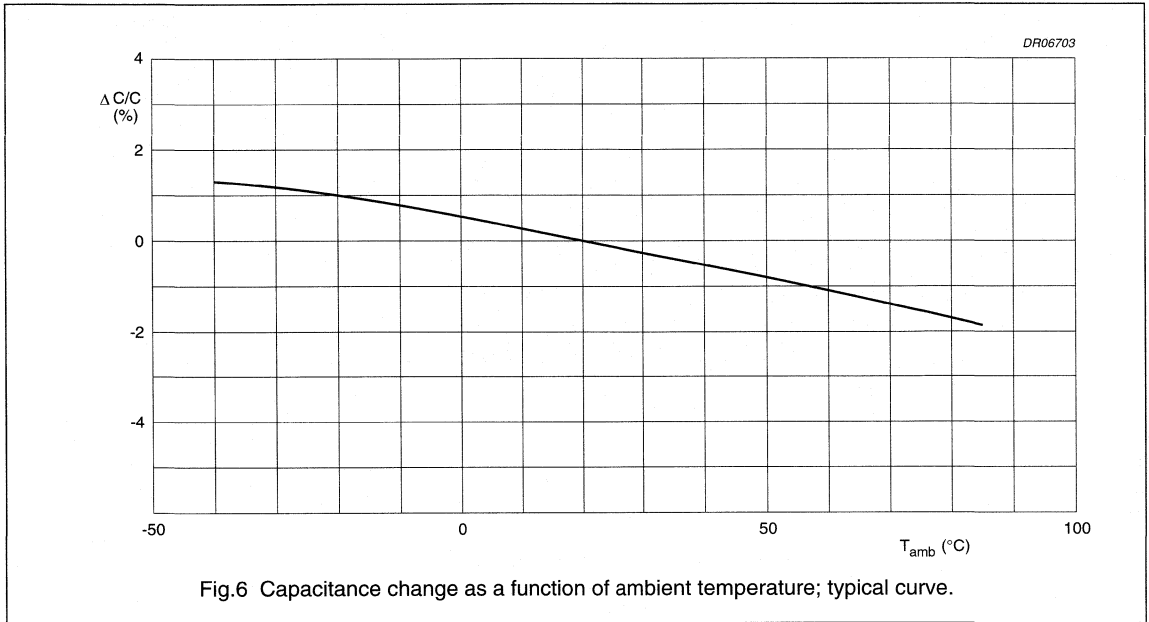


# Interference suppression film capacitors

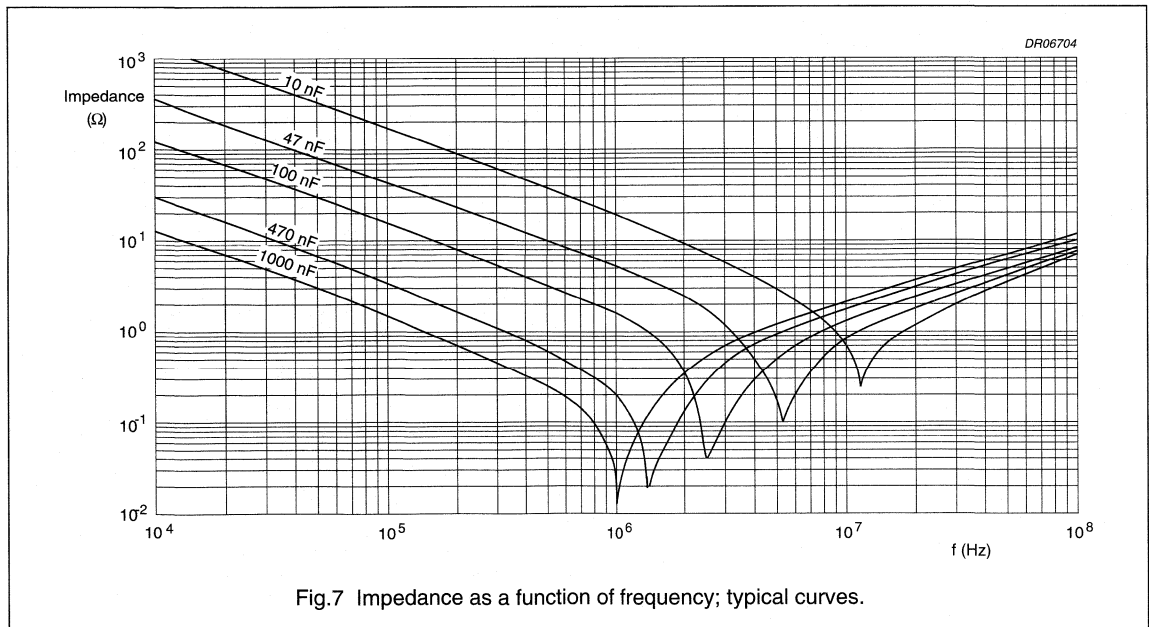
MKP 335 1

## Capacitance

All capacitance values are specified at 1 kHz.



## Impedance



Interference suppression film capacitors

MKP 335 1

Resonant frequency

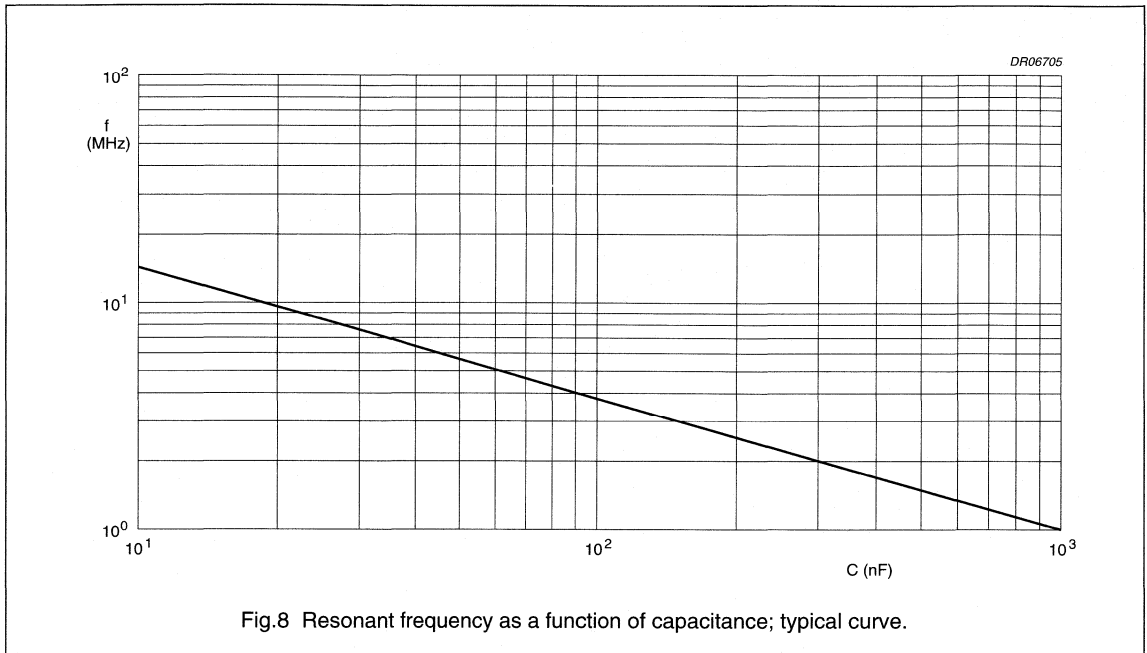


Fig.8 Resonant frequency as a function of capacitance; typical curve.

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

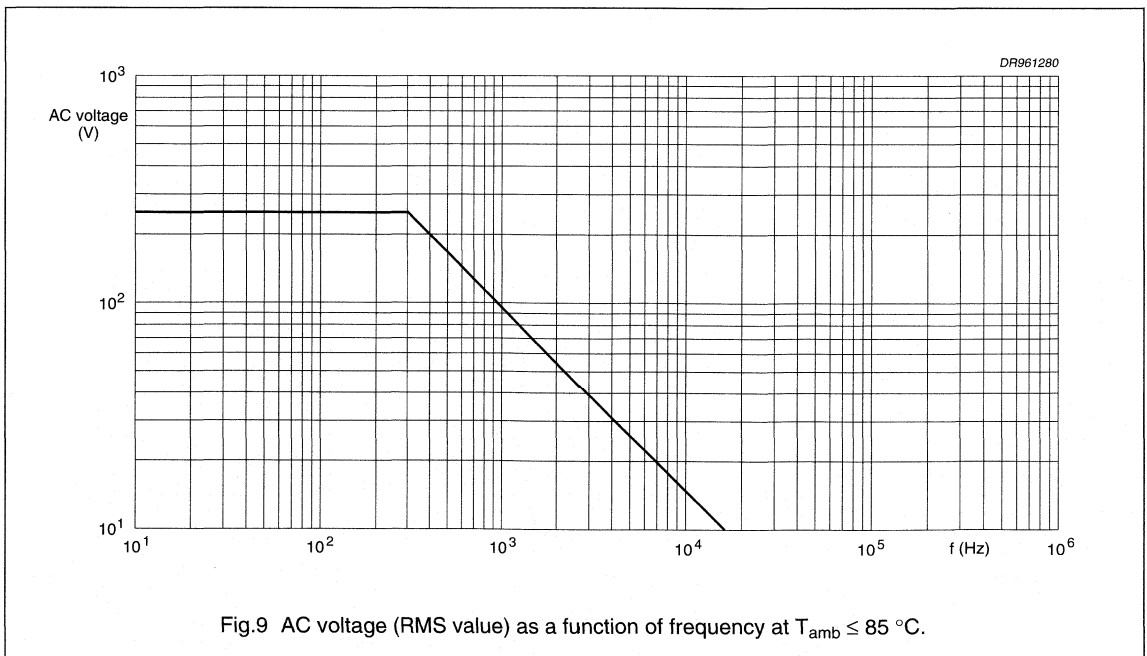


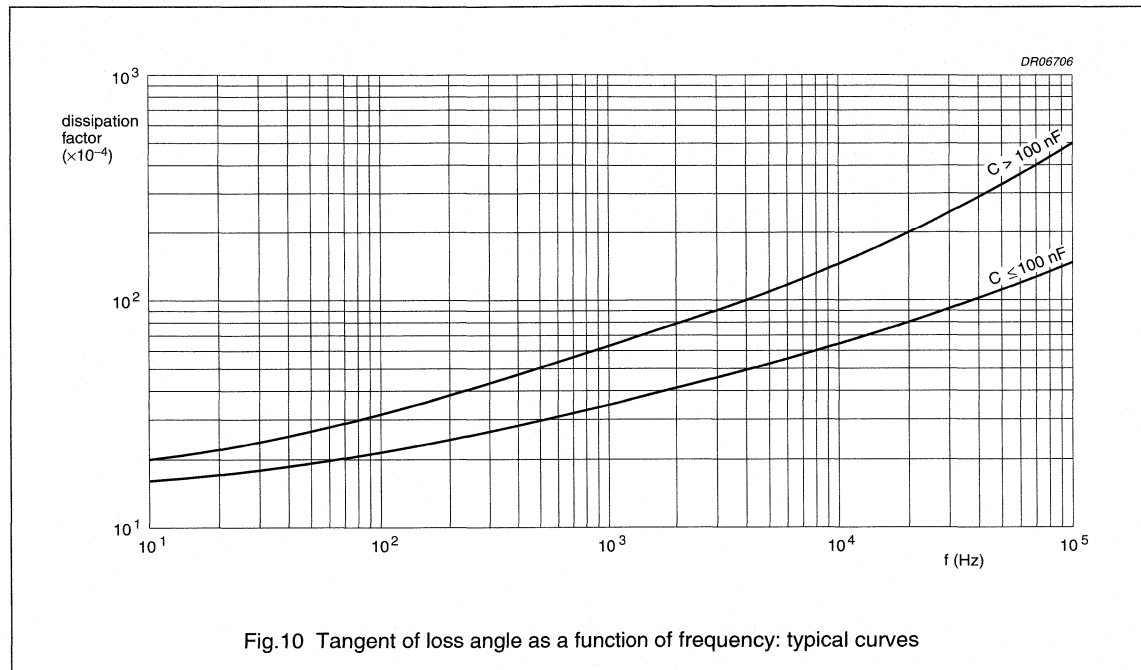
Fig.9 AC voltage (RMS value) as a function of frequency at  $T_{amb} \leq 85\text{ }^\circ\text{C}$ .

## Interference suppression film capacitors

MKP 335 1

## Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE	
	at 10 kHz	at 100 kHz
$C \leq 100 \text{ nF}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
$100 \text{ nF} < C \leq 470 \text{ nF}$	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$
$C > 470 \text{ nF}$	$\leq 70 \times 10^{-4}$	—



## Temperature

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

## Voltage

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

Rated voltage pulse slope  $(dU/dt)_R$ 

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

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

## Interference suppression film capacitors

MKP 335 1

**Insulation resistance**

The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm 5$  seconds, at  $T_{\text{amb}} = 20$  °:

- R between leads for  $C \leq 0.33 \mu\text{F}$ :  $>30000 \text{ M}\Omega$
- RC between leads for  $C > 0.33 \mu\text{F}$ :  $>10000 \text{ s}$
- R between interconnected leads and case (foil method):  $>30000 \text{ M}\Omega$ .

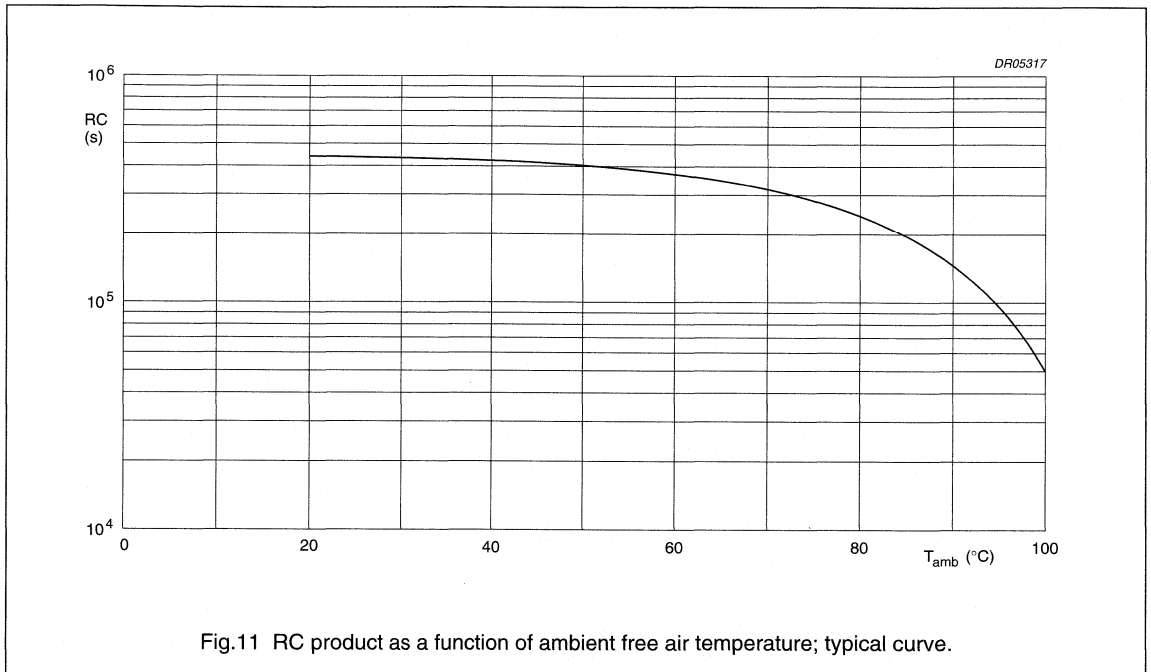


Fig.11 RC product as a function of ambient free air temperature; typical curve.

## Interference suppression film capacitors

MKP 335 1

## 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 =  $\pm 20\%$ ; K =  $\pm 10\%$
3. Rated voltage (AC) (250 V~)
4. Sub-class (X2)
5. Manufacturer's type designation (335 1)
6. Code for dielectric material (MKP)
7. Manufacturer (PHILIPS)
8. Year and week of manufacture (e.g. 9411)
9. Safety approvals.

The products will not be marked with (N, D, and ÖVE) symbols.

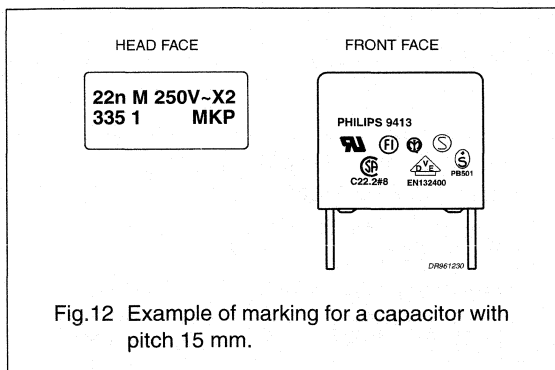


Fig.12 Example of marking for a capacitor with pitch 15 mm.

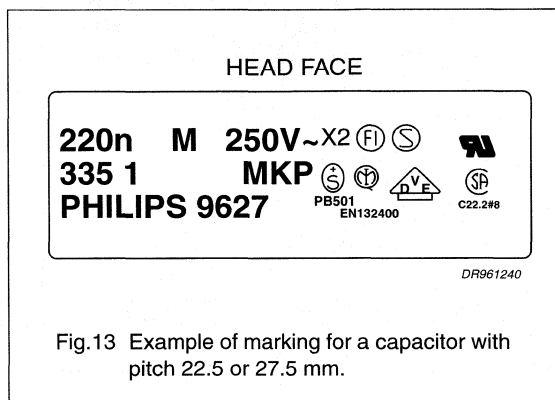


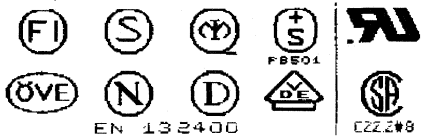



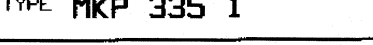
Fig.13 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.

Interference suppression film capacitors

MKP 335 1

Package marking

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

<ol style="list-style-type: none"> <li>1. PHILIPS COMPONENTS</li> <li>2. MADE IN BELGIUM</li> <li>3. INTERF. SUPPR. FILM CAPACITOR</li> <li>4. MKP RADIAL POTTED TYPE X2</li> <li>5. 0.15<math>\mu</math>F <math>\pm</math>20% 250V<math>\sim</math> 40/085/21/C</li> <li>6. </li> <li>7.  ORIG R170 RPC HQ</li> <li>8.  TYPE MKP 335 1</li> <li>9.  QTY 500 DATE 9632</li> <li>10.  CODENO 2222 335 14154</li> </ol>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description and safety class X2</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>Safety approvals</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO</td> </tr> <tr> <td>8</td> <td>Product type description</td> </tr> <tr> <td>9</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>10</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description and safety class X2	5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")	6	Safety approvals	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO	8	Product type description	9	Quantity and production period, year and week code	10	Product code (12NC)
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10	Product code (12NC)																						

CCA330

Fig.14 Barcode label.

## Interference suppression film capacitors

MKP 335 1

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: <i>"IEC 68-2-21"</i> Resistance to soldering heat: <i>"IEC 68-2-20"</i> Component solvent resistance	solder bath: 260 °C; 10 s isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking $ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ (100 nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2
<b>Robustness of component</b>		
Rapid change of temperature: <i>"IEC 68-2-14"</i> Vibration: <i>"IEC 68-2-6"</i> Shock: <i>"IEC 68-2-27"</i>	5 cycles 1 cycle = 30 minutes at -40 °C and 30 minutes at 85 °C 10 to 55 Hz; amplitude 0.75 mm; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ (100 nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2
<b>Climatic sequence</b>		
Dry heat: <i>"IEC 68-2-2"</i> Damp heat, cyclic, test Db, first cycle: <i>"IEC 68-2-30"</i> Cold: <i>"IEC 68-2-1"</i> Damp heat, cyclic, test Db, remaining cycles: <i>"IEC 68-2-30"</i> Voltage proof: <i>"IEC 384-14"</i>	16 hours; 85 °C 2 hours; -40 °C V <sub>p</sub> = 1075 V (DC); 1 minute	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ (100 nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2 R <sub>ins</sub> ≥ 50% of specified value

## Interference suppression film capacitors

MKP 335 1

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 $V_p = 1075$ V (DC); 1 minute	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-14"	$3 \times 2.5$ kV pulse voltage; 1000 hours; $1.25 \times U_{Rac}$ at 85 °C; once per hour; 0.1 s; 1000 V (RMS) via resistor of 47 $\Omega$ , $V_p = 1075$ V (DC); 1 minute	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Charge and discharge: "IEC 384-14"	10000 cycles; 5 ms; $1.5 \times dV/dt$	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2 $R_{ins} \geq 50\%$ of specified value
Passive flammability: "IEC 695-2-2"	class C	no burning
Active flammability: "IEC 384-14"	$20 \times 2.5$ kV discharge	no burning
Heat storage: "IEC 384-14"	1000 hours; 85 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2
Resistance to soldering heat with preheating: "IEC 384-14"	preheating: 85 °C; solder bath: 260 °C; 10 s	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 100 \times 10^{-4}$ ( $C \leq 100$ nF); note 2 $\Delta \tan \delta \leq 200 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF); note 2 $\Delta \tan \delta \leq 70 \times 10^{-4}$ ( $C > 470$ nF); note 2

**Notes**

- For detailed information, see "Type specification".
- Measuring frequency 100 kHz for  $C \leq 470$  nF and 10 kHz for  $C > 470$  nF.



## Interference suppression film capacitors

MKT-P 330 4

MKT-P RADIAL POTTED CAPACITORS

PITCH 15/22.5/27.5 mm

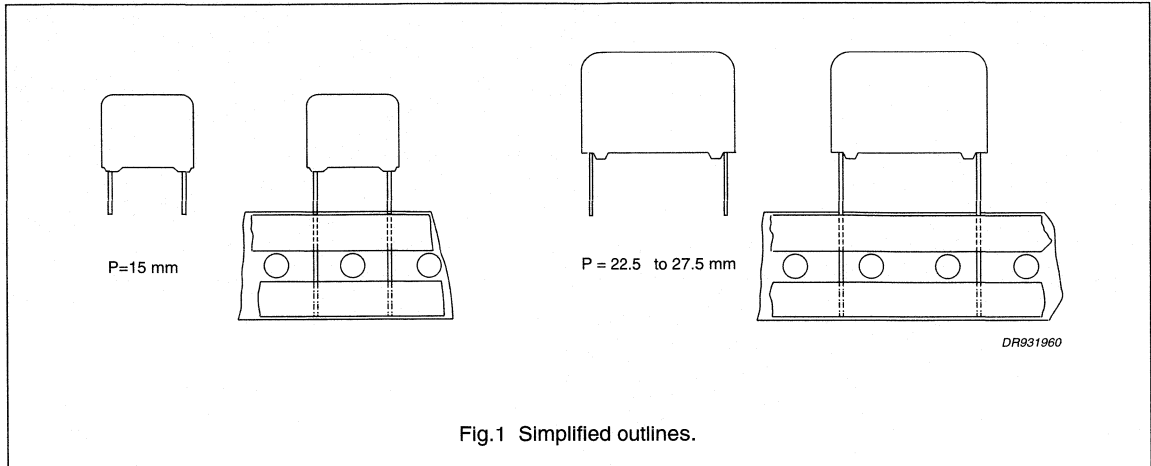


Fig.1 Simplified outlines.

## 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-O
Safety class	X2

## Interference suppression film capacitors

MKT-P 330 4

## MKT-P 330 4 GENERAL DATA

PITCH 15/22.5/27.5 mm

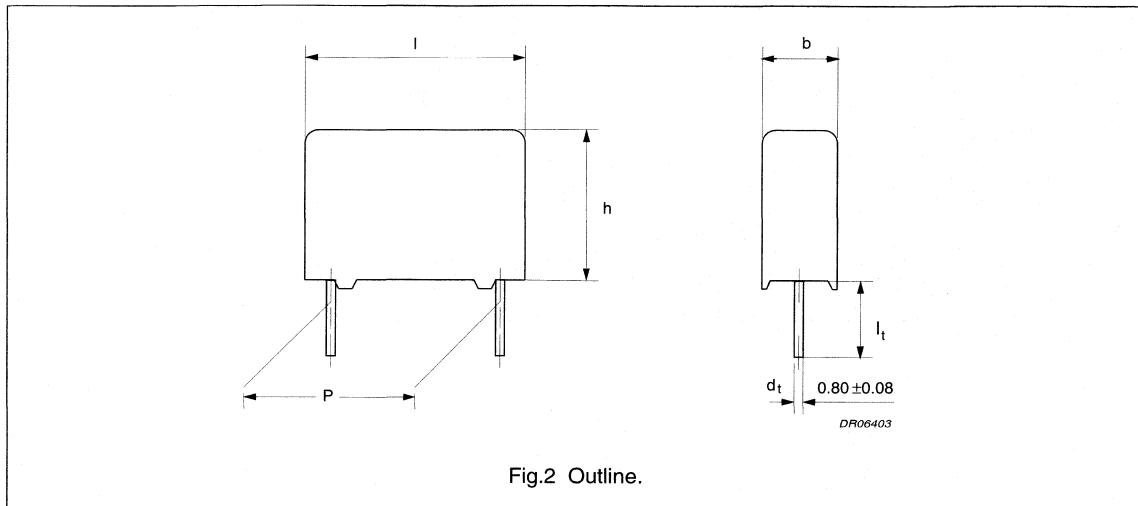


Fig.2 Outline.

## 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	$H = 18.5 \text{ mm}$ ; 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

## Interference suppression film capacitors

MKT-P 330 4

## 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
			$l_t =$ $5.0 \pm 1.0 \text{ mm}$	SPQ	$l_t =$ $25.0 \pm 2.0 \text{ mm}$	SPQ
			last 5 digits of catalogue number <sup>(1)</sup>		SPQ	
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>						
0.01	$5.0 \times 11.0 \times 17.5$	1.2	40103	1000	1000	1100
0.015			40153			
0.022			40223			
0.033			40333			
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 = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></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 = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></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

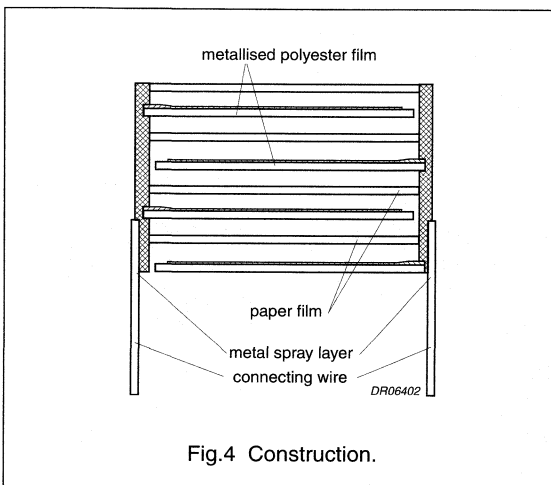
1. The shading indicates preferred types.

## Interference suppression film capacitors

MKT-P 330 4

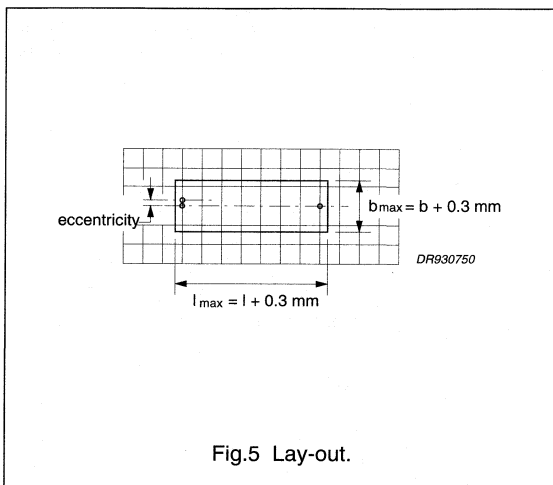
**CONSTRUCTION****Description**

- 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  $50 \pm 2\%$ .

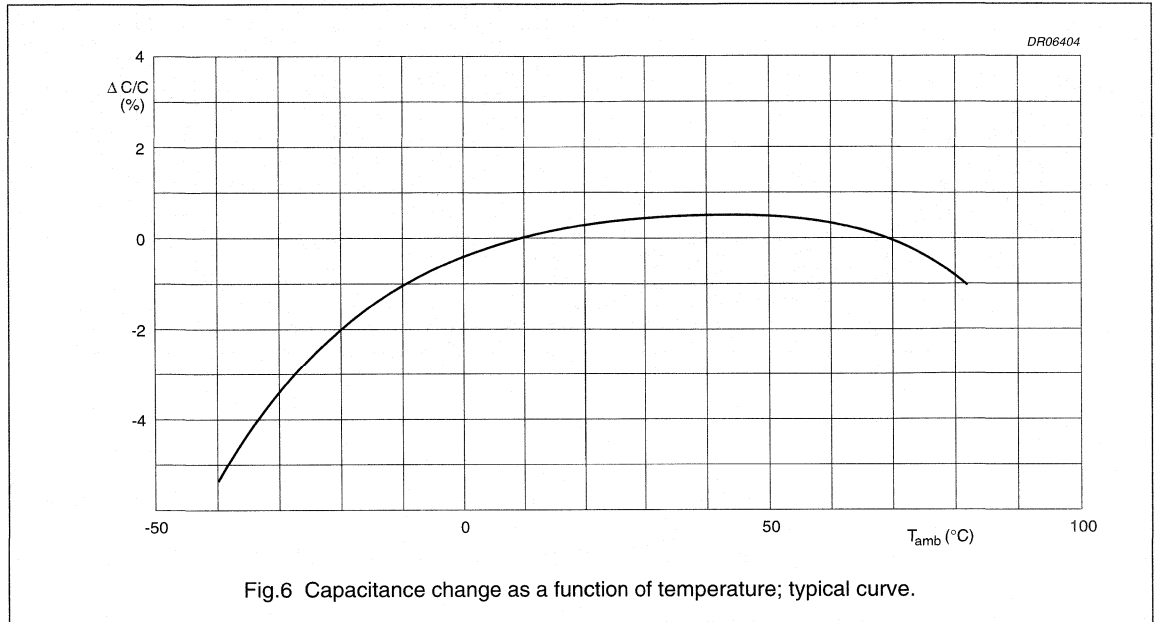
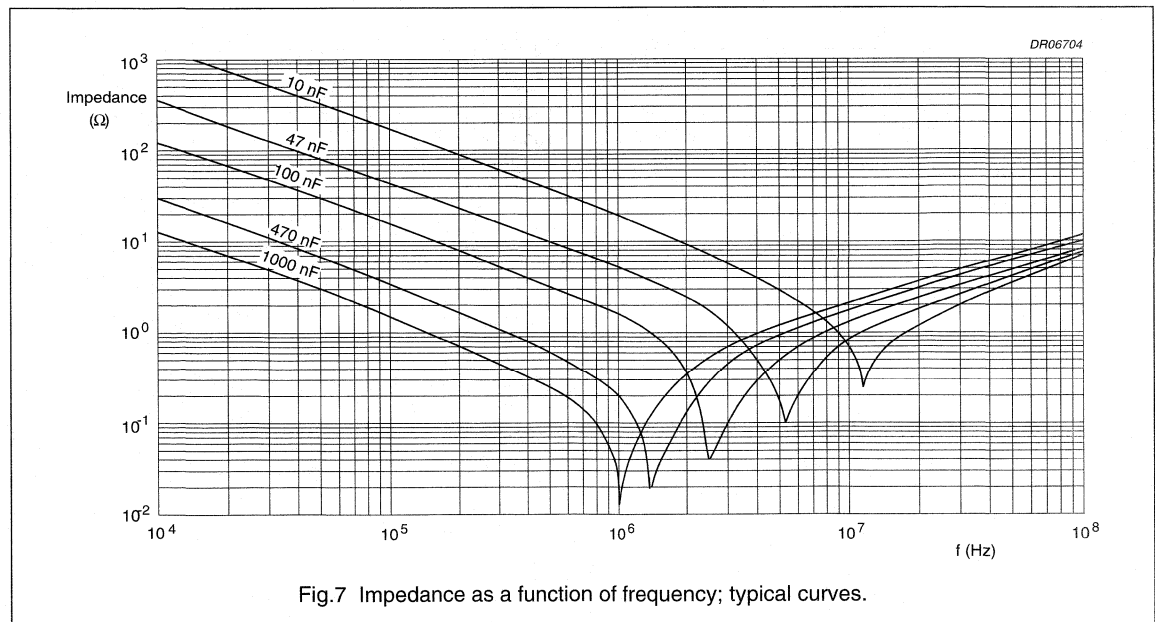
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

## Interference suppression film capacitors

MKT-P 330 4

**Capacitance**

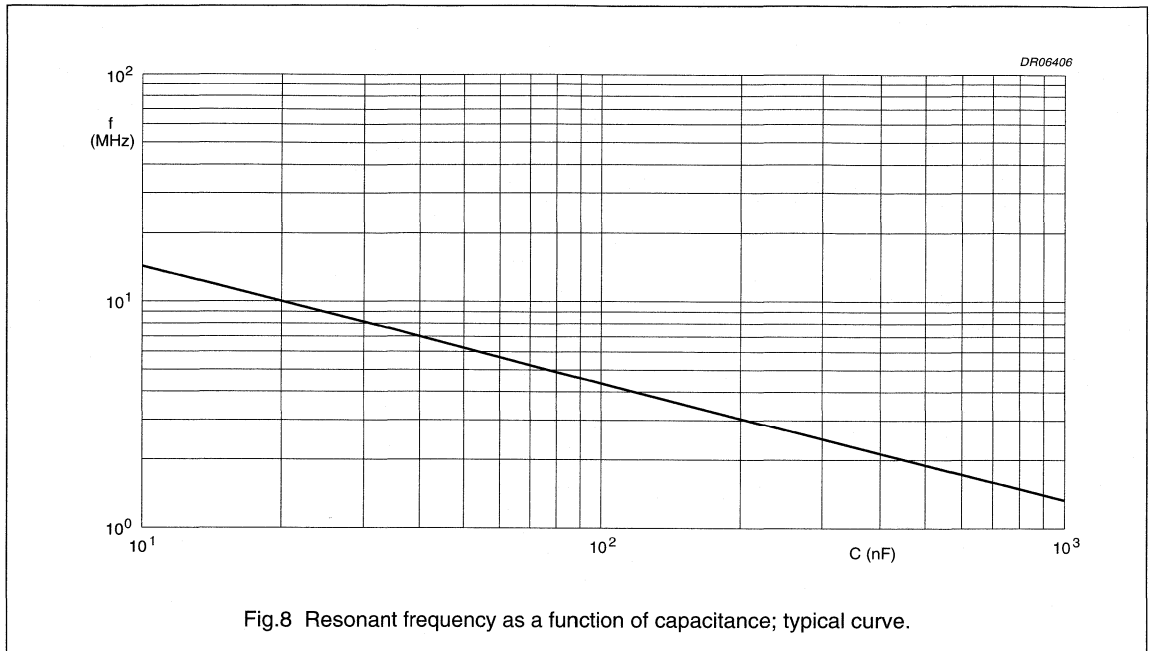
All capacitance values are specified at 1 kHz.

**Impedance**

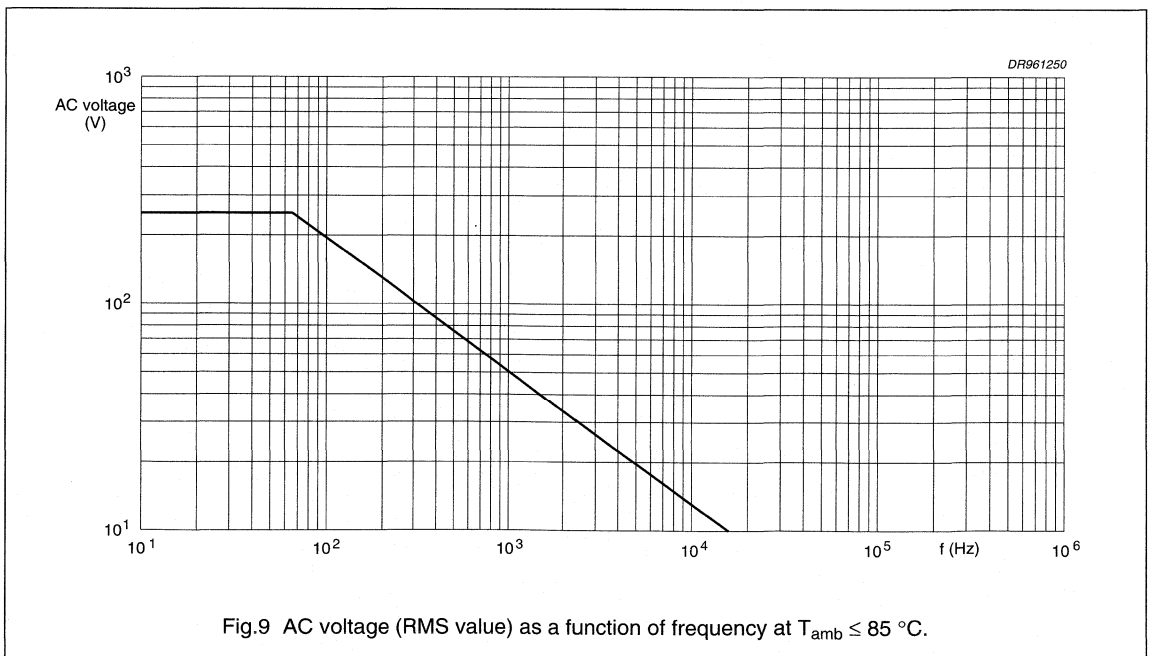
# Interference suppression film capacitors

MKT-P 330 4

## Resonant frequency



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

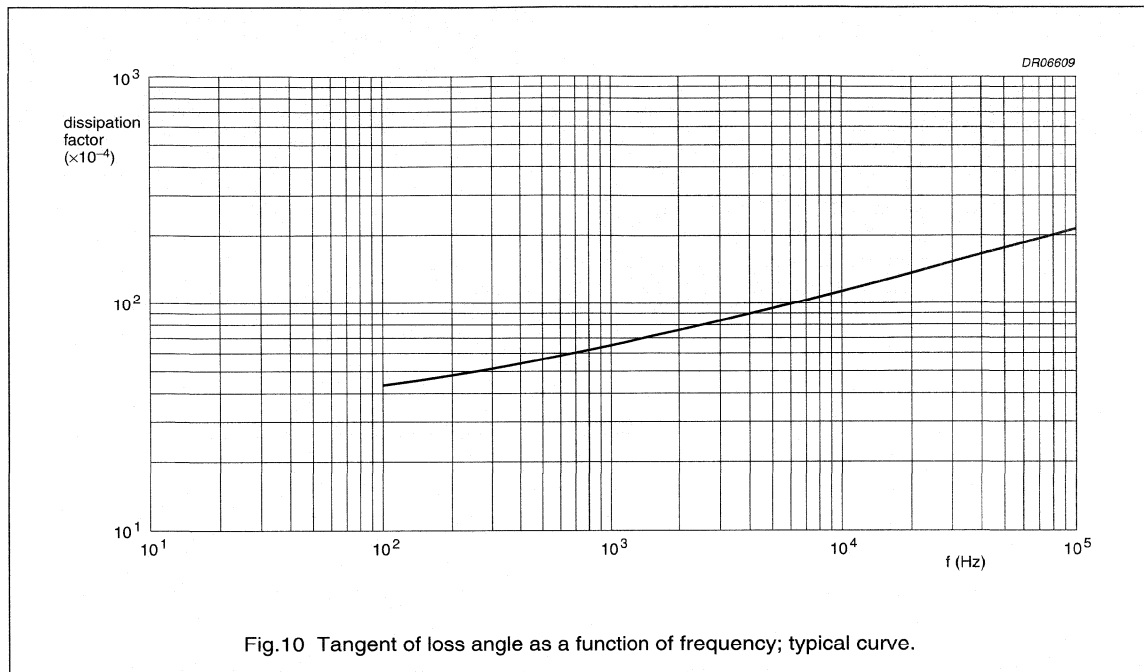


Interference suppression film capacitors

MKT-P 330 4

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.

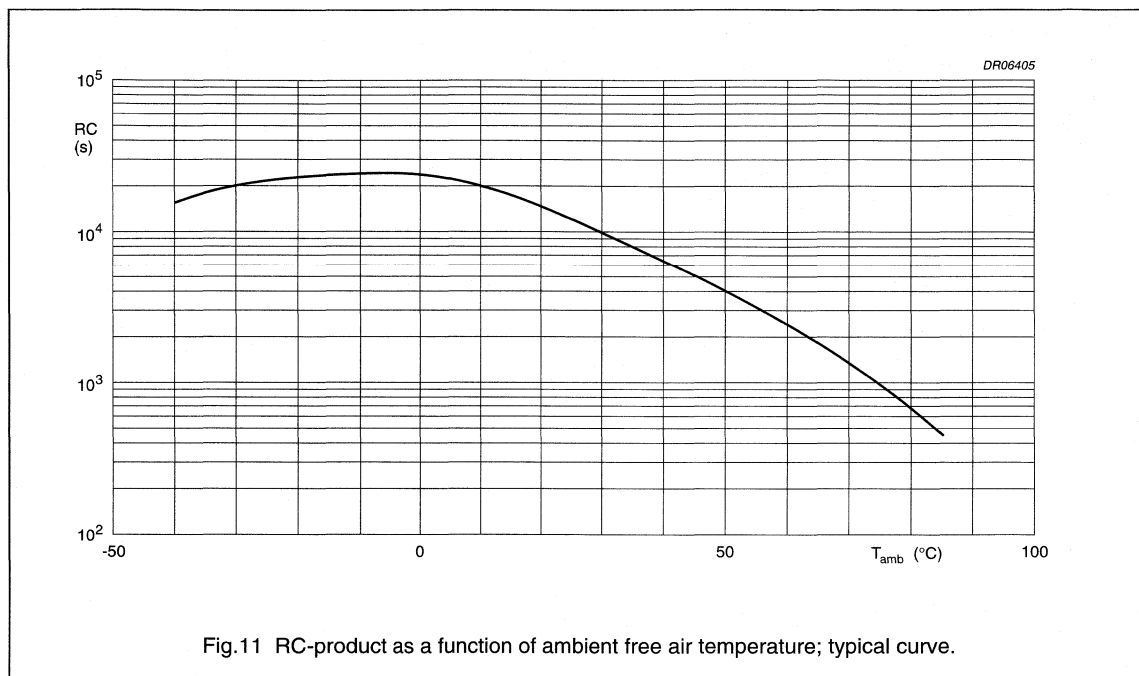
## Interference suppression film capacitors

MKT-P 330 4

**Insulation resistance**

The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm 5$  seconds at  $T_{\text{amb}} = 20$  °C:

- R between leads: for value see specific reference data
- R between interconnected leads and case (foil method):  $>30000$  M $\Omega$ .





## Interference suppression film capacitors

## MKT-P 330 4

**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.

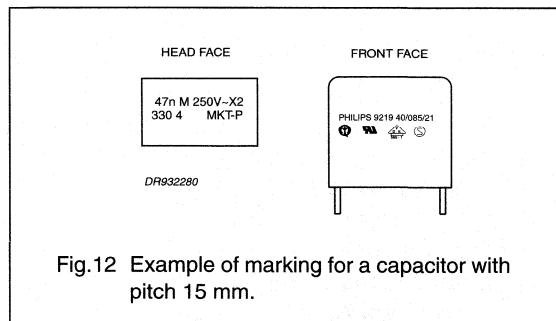


Fig.12 Example of marking for a capacitor with pitch 15 mm.

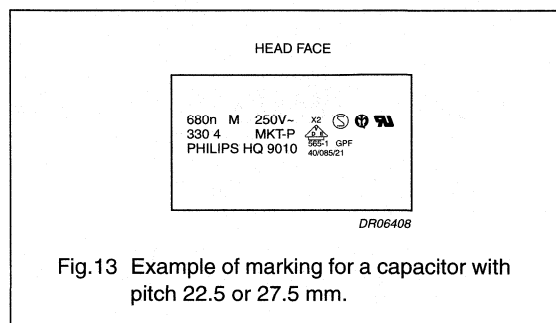







Fig.13 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.

Interference suppression film capacitors

MKT-P 330 4

Package marking

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

<ol style="list-style-type: none"> <li>1. PHILIPS COMPONENTS</li> <li>2. MADE IN BELGIUM</li> <li>3. INTERF. SUPPR. FILM CAPACITOR</li> <li>4. MKT-P RADIAL POTTED TYPE X2</li> <li>5. 0.47µF ±10% 250V~ 40/065/21</li> <li>6. </li> <li>7.  WO: 12345678 ORIG R170 RPC HQ 1234 </li> <li>8. TYPE MKT-P 330 4</li> <li>9.  QTY 125 DATE 9625 </li> <li>10. CODENO 2222 330 45474</li> </ol>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description and safety class X2</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>Safety approvals</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO</td> </tr> <tr> <td>8</td> <td>Product type description</td> </tr> <tr> <td>9</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>10</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description and safety class X2	5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")	6	Safety approvals	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO	8	Product type description	9	Quantity and production period, year and week code	10	Product code (12NC)
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9	Quantity and production period, year and week code																						
10	Product code (12NC)																						

COA342

Fig.14 Barcode label.

## Interference suppression film capacitors

MKT-P 330 4

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: "IEC 68-2-21"		no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"	solder bath: 260 °C; 10 s	$ \Delta C/C  \leq 2\%$
Component solvent resistance	isopropyl alcohol; 23 °C; 5 minutes	$\Delta \tan \delta \leq 30 \times 10^{-4}$
<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	

## Interference suppression film capacitors

MKT-P 330 4

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**

1. For detailed information, see "Type specification".

## Interference suppression film capacitors

MKT 2222 311 901..

MKT RADIAL EPOXY LACQUERED CAPACITORS

PITCH 15 mm

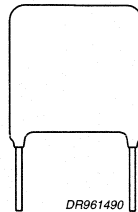


Fig.1 Simplified outlines.

**FEATURES**

- 15 mm pitch
- Supplied loose in box.

**APPLICATIONS**

- For radio interference suppression in consumer products, such as:
  - Coffee grinders
  - Food mixers.

All metallized film capacitors have an active flammability risk and should only be used in situations where they are not continuously connected to the main power supply.

**QUICK REFERENCE DATA**

DESCRIPTION	VALUE
Capacitance range (E6 series); note 1	0.033 to 0.1 $\mu$ F
Capacitance tolerance	$\pm$ 20%
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 approval	VDE 565-1
Safety class	X2

**Note**

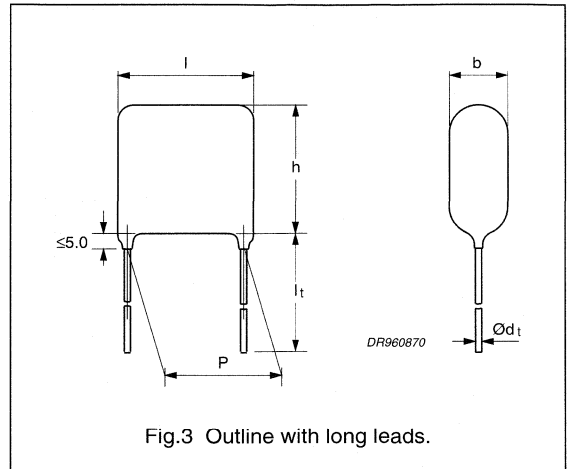
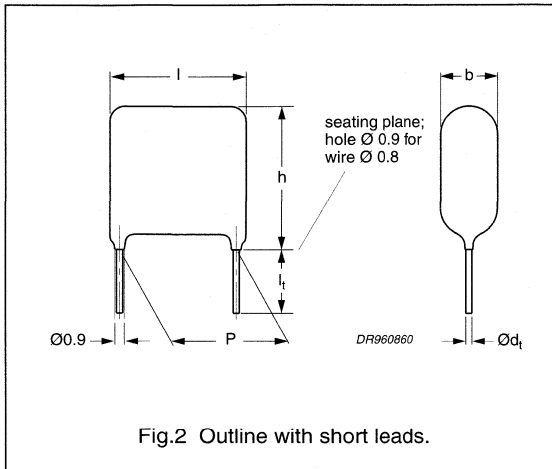
1. Intermediate values of the E12 series are available to special order.

Interference suppression film capacitors

MKT 2222 311 901..

MKT 2222 311 901.. GENERAL DATA

PITCH 15 mm



Specific reference data for the 250 V AC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.1 \mu\text{F}$	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	100 V/ $\mu\text{s}$		
R between leads, for $C \leq 0.33 \mu\text{F}$	$> 30000 \text{ M}\Omega$		
R between interconnected leads and case	$> 30000 \text{ M}\Omega$		
Test (DC) voltage	1075 V; 1 s		

Available 250 V AC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.75 \pm 0.75 \text{ mm}$	$\pm 20\%$	2222 311 901..	on request
	$l_t = 34.0 \pm 2.0 \text{ mm}$	$\pm 20\%$	2222 311 901..	on request
	$l_t = 40.0 \pm 2.0 \text{ mm}$	$\pm 20\%$	2222 311 901..	on request

## Interference suppression film capacitors

MKT 2222 311 901..

## Safety approvals

SAFETY APPROVALS	FILE NUMBER
VDE 565-1	68317



Fig.4 Safety approvals.

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

loose

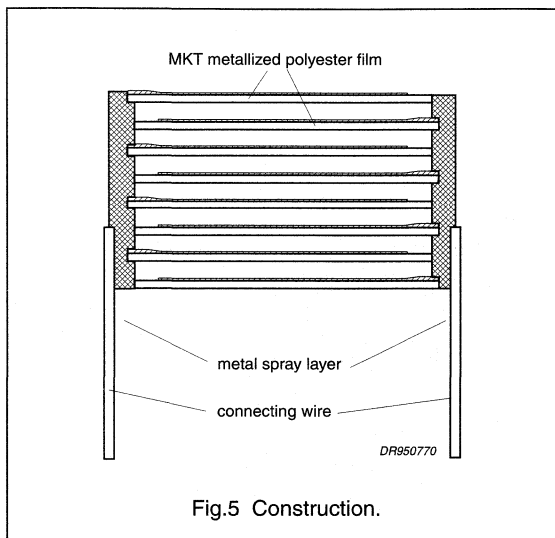
C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 311 901.. AND PACKAGING			
			$l_t$	last 5 digits of catalogue number	SPQ	PQ
				C-tol = $\pm 20\%$		
<b>Pitch = <math>15.24 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math> (see Fig.2)</b>						
0.033	$5.5 \times 12.0 \times 17.5$	0.9	$3.75 \pm 0.75 \text{ mm}$	90112	1000	4000
0.047	$6.5 \times 12.5 \times 17.5$	1.1		90105		
0.068	$7.5 \times 13.5 \times 17.5$	1.3		90109		
0.1	$8.5 \times 17.5 \times 17.5$	1.5		90111		
<b>Pitch = <math>15.24 \pm 2.0 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math> (see Fig.3)</b>						
0.033	$5.5 \times 10.0 \times 17.5$	0.9	$34.0 \pm 2.0 \text{ mm}$	90101	1000	4000
0.033	$5.5 \times 10.0 \times 17.5$	0.9	$40.0 \pm 2.0 \text{ mm}$	90104		
0.047	$6.5 \times 11.0 \times 17.5$	1.1	$34.0 \pm 2.0 \text{ mm}$	90102		
0.047	$6.5 \times 11.0 \times 17.5$	1.1	$40.0 \pm 2.0 \text{ mm}$	90106		
0.068	$7.5 \times 12.0 \times 17.5$	1.3	$34.0 \pm 2.0 \text{ mm}$	90103		
0.1	$8.5 \times 16.0 \times 17.5$	1.5	$34.0 \pm 2.0 \text{ mm}$	90107		
0.1	$8.5 \times 16.0 \times 17.5$	1.5	$40.0 \pm 2.0 \text{ mm}$	90109		

## Interference suppression film capacitors

MKT 2222 311 901..

**CONSTRUCTION****Description**

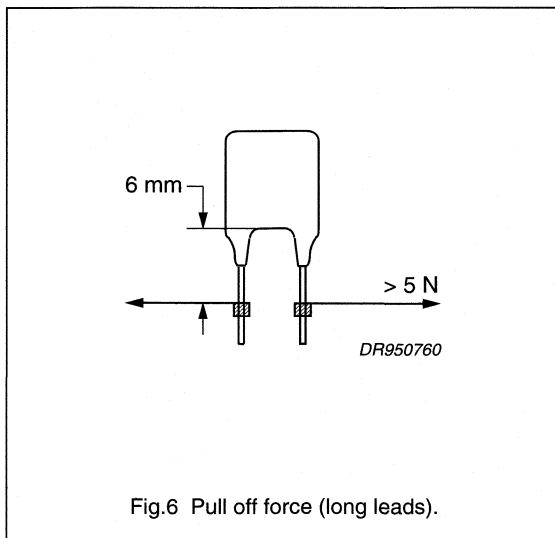
- Impregnated low-inductance wound cell of metallized polyethylene terephthalate (PETP) film
- Protected by a hard, water repellent, solvent resistant epoxy lacquer
- Radial copper leads, solder-coated.

**Mounting**

SPECIFIC METHOD OF MOUNTING TO WITHSTAND VIBRATION AND SHOCK

In order to withstand vibration and shock tests, it must be ensured that the capacitor is in good contact with the printed-circuit board.

PULL OFF FORCE (LONG LEADS)

**RATINGS AND CHARACTERISTICS**

Unless otherwise specified, all electrical values apply to an ambient free air temperature of  $23 \pm 1$  °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%.

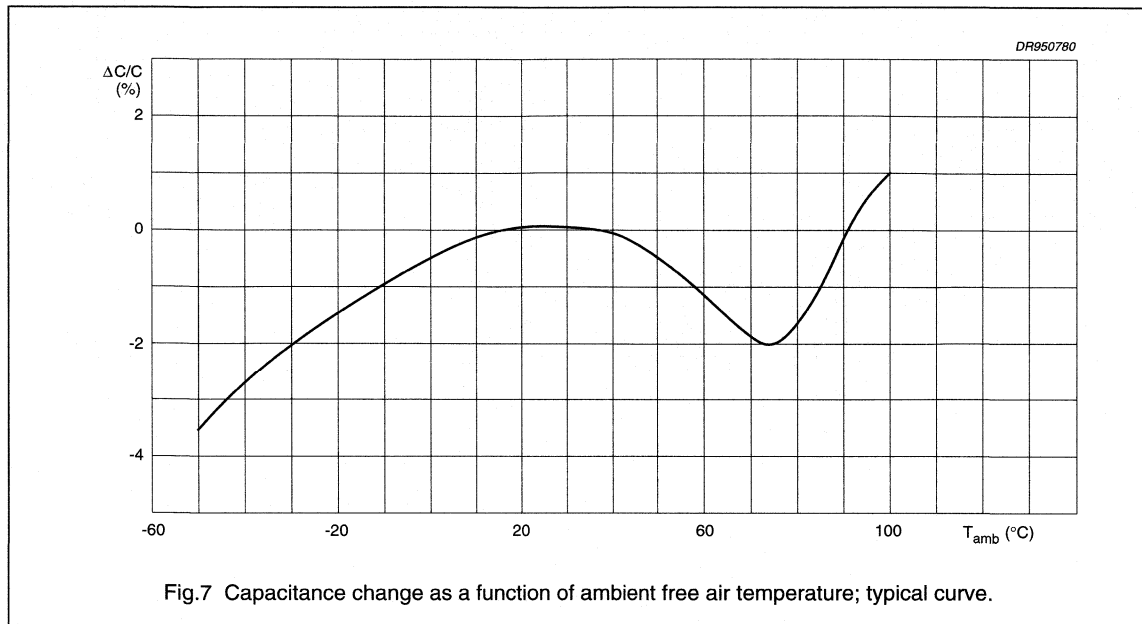


# Interference suppression film capacitors

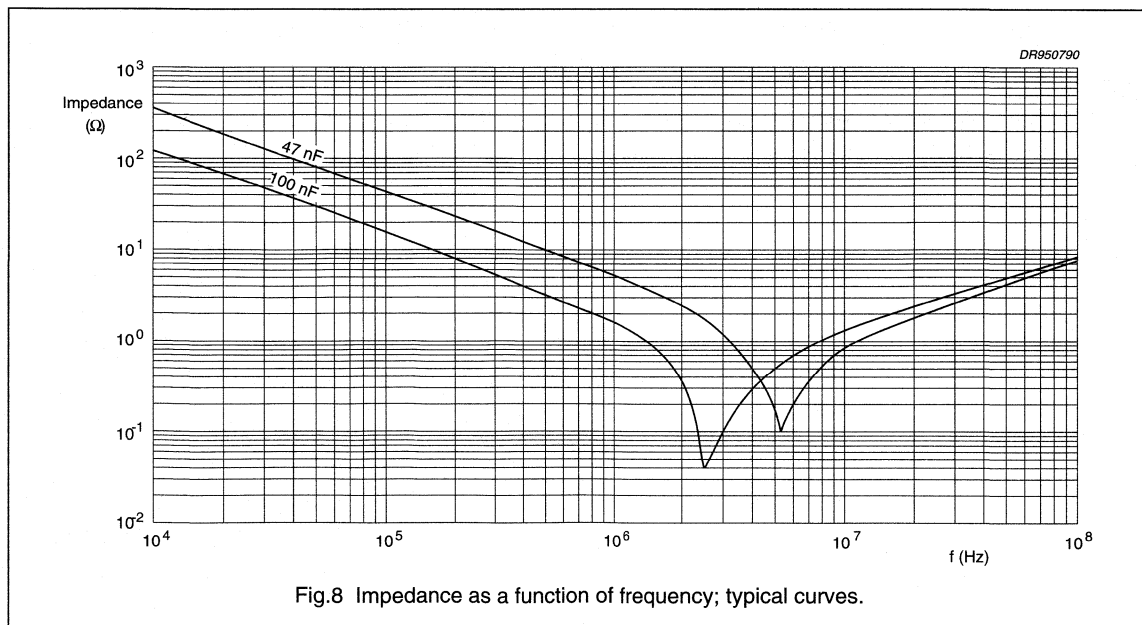
MKT 2222 311 901..

## Capacitance

All capacitance values are specified at 1 kHz.

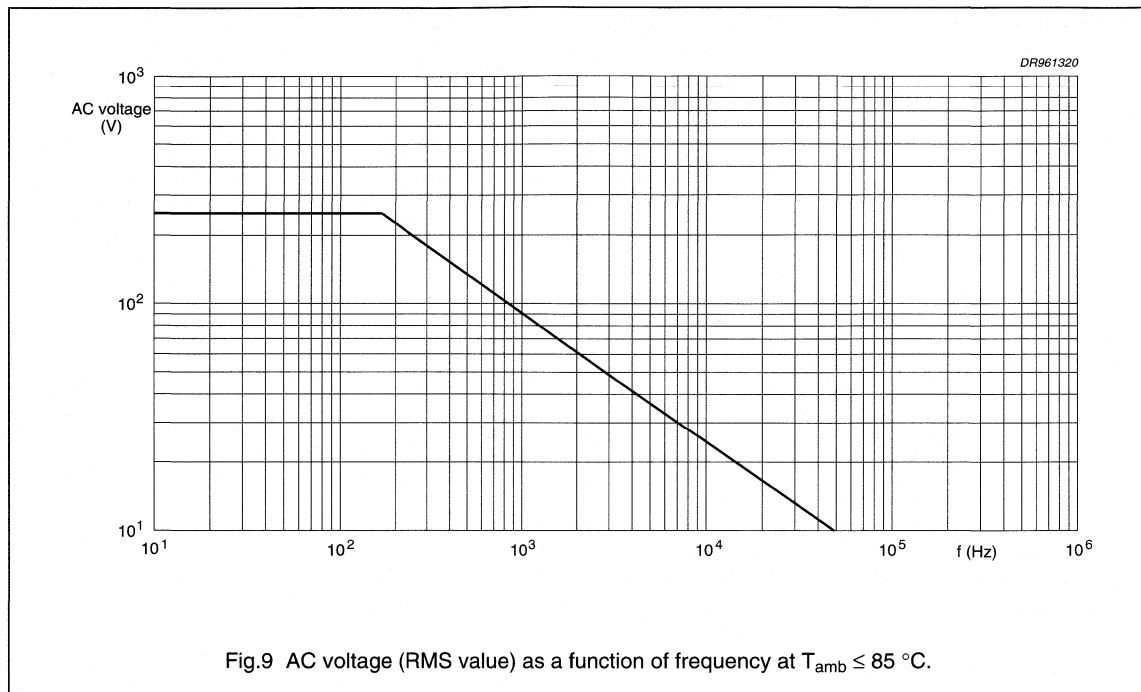


## Impedance



## Interference suppression film capacitors

MKT 2222 311 901..

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

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

**Voltage**

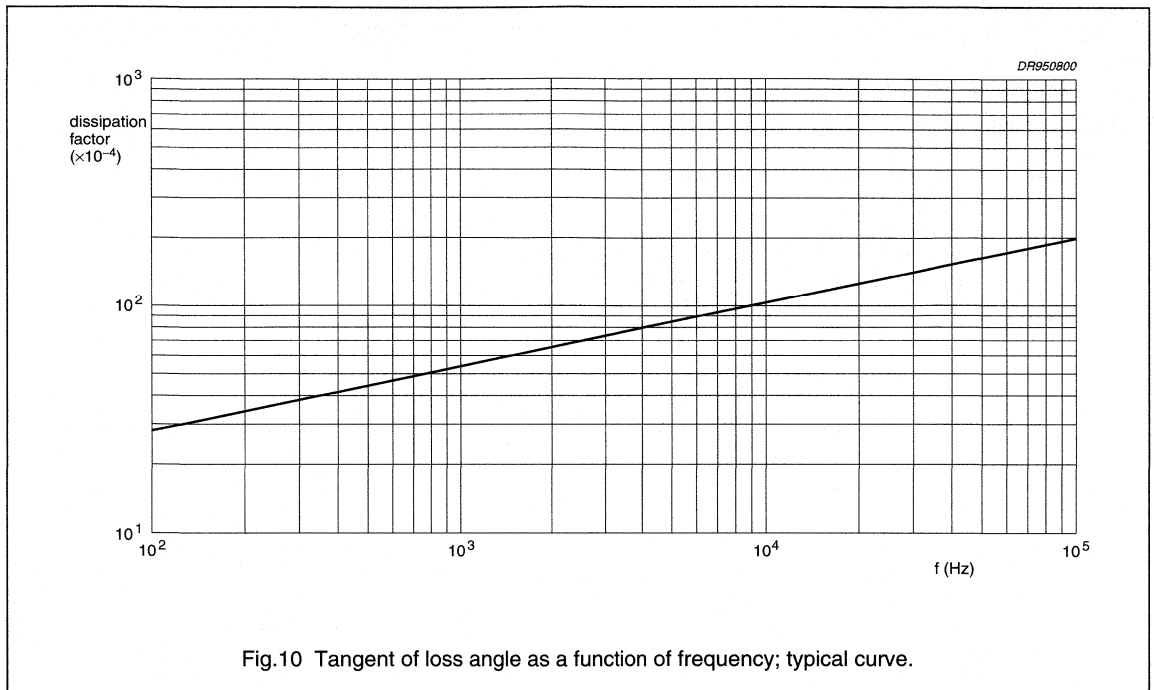
- Test voltage (DC) between leads, 100 % on line for 1 second: 1075 V
- Test voltage (AC) between interconnected leads and case (foil method): 2000 V.

## Interference suppression film capacitors

MKT 2222 311 901..

## Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE		
	at 1 kHz	at 10 kHz	at 100 kHz
0.033 to 0.1 $\mu$ F	$\leq 75 \times 10^{-4}$	$\leq 130 \times 10^{-4}$	$\leq 250 \times 10^{-4}$



Interference suppression film capacitors

MKT 2222 311 901..

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

Maximum pulse load: 100 V/μs.

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.

**Insulation resistance**

The insulation resistance is measured after a voltage of 100 ±15 V has been applied for 1 minute ±5 seconds, at T<sub>amb</sub> = 20 °C:

- R between leads, for C ≤ 0.33 μF: >30000 MΩ
- R between interconnected leads and case (foil method): >30000 MΩ.

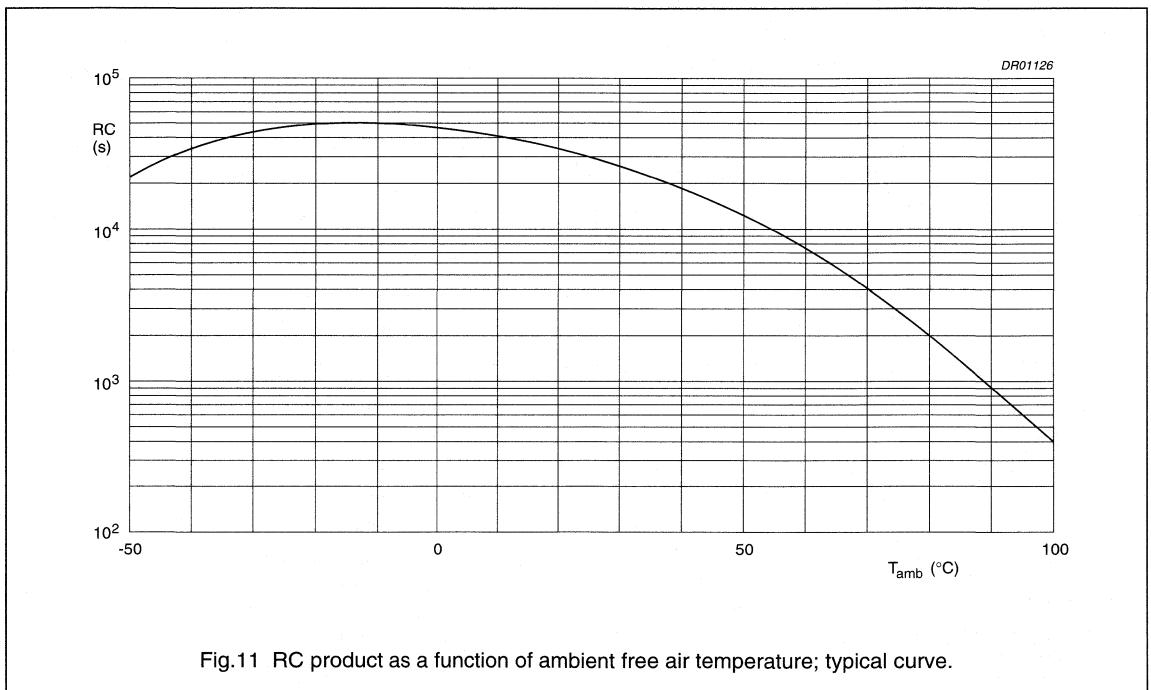


Fig.11 RC product as a function of ambient free air temperature; typical curve.

## Interference suppression film capacitors

MKT 2222 311 901..

**MARKING****Product marking**

CAPACITORS WITH A BODY LENGTH 15.0 mm

The capacitors are marked on the top in black ink with the following information:

1. Manufacturer's name (PHILIPS)
2. Capacitance in nF
3. Rated voltage (250~)
4. Code for dielectric material (MKT)
5. Manufacturer's type designation (311)
6. Capacitor class and subclass (X2)
7. Approval mark of National Station.

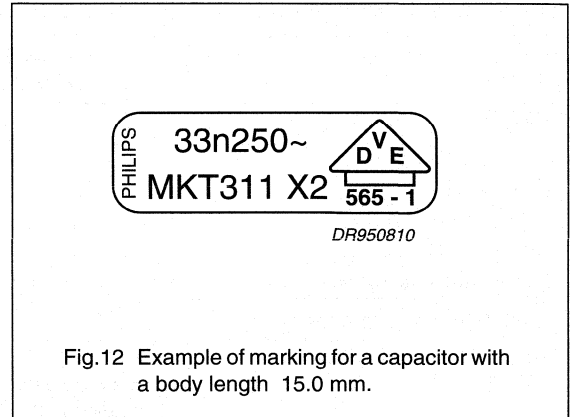


Fig.12 Example of marking for a capacitor with a body length 15.0 mm.

**Package marking**

The package containing the capacitors is marked as shown in Fig.13.

LINE	MARKING EXPLANATION
1.	Manufacturer's name
2.	Country of origin
3.	Sub-family
4.	Type description
5.	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")
6.	Safety approvals X2
7.	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO
8.	Product type description
9.	Quantity and production period, year and week code
10.	Product code (12NC)

Fig.13 Barcode label.

## Interference suppression film capacitors

MKT 2222 311 901..

**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  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 2\%$
Component solvent resistance		$\Delta \tan \delta \leq 50 \times 10^{-4}$
<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\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$
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	
Voltage proof: "IEC 384-14 1 <sup>st</sup> edition 1981"	$V_p = 1075$ V (DC); 1 minute	
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 85 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 70 \times 10^{-4}$
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"	$V_p = 1075$ V (DC); 1 minute	

## Interference suppression film capacitors

MKT 2222 311 901..

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 $V_p = 1075$ V (DC); 1 minute	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 70 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-14 1 <sup>st</sup> edition 1981"	1 000 hours; $1.25 \times U_{Rac}$ at 85 °C; once per hour; 0.1 s; 1 000 V (RMS) via resistor of 220 $\Omega$ $V_p = 710$ V (DC); 1 minute.	$ \Delta C/C  \leq 10\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Charge and discharge: "IEC 384-14 1 <sup>st</sup> edition 1981"	10 000 cycles; 5 ms; $5 \times dV/dt$	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$
Heat storage: "IEC 384-14 1 <sup>st</sup> edition 1981"	1 000 hours; 85 °C	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 30 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
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\%$ $\Delta \tan \delta \leq 50 \times 10^{-4}$

**Note**

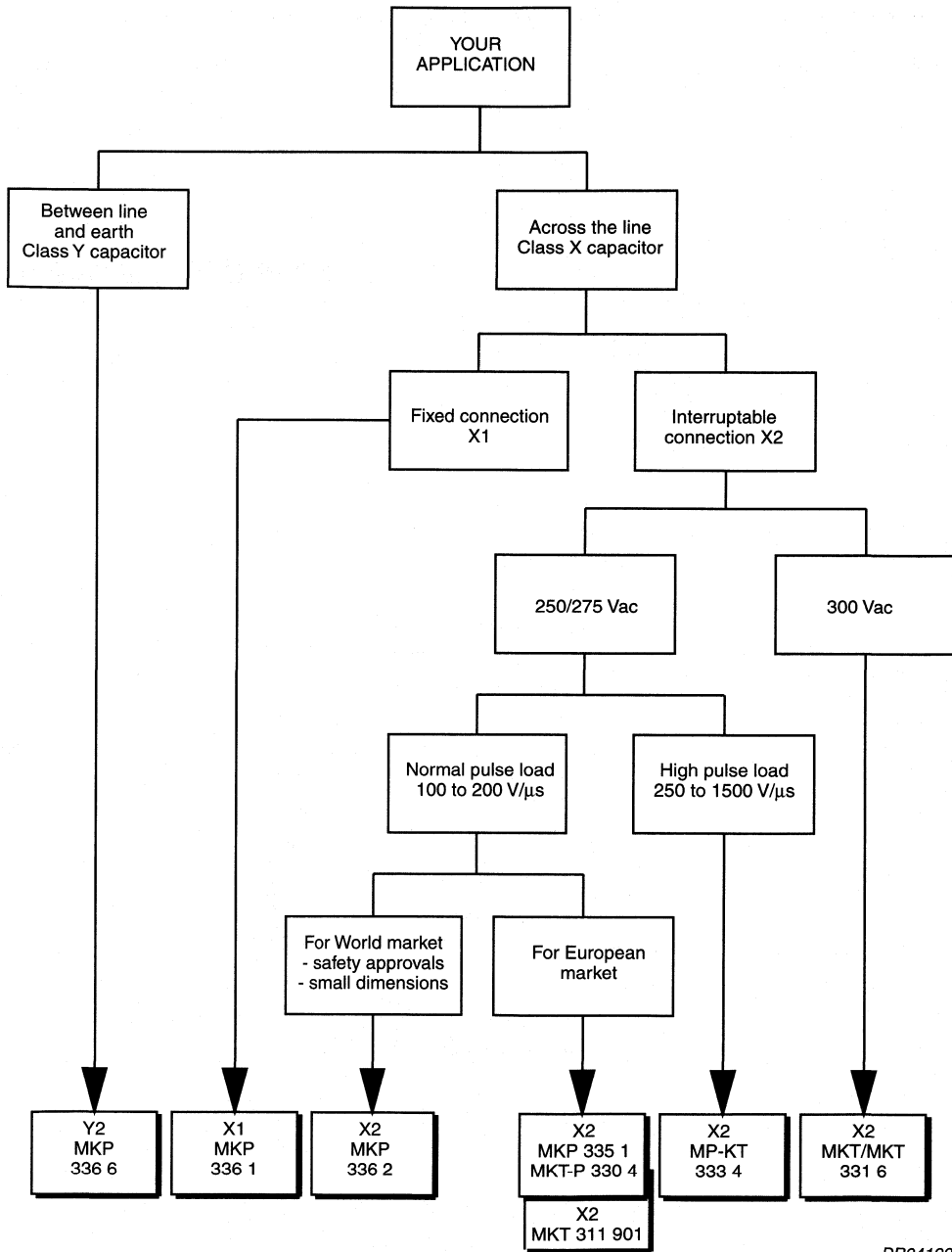
1. For detailed information, see "Type specification".





## **AC AND PULSE CAPACITORS**

# HOW TO SELECT



# AC and pulse polypropylene film foil capacitors

## KP 374

### KP RADIAL EPOXY LACQUERED TYPES

PITCH 5/7.5/10/15/22.5/27.5 mm

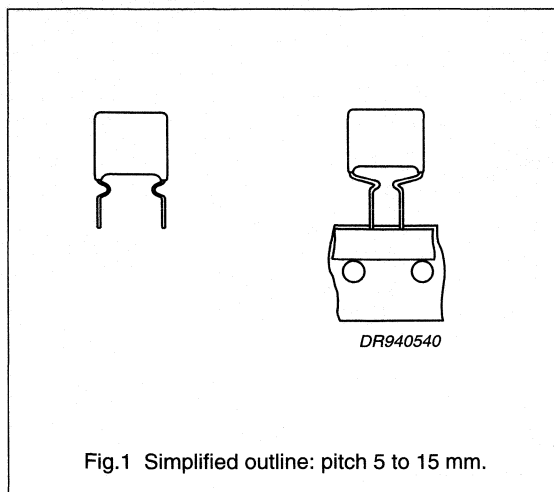


Fig.1 Simplified outline: pitch 5 to 15 mm.

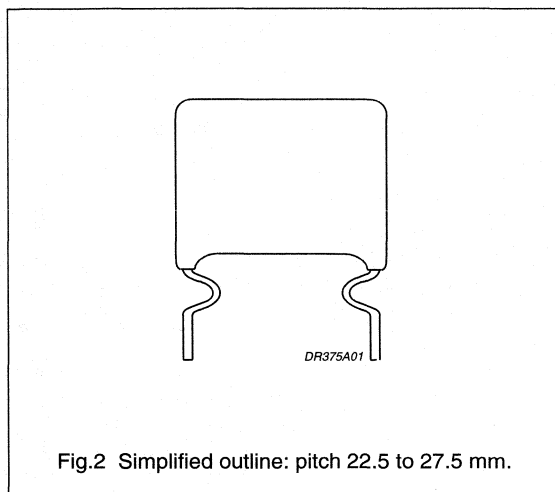


Fig.2 Simplified outline: pitch 22.5 to 27.5 mm.

### FEATURES

- 5 to 27.5 mm terminal pitch
- Supplied loose in box: for styles: 2222 374 3/4....  
Supplied loose in box, taped on reel and ammpack: for style: 2222 374 6....

### APPLICATIONS

- Consumer and industrial
- Where high currents and/or steep pulses occur.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE	
	KP 374 3/4....	KP 374 6....
Capacitance range (E24 series)	100 to 820 nF	750 to 12000 pF
Capacitance tolerance	±5%	±10%; ±5%
Rated voltage $U_{Rdc}$	200 V; 250 V <sup>(1)</sup>	630 V
Climatic category	40/085/56	55/100/56
Rated temperature	85 °C	85 °C
Maximum application temperature	85 °C	100 °C
Reference specification	IEC 384-13	IEC 384-13

### Note

1. Derating is required according to capacitance value, see Tables for "200 V series" and "250 V series".

# AC and pulse polypropylene film foil capacitors

KP 374

**KP 374 GENERAL DATA**

**PITCH 22.5/27.5 mm**

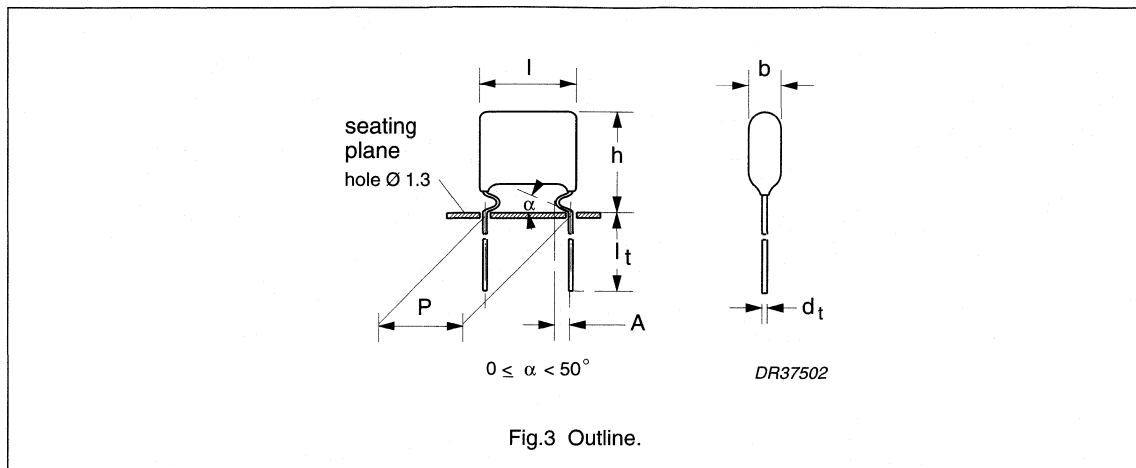


Fig.3 Outline.

**Specific reference data for the 200 V series**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: P = 22.5 mm P = 27.5 mm	$\leq 4 \times 10^{-4}$ $\leq 5 \times 10^{-4}$	$\leq 20 \times 10^{-4}$ $\leq 25 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	

**Available 200 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 374 31...	preferred

# AC and pulse polypropylene film foil capacitors

KP 374

200 V series

loose

C ( $\mu\text{F}$ )	$U_{\text{Rdc}}$	$U_{\text{Rpp}}$	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 374 ..... AND PACKAGING	
					LOOSE IN BOX; $l_t = 5.0 \pm 0.5$ mm	
					last 5 digits of catalogue number <sup>(1)</sup>	SPQ
					C-tol = $\pm 5\%$	
<b>Pitch = <math>22.5 \pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm; A = <math>2.5 +1.4/-0.5</math> mm</b>						
0.1	200	200	$6.0 \times 19.0 \times 26.0$	2.0	31104	800
0.11					31114	
0.12	195	195	$6.5 \times 19.5 \times 26.0$	2.3	31124	750
0.13					31134	
0.15	190	190	$7.0 \times 20.0 \times 26.0$	2.7	31154	650
0.16					31164	
0.18	185	185	$7.5 \times 20.5 \times 26.0$	3.0	31184	600
0.2	185	185	$8.0 \times 21.0 \times 26.0$	3.5	31204	550
0.22	180	180	$9.0 \times 22.0 \times 26.0$	4.0	31224	450
0.24					31244	
0.27	175	175	$9.5 \times 22.5 \times 26.0$	4.4	31274	400
0.3	175	175	$10.0 \times 23.0 \times 26.0$	4.8	31304	400
0.33	170	170	$10.5 \times 23.5 \times 26.0$	5.2	31334	350
<b>Pitch = <math>27.5 \pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm; A = <math>2.5 +1.4/-0.5</math> mm</b>						
0.36	170	170	$10.0 \times 23.0 \times 30.0$	6.1	31364	500
0.39	165	165			31394	
0.43	165	165	$10.5 \times 23.5 \times 30.0$	6.7	31434	450
0.47	160	160	$11.0 \times 24.0 \times 30.0$	7.3	31474	400
0.51	160	160	$11.5 \times 24.5 \times 30.0$	7.9	31514	400
0.56	155	155	$12.5 \times 25.5 \times 30.0$	8.6	31564	350
0.62	155	155	$13.0 \times 26.0 \times 30.0$	9.5	31624	300
0.68	150	150	$14.0 \times 27.0 \times 30.0$	10.5	31684	300
0.75	150	150	$14.5 \times 27.5 \times 30.0$	11.5	31754	250
0.82	145	145	$15.0 \times 28.0 \times 30.0$	12.5	31824	250

**Note**

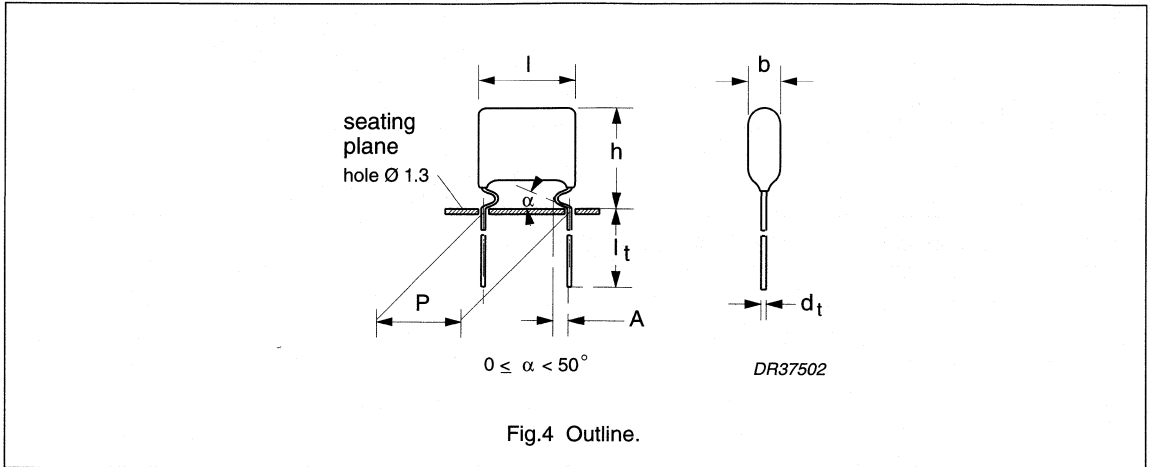
1. The shading indicates preferred types.

AC and pulse  
polypropylene film foil capacitors

KP 374

KP 374 GENERAL DATA

PITCH 22.5/27.5 mm



Specific reference data for the 250 V series

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: P = 22.5 mm P = 27.5 mm	$\leq 4 \times 10^{-4}$ $\leq 5 \times 10^{-4}$	$\leq 20 \times 10^{-4}$ $\leq 25 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	

Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 374 41...	preferred

# AC and pulse polypropylene film foil capacitors

## KP 374

### 250 V series

### loose

C ( $\mu\text{F}$ )	$U_{\text{Rdc}}$	$U_{\text{Rpp}}$	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 374 ..... AND PACKAGING	
					LOOSE IN BOX; $l_t = 5.0 \pm 0.5$ mm	
					last 5 digits of catalogue number <sup>(1)</sup>	SPQ
					C-tol = $\pm 5\%$	
<b>Pitch = <math>22.5 \pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm; A = <math>2.5 +1.4/-0.5</math> mm</b>						
0.1	250	250	6.5 × 19.5 × 26.0	3.4	41104	750
0.11					41114	
0.12	245	245	7.0 × 20.0 × 26.0	3.7	41124	650
0.13					41134	
0.15	240	240	7.5 × 20.5 × 26.0	4.0	41154	600
0.16	240	240	8.0 × 21.0 × 26.0	4.1	41164	550
0.18	235	235	8.5 × 21.5 × 26.0	4.4	41184	500
0.2	235	235	9.0 × 22.0 × 26.0	4.7	41204	450
0.22	230	230	9.5 × 22.5 × 26.0	5.3	41224	400
0.24					41244	
<b>Pitch = <math>27.5 \pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm; A = <math>2.5 +1.4/-0.5</math> mm</b>						
0.27	225	225	9.5 × 22.5 × 30.0	5.7	41274	500
0.3	225	225	10.0 × 23.0 × 30.0	6.1	41304	500
0.33	220	220	10.5 × 23.5 × 30.0	6.6	41334	450
0.36	220	220	11.0 × 24.0 × 30.0	7.0	41364	400
0.39	215	215	11.5 × 24.5 × 30.0	7.4	41394	400
0.43	215	215	12.0 × 25.0 × 30.0	8.0	41434	350
0.47	210	210	12.5 × 25.5 × 30.0	8.5	41474	350
0.51	210	210	13.0 × 26.0 × 30.0	9.1	41514	300
0.56	205	205	14.0 × 27.0 × 30.0	10.0	41564	300
0.62	205	205	14.5 × 27.5 × 30.0	10.7	41624	250
0.68	200	200	15.0 × 28.0 × 30.0	11.6	41684	250

### Note

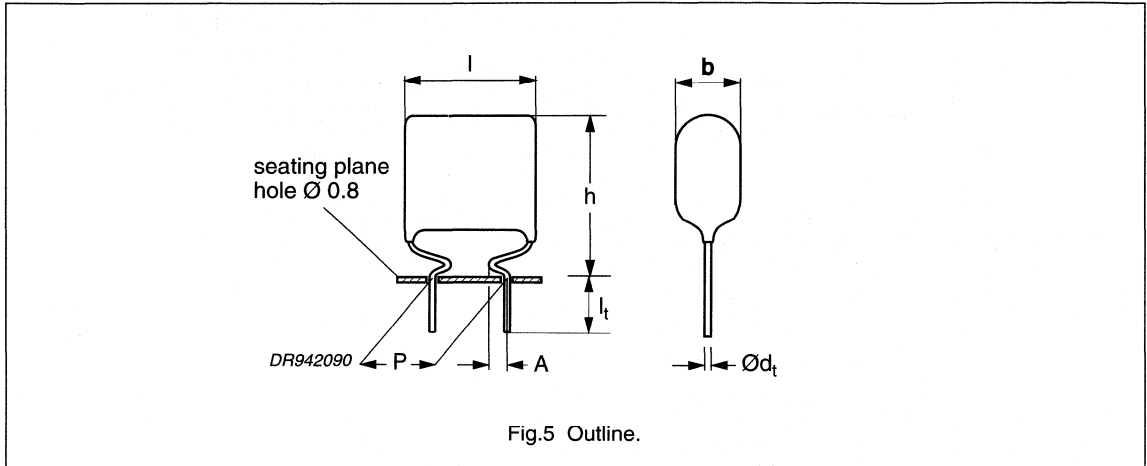
- The shading indicates preferred types.

AC and pulse  
polypropylene film foil capacitors

KP 374

KP 374 GENERAL DATA

PITCH 5 mm



Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle: 750 pF < C ≤ 12000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	> 10000 V/μs	
R between leads	> 100000 MΩ	

Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 16.0 mm; note 1	±10%	2222 374 62...	preferred
		±5%	2222 374 63...	on request
Taped on reel	H = 16.0 mm; note 1	±10%	2222 374 66...	on request
		±5%	2222 374 67...	on request

Note

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



# AC and pulse polypropylene film foil capacitors

KP 374

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}/U_{pp} = 560 \text{ V}$ 

taped

C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 374 ..... AND PACKAGING		
			AMMOPACK; H = 16 mm		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>5.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = <math>1.7 \pm 0.3 \text{ mm}</math></b>					
750	$4.5 \times 14.0 \times 11.5$	0.45	62751	1250	–
820	$5.0 \times 14.5 \times 11.5$	0.50	62821	1000	1250
1000		0.55	62102		
1200	$5.5 \times 15.0 \times 11.5$	0.60	62122	1000	1000
1500; note 2	$4.5 \times 14.0 \times 14.0$	0.45	62152	600	1300
1800; note 2	$5.0 \times 14.5 \times 14.0$	0.55	62182	550	1200
2200; note 2	$5.5 \times 15.0 \times 14.0$	0.60	62222	500	1100
2700; note 2		0.70	62272		
3300; note 2	$6.0 \times 15.5 \times 14.0$	0.80	62332	450	1000
3900; note 2	$6.5 \times 16.0 \times 14.0$	0.90	62392	400	900

**Notes**

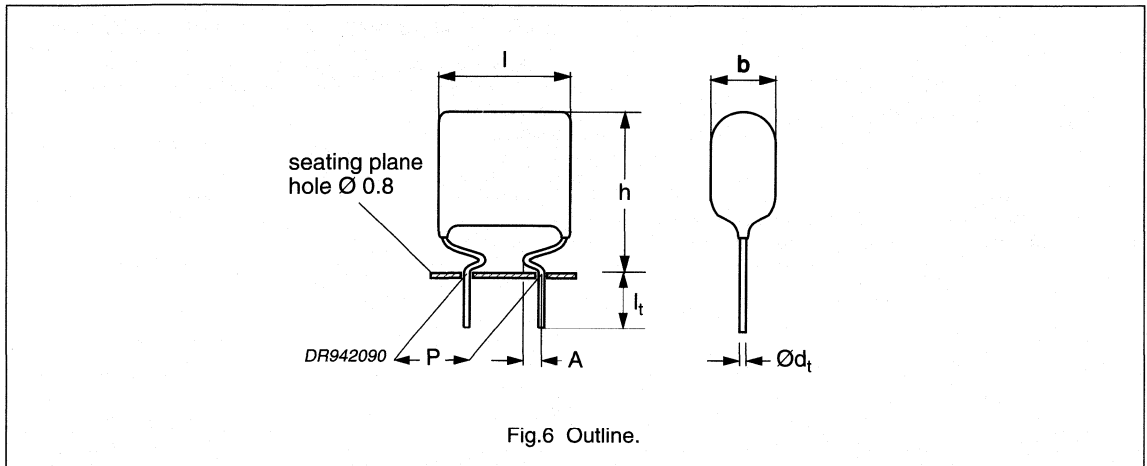
1. The shading indicates preferred types.
2. Not yet available in ammopack.

# AC and pulse polypropylene film foil capacitors

## KP 374

### KP 374 GENERAL DATA

### PITCH 7.5/10/15 mm



### Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle: 750 pF < C ≤ 12000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	> 10000 V/μs	
R between leads	> 100000 MΩ	

### Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ± 0.4 mm	±10%	2222 374 60...	preferred
		±5%	2222 374 61...	on request

# AC and pulse polypropylene film foil capacitors

## KP 374

 $U_{Rdc} = 630 \text{ V}; U_{Rac} = 200 \text{ V}/U_{pp} = 560 \text{ V}$ 

taped

C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 374 ..... AND PACKAGING	
			LOOSE IN BOX; $l_t = 3.5 \pm 0.4 \text{ mm}$	
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ
			C-tol = $\pm 10\%$	
<b>Pitch = <math>7.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>				
750	$4.5 \times 12.5 \times 11.5$	0.45	60751	2000
820	$5.0 \times 13.0 \times 11.5$	0.50	60821	2000
1000		0.55	60102	
1200	$5.5 \times 13.5 \times 11.5$	0.60	60122	1500
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>				
1500	$4.5 \times 12.5 \times 14.0$	0.45	60152	2000
1800	$5.0 \times 13.0 \times 14.0$	0.55	60182	2000
2200	$5.5 \times 13.5 \times 14.0$	0.60	60222	2000
2700		0.70	60272	
3300	$6.0 \times 14.0 \times 14.0$	0.80	60332	1750
3900	$6.5 \times 14.5 \times 14.0$	0.90	60392	1500
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 1.7 \pm 0.3 \text{ mm}</math></b>				
4700	$5.5 \times 14.0 \times 19.5$	0.95	60472	2000
5600	$6.0 \times 14.5 \times 19.5$	1.05	60562	2000
6800	$6.5 \times 15.0 \times 19.5$	1.20	60682	1500
8200	$7.0 \times 15.5 \times 19.5$	1.35	60822	1500
10000	$7.5 \times 16.0 \times 19.5$	1.60	60103	1250
12000	$8.0 \times 16.5 \times 19.5$	1.85	60123	1250

**Note**

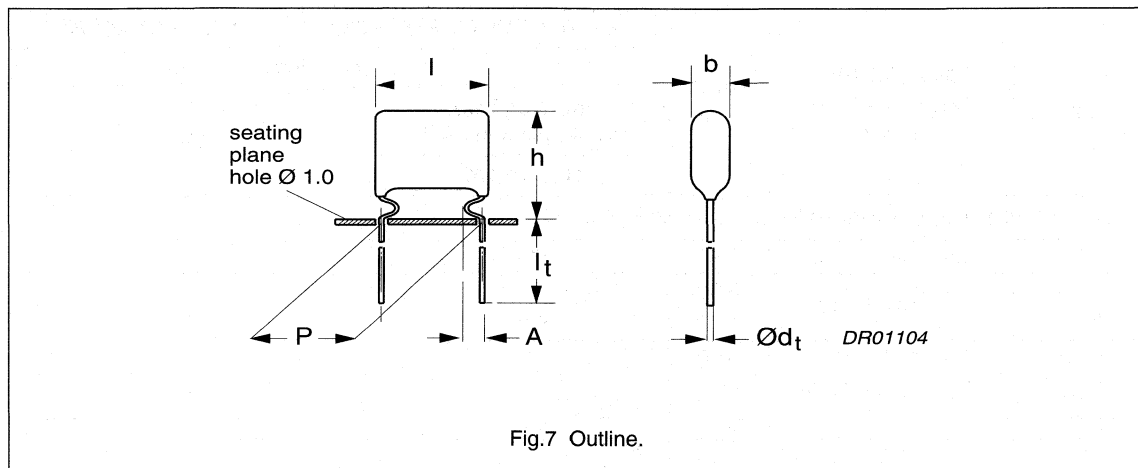
1. The shading indicates preferred types.

# AC and pulse polypropylene film foil capacitors

## KP 374

### KP 374 GENERAL DATA

### PITCH 7.5 mm



### Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle: 750 pF < C ≤ 2200 pF	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	> 10000 V/μs	
R between leads	> 100000 MΩ	

### Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel	H = 16.0 mm; note 1	±10%	2222 374 64...	preferred
		±5%	2222 374 65...	on request

### Note

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

# AC and pulse polypropylene film foil capacitors

## KP 374

 $U_{Rdc} = 630 \text{ V}; U_{Rac} = 200 \text{ V}/U_{pp} = 560 \text{ V}$ 

taped

C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 374 ..... AND PACKAGING	
			REEL; H = 16 mm	
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ
			C-tol = $\pm 10\%$	
<b>Pitch = <math>7.5 \pm 0.4</math> mm; <math>d_t = 0.60 \pm 0.06</math> mm; A = <math>2.0 \pm 0.5</math> mm</b>				
750	$4.5 \times 14.0 \times 11.5$	0.45	64751	1250
820	$5.0 \times 14.5 \times 11.5$	0.50	64821	1250
1000		0.55	64102	
1200	$5.5 \times 15.0 \times 11.5$	0.60	64122	1000
1500		0.45	64152	
1800		0.55	64182	
2200	$6.0 \times 15.5 \times 11.5$	0.60	64222	1000

**Note**

1. The shading indicates preferred types.

# AC and pulse polypropylene film foil capacitors

## KP 374

### CONSTRUCTION

#### Description

- Low-inductive wound cell of lead-tin (2222 374 6....) or aluminium (2222 374 3/4....) foil and a polypropylene film
- Protected by a hard, water repellent, solvent resistant epoxy lacquer
- Radial leads, solder-coated:
  - Copper clad steel wire (2222 374 6....)
  - Copper wire (2222 374 3/4....).

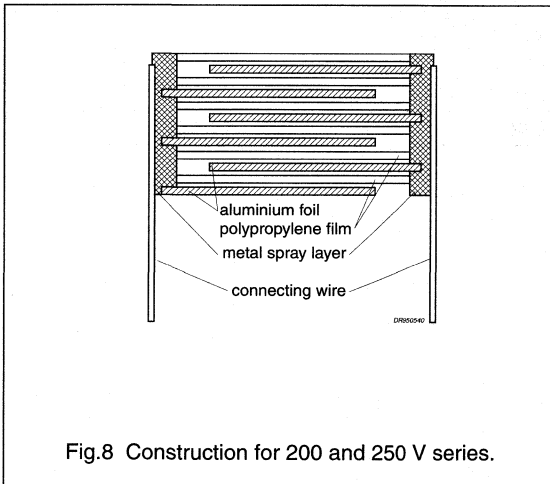


Fig.8 Construction for 200 and 250 V series.

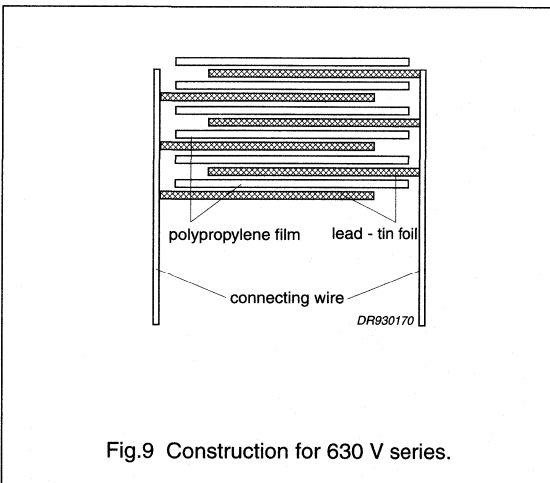


Fig.9 Construction for 630 V series.

### Mounting

#### NORMAL USE

The capacitors are designed for mounting on printed-circuit boards.

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

*Styles: 2222 374 3/4....*

In order to withstand vibration and shock tests, it must be ensured that the underside of the kinks are in good contact with the printed-circuit board.

The capacitors shall be mechanically fixed by the leads and the body clamped.

*Style: 2222 374 6....*

Not applicable due to small size.

### RATINGS AND CHARACTERISTICS

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

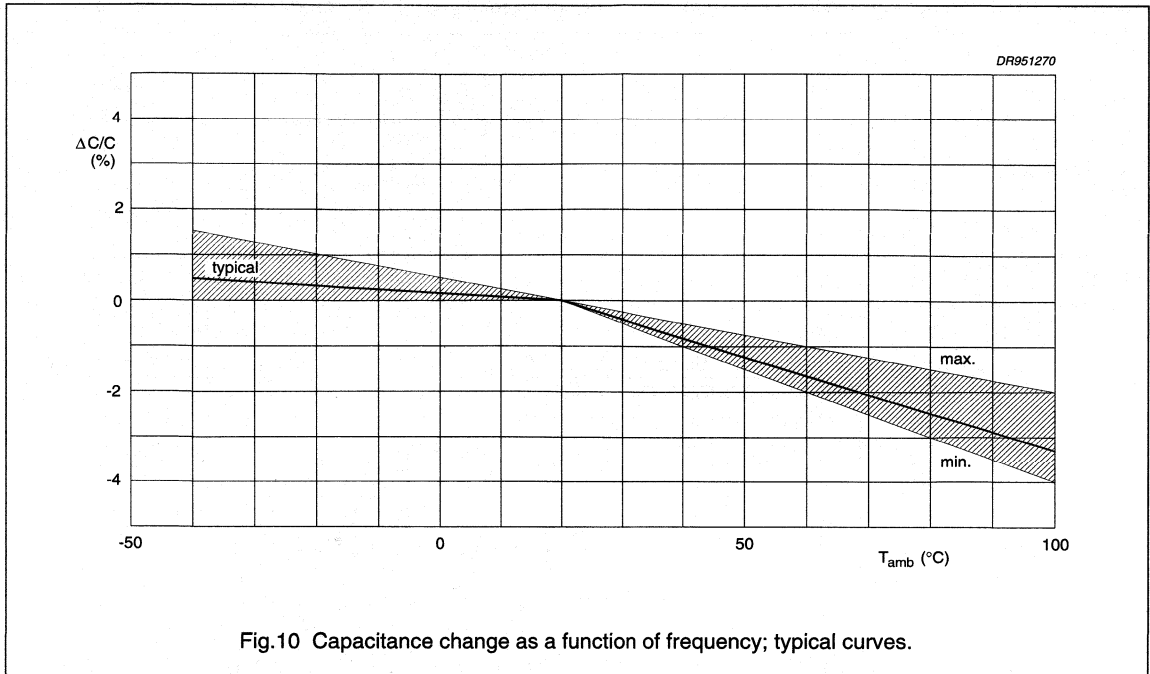
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

### Capacitance

All capacitance values are specified at 1 kHz.

# AC and pulse polypropylene film foil capacitors

KP 374



## Temperature

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

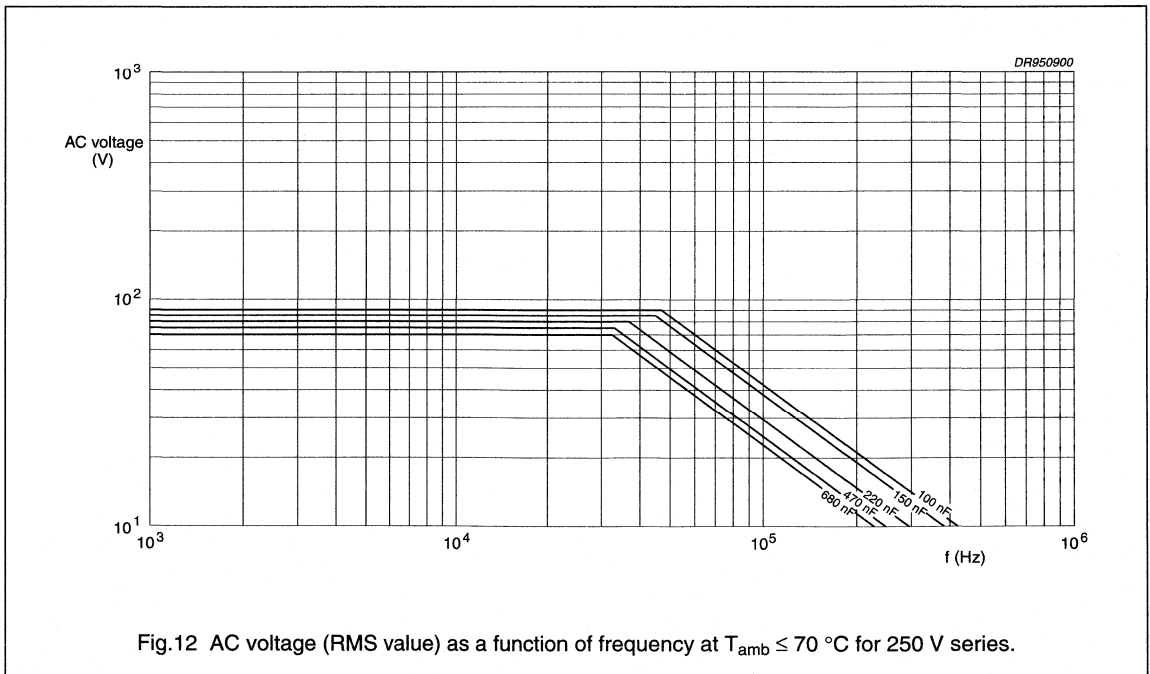
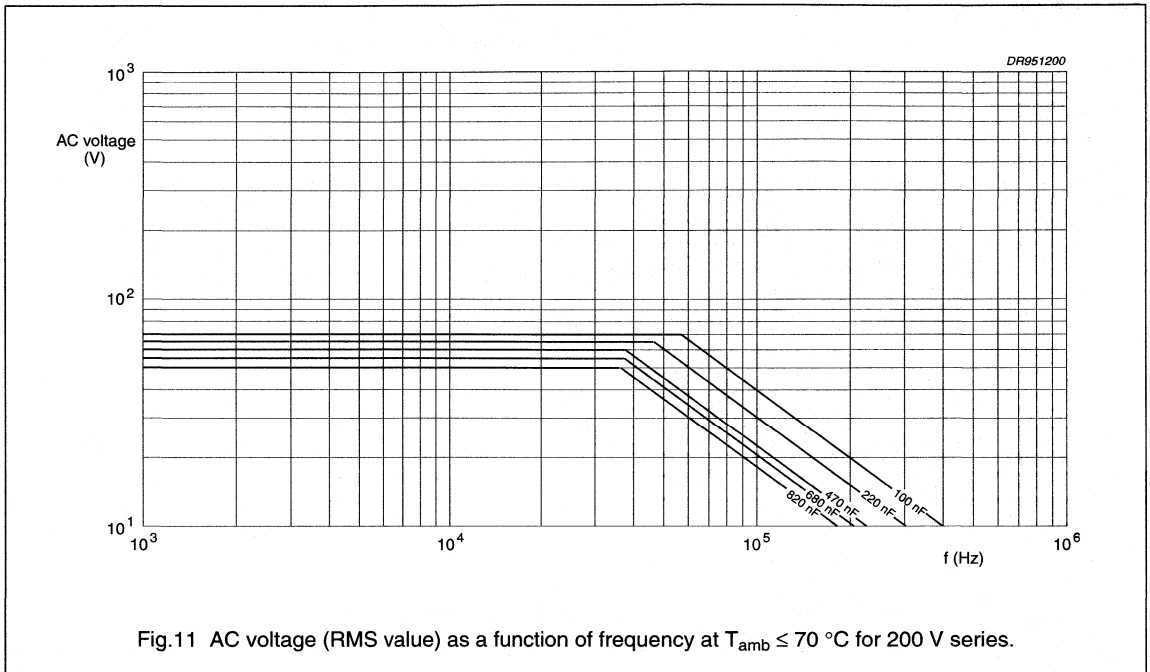
## Voltage

- Category voltage:
  - $U_c = U_{Rdc}$  for 200 V for 200 and 250 V series
  - $U_c = 0.7 \times U_{Rdc}$  for 630 V series.
- Test voltage between leads:  $2 \times U_{Rdc}$
- Test voltage between interconnected leads and case (foil method):  $2 \times U_{Rdc}$ .

# AC and pulse polypropylene film foil capacitors

KP 374

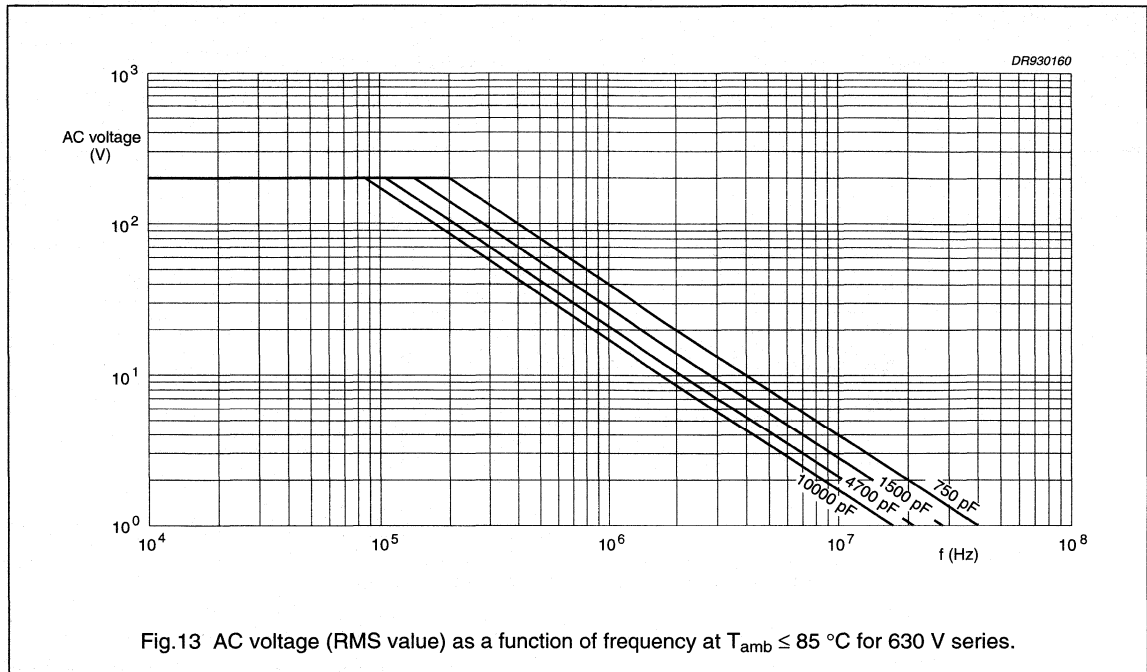
Maximum RMS voltage (sinewave) as a function of frequency for  $T_{amb} \leq 70^\circ\text{C}$  for 200 and 250 V series





# AC and pulse polypropylene film foil capacitors

KP 374

**Maximum RMS voltage (sinewave) as a function of frequency for  $T_{amb} \leq 85^\circ\text{C}$  for 630 V series**

# AC and pulse polypropylene film foil capacitors

KP 374

## Maximum RMS voltage (sinewave) as a function of frequency for $T_{amb} > 70\text{ }^{\circ}\text{C}$

200 AND 250 V SERIES

The maximum RMS voltage in Figs 11 and 12 has to be multiplied by a factor given in Fig.14.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 18 and 19.

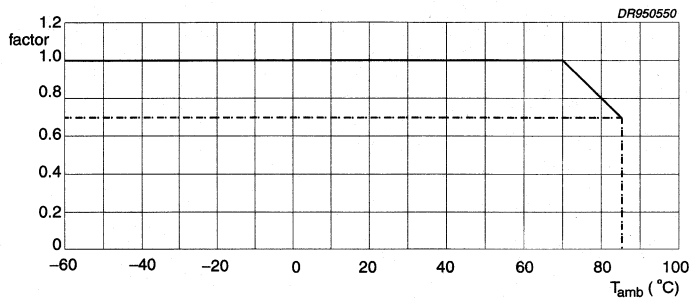


Fig.14 Multiplying factor as a function of temperature.

630 V SERIES

The maximum RMS voltage in Fig.13 has to be multiplied by a factor given in Fig.15.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 20 and 21.

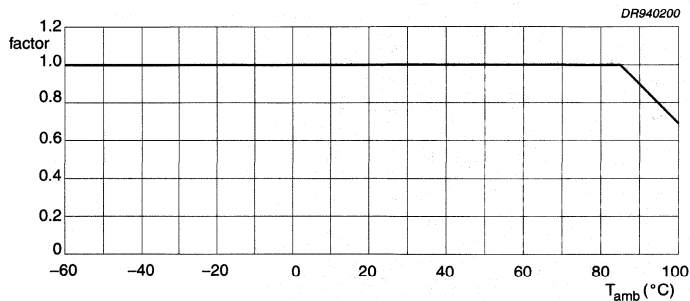


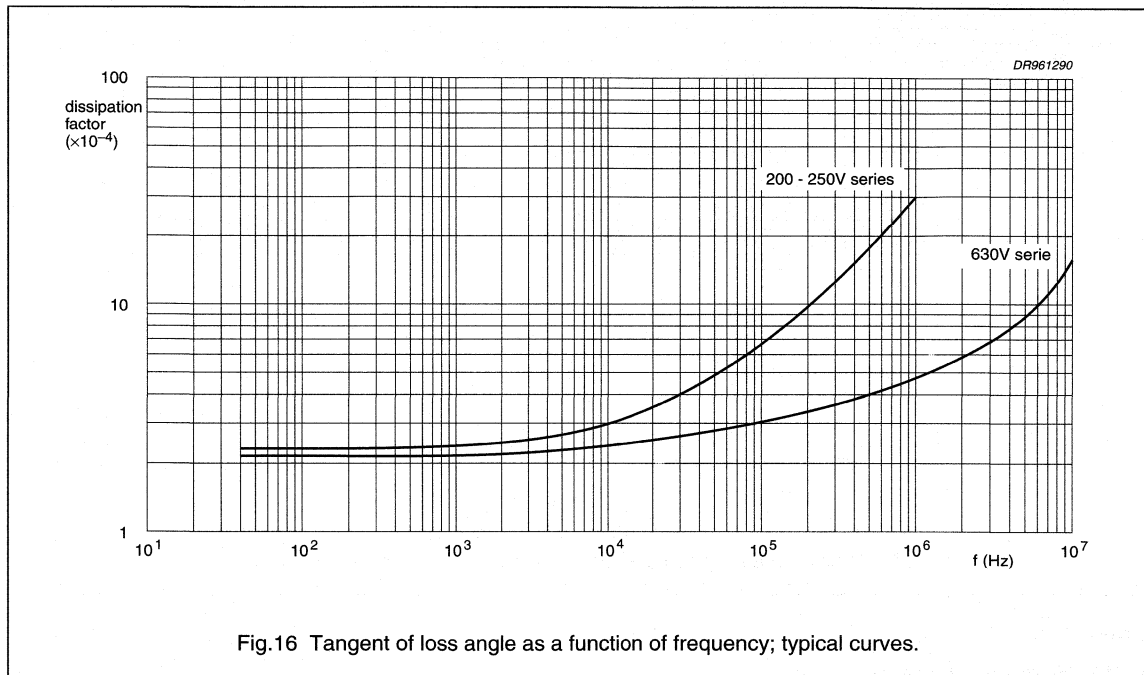
Fig.15 Multiplying factor as a function of temperature.

AC and pulse  
polypropylene film foil capacitors

KP 374

Tangent of loss angle

PITCH	TANGENT OF LOSS ANGLE	
	at 10 kHz	at 100 kHz
P ≤ 15 mm	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>
P = 22.5 mm	≤ 4 × 10 <sup>-4</sup>	≤ 20 × 10 <sup>-4</sup>
P = 27.5 mm	≤ 5 × 10 <sup>-4</sup>	≤ 25 × 10 <sup>-4</sup>



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

- >10000 V/ μs.

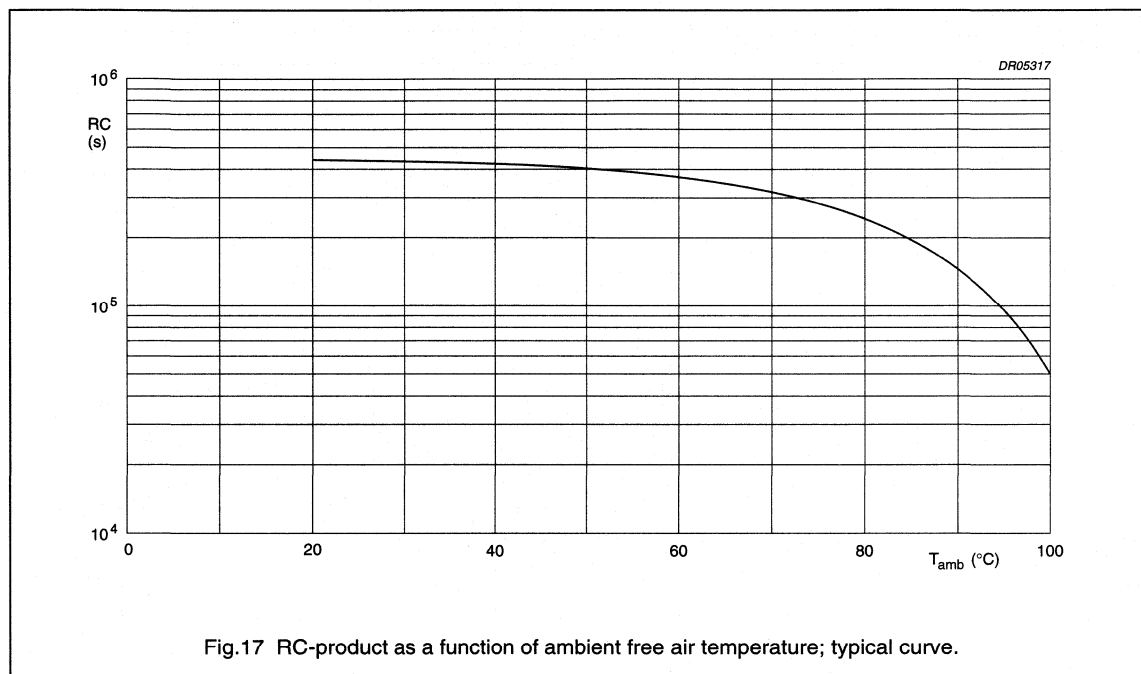
# AC and pulse polypropylene film foil capacitors

KP 374

## Insulation resistance

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $100 \pm 10$  V for 200 and 250 V series and  $500 \pm 50$  V for 630 V series;  $T_{\text{amb}} = 20$  °C:

- R between interconnected leads and case:  $>100000$  M $\Omega$ .



## Inductance

- $\leq 10$  nH/cm lead and capacitor length.

# AC and pulse polypropylene film foil capacitors

## KP 374

### Maximum dissipation

Power dissipation curves as a function of capacitor body length and thickness (see Figs 18 to 21)

$b_{\max}$ (mm)	$l_{\max}$ (mm)					
	6..9	10..12	13..15	16..20	21..25	26..32
3.5	1	5	—	—	—	—
4	2	6	7	9	—	—
4.5	3	6	8	10	—	—
5	4	7	9	10	15	16
5.5	5	7	10	11	16	17
6	6	8	10	11	16	17
6.5	—	9	11	12	17	18
7	—	—	—	12	17	18
7.5	—	—	—	13	18	19
8	—	—	—	13	18	20
8.5	—	—	—	14	19	20
9	—	—	—	14	19	21
9.5	—	—	—	15	20	21
10	—	—	—	15	20	22
10.5	—	—	—	—	—	23
11	—	—	—	—	—	23
11.5	—	—	—	—	—	24
12	—	—	—	—	—	24
12.5	—	—	—	—	—	25
13	—	—	—	—	—	25
13.5	—	—	—	—	—	25
14	—	—	—	—	—	25
14.5	—	—	—	—	—	26
15	—	—	—	—	—	26
15.5	—	—	—	—	—	27
16	—	—	—	—	—	27

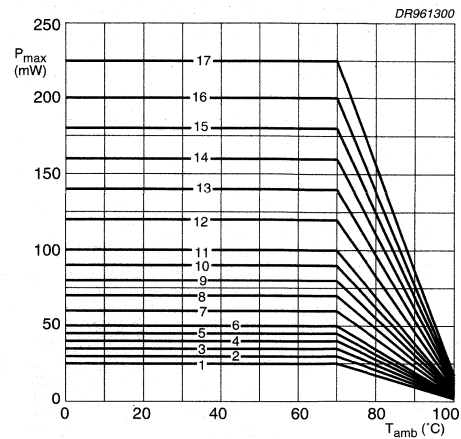


Fig.18 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions for 200 and 250 V series.

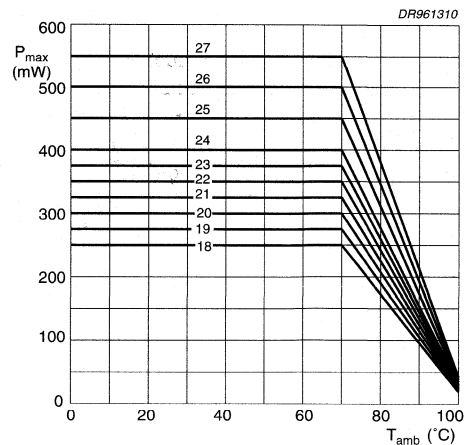


Fig.19 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions for 200 and 250 V series.

AC and pulse  
polypropylene film foil capacitors

KP 374

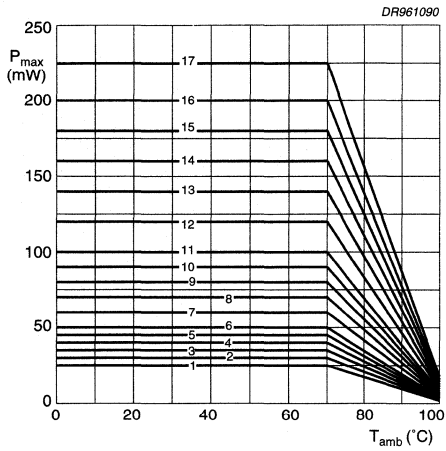


Fig.20 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions for 630 V series.

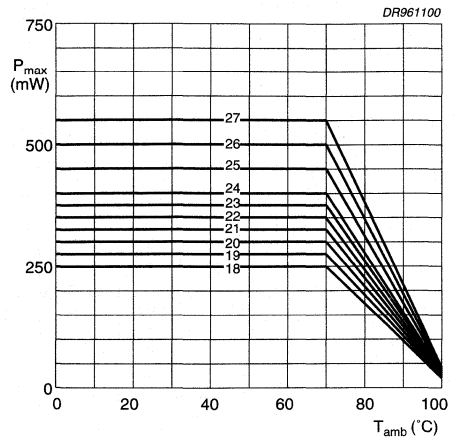


Fig.21 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions for 630 V series.

# AC and pulse polypropylene film foil capacitors

KP 374

## Application note<sup>(1)</sup>

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. There is no limit for the peak current ( $I_p$ ) or voltage slope ( $dU/dt$ ) in the application.
4. The dissipated power shall not be greater than the maximum permissible power dissipation shown in Figs 18 to 21.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.

Example:  $C = 330 \text{ nF} - 250 \text{ V}$  used for S-correction.

In this application the following pulse criteria apply:  $U_{p-p} = 123 \text{ V}$ ;  $U_p = 170 \text{ V}$ ;  $T_1 = 6 \mu\text{s}$ ;  $T_2 = 32 \mu\text{s}$ ;  $I_{p-p} = 8 \text{ A}$ .

The ambient temperature is  $50 \text{ }^\circ\text{C}$ .

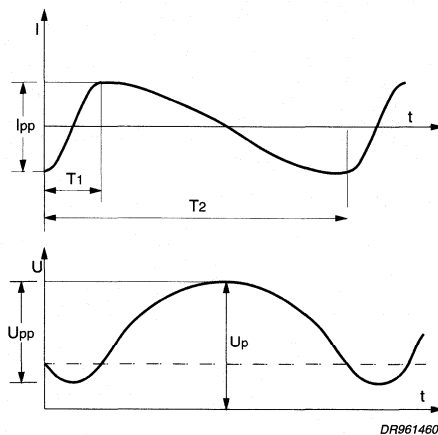


Fig.22 Application example pulse criteria.

## Checking the conditions

1. The peak voltage  $U_p = 170 \text{ V}$  is lower than  $220 \text{ V}$  (DC).
2. The peak-to-peak voltage  $123 \text{ V}$  is lower than  $2 \times \sqrt{2}$  times  $160 \text{ V}$  (AC) =  $220 U_{p-p}$ .
3.  $I_p = 4 \text{ A}$  is lower than  $0.47 \mu\text{F} \times 60 \text{ V} / \mu\text{s} (= 28 \text{ A})$ .
4. The dissipated power is about  $240 \text{ mW}$  as calculated with Fourier terms and  $\text{tg}\delta$  maximum values.  
This is less than  $375 \text{ mW}$ , allowed for a capacitor with dimensions  $b_{\text{max}} \times l_{\text{max}}$  ( $10.5 \times 23 \text{ mm}$ ) at  $50 \text{ }^\circ\text{C}$ .
5. Depends on actual application.

(1) Peak-to-peak current tables for S-correction application, are available on request.

# AC and pulse polypropylene film foil capacitors

## KP 374

### MARKING

#### Product marking

CAPACITORS WITH PITCH 22.5 AND 27.5 mm:  
STYLES 2222 374 3/4....

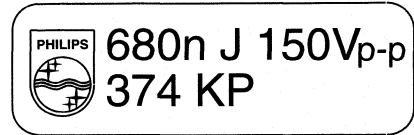
The capacitors are marked on the top in black ink with the following information:

1. Manufacturer's emblem.
2. Rated capacitance code in accordance with "IEC 62"
3. Tolerance on rated capacitance: J =  $\pm 5\%$
4. Rated peak-to-peak voltage (e.g. 150 V<sub>p-p</sub>)
5. Manufacturer's type designation (374)
6. Code for dielectric material (KP).

CAPACITORS WITH PITCH  $\leq 15$  mm:  
STYLE 2222 374 6....

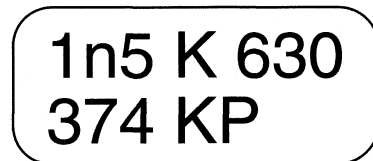
The capacitors are marked on the top in black ink with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: J =  $\pm 5\%$ ; K =  $\pm 10\%$
3. Rated (DC) voltage (e.g. 630 V)
4. Manufacturer's type designation (374)
5. Code for dielectric material (KP).



Styles 2222 374 3/4....

Fig.23 Example of marking.



Style 2222 374 6....

Fig.24 Example of marking.



# AC and pulse polypropylene film foil capacitors

## KP 374

### Package marking

CAPACITORS WITH PITCH 22.5 AND 27.5 mm:  
STYLES 2222 374 3/4....

The package containing the capacitors is marked as shown in Fig.25.

Barcode label marking	
LINE	MARKING EXPLANATION
1.	Manufacturer's name
2.	Country of origin
3.	Sub-family
4.	Type description
5.	Capacitance value, tolerance and climatic category ("IEC 68-1")
6.	—
7.	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO
8.	Product type description
9.	Quantity and production period, year and week code
10.	Product code (12NC)

The diagram shows a rectangular label with 10 numbered lines. Each line contains a barcode and text. Line 1: PHILIPS COMPONENTS. Line 2: MADE IN BELGIUM. Line 3: METAL. PETP FILM CAPACITOR. Line 4: MKT RADIAL POTTED TYPE. Line 5: 1µF ±10% 100V= 55/100/56. Line 6: (empty). Line 7: ORIG A170 RPC HQ 6210. Line 8: TYPE MKT 373. Line 9: QTY 1000 DATE 9640. Line 10: CODENO 2222 373 21105. A work order number WO: 12345678 is printed above the barcode for line 7. The label is identified as CCA396.

Fig.25 Barcode label.

# AC and pulse polypropylene film foil capacitors

KP 374

CAPACITORS WITH PITCH ≤15 mm:

STYLE 2222 374 6....

The package containing the capacitors is marked as shown in Fig.26.

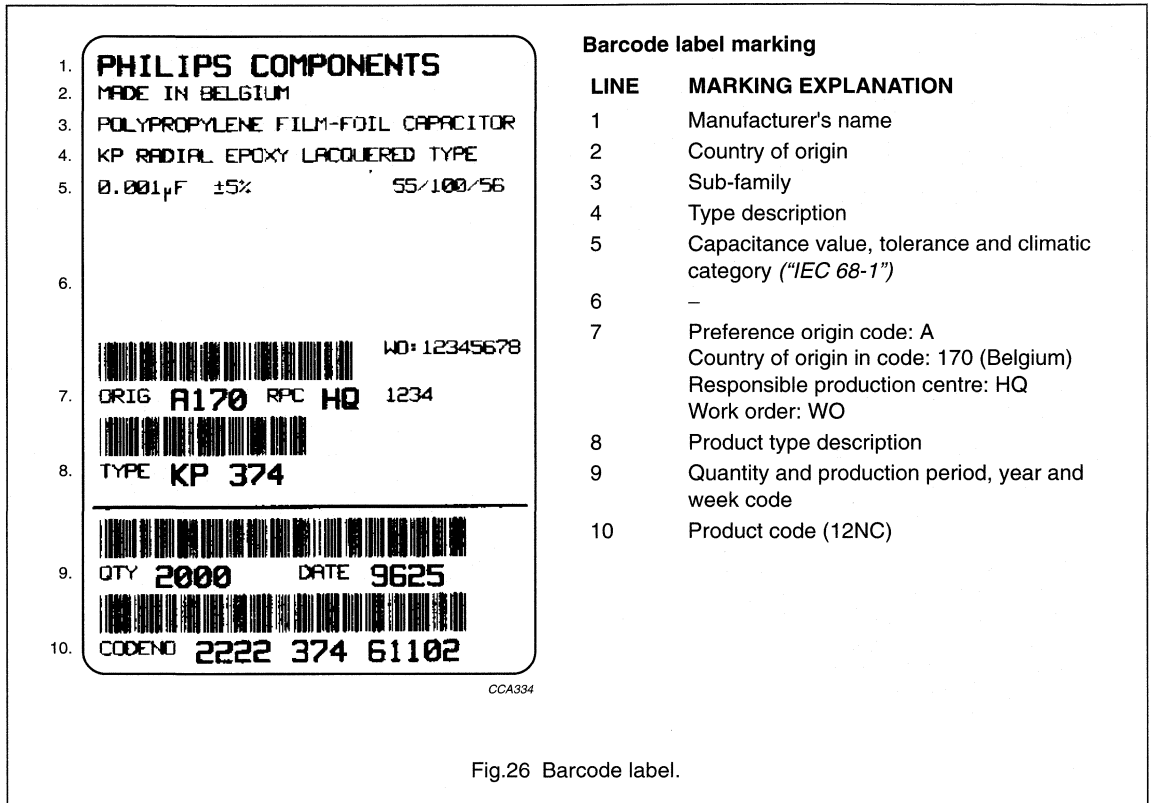


Fig.26 Barcode label.

# AC and pulse polypropylene film foil capacitors

## KP 374

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: "IEC 68-2-21" Resistance to soldering heat: "IEC 68-2-20"	solder bath: 260 °C; 10 s	no visible damage legible marking $ \Delta C/C  \leq 1\%$
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6" Shock: "IEC 68-2-27"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 3\%$ (styles 2222 374 3/4....) $ \Delta C/C  \leq 1\%$ (style 2222 374 6....)
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2" Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30" Cold: "IEC 68-2-1" Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"	16 hours; temperature: upper category  2 hours; temperature: lower category	$ \Delta C/C  \leq 3\%$ (styles 2222 374 3/4....) $ \Delta C/C  \leq 1\%$ (style 2222 374 6....) $\Delta \tan \delta$ : as specified in Section "Tangent of loss angle" of this specification or $\leq 1.4 \times$ measured initial value $R_{ins} \geq 50\%$ of specified value

# AC and pulse polypropylene film foil capacitors

## KP 374

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"		$ \Delta C/C  \leq 3\%$ (styles 2222 374 3/4....) $ \Delta C/C  \leq 1\%$ (style 2222 374 6....) $\Delta \tan \delta$ : as specified in Section "Tangent of loss angle" of this specification or $\leq 1.4 \times$ measured initial value $R_{ins} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-13"	styles 2222 374 3/4.... 1000 hours: $1.5 \times U_{Rdc}$ ; 85 °C style 2222 374 6.... 2000 hours: $1.5 \times U_{Rdc}$ ; 85 °C $1.5 \times U_{Cdc}$ ; 100 °C	$ \Delta C/C  \leq 5\%$ (styles 2222 374 3/4....) $ \Delta C/C  \leq 2\%$ (style 2222 374 6....) $\Delta \tan \delta$ : as specified in Section "Tangent of loss angle" of this specification or $\leq 1.4 \times$ measured initial value
Heat storage: "IEC 384-13"	2000 hours; upper category	$ \Delta C/C  \leq 3\%$ (styles 2222 374 3/4....) $ \Delta C/C  \leq 2\%$ (style 2222 374 6....) $\Delta \tan \delta$ : as specified in Section "Tangent of loss angle" of this specification or $\leq 1.4 \times$ measured initial value
Endurance (AC): "IEC 384-13"	1000 h: $1.25 \times U_{Rac}$ ; 85 °C	$ \Delta C/C  \leq 2\%$ $\Delta \tan \delta$ : as specified in Section "Tangent of loss angle" of this specification or $\leq 1.4 \times$ measured initial value
Resistance to detergents: "IEC 384-13"		$ \Delta C/C  \leq 1\%$ $\Delta \tan \delta$ : as specified in Section "Tangent of loss angle" of this specification or $\leq 1.4 \times$ measured initial value $R_{ins} \geq 50\%$ of specified value
Resistance to soldering heat with preheating: "IEC 384-13"	body temperature: 85 °C for styles 2222 374 3/4.... 100 °C for style 2222 374 6.... bath temperature: 260 °C dwell time: 10 s	$ \Delta C/C  \leq 3\%$ (styles 2222 374 3/4....) $ \Delta C/C  \leq 2\%$ (style 2222 374 6....)

### Note

- For detailed information, see "Type specification".

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

KP/MKP RADIAL LACQUERED CAPACITORS

PITCH 10/15/22.5/27.5 mm

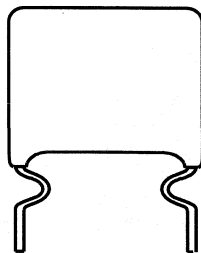


Fig.1 Simplified outline.

### FEATURES

- 10.0 to 27.5 mm lead pitch
- Supplied loose and taped
- Taped products available on request.

### APPLICATIONS

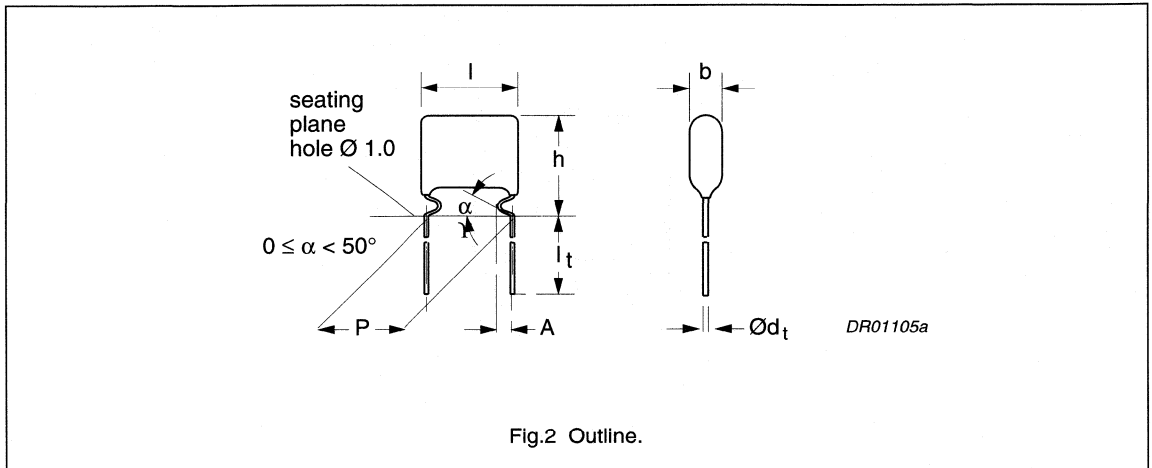
- Where high currents and steep pulses occur
- For deflection circuits in television receivers.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E24 series)	100 pF to 270 nF
Capacitance tolerance	±5%; ±3.5%
Rated voltage (DC)	630 V; 1000 V; 1600 V; 2000 V; 2500 V
Rated voltage (AC)	300 V; 400 V; 500 V; 600 V; 880 V
Rated peak-to-peak voltage	850 V; 1100 V; 1400 V; 1700 V; 2500 V
Climatic category	55/100/56
Maximum application temperature	100 °C
Rated temperature	85 °C
Reference specification	IEC 384-17
Performance grade: for C > 5.6 nF and 2500 V for C ≤ 5.6 nF	grade 1 (long life) grade 2 (general purpose)
Stability grade	grade 2

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

**KP/MKP 375 GENERALDATA**
**PITCH 10 mm**

**Specific reference data for the 630 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 6 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	$> 400 \text{ V (AC)}$	

**Available 630 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 375 10...	preferred
		$\pm 3.5\%$	2222 375 11...	on request
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 375 14...	on request
		$\pm 3.5\%$	2222 375 15...	on request
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 5\%$	2222 375 12...	on request
		$\pm 3.5\%$	2222 375 13...	on request

**Note**

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

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 630 \text{ V}; U_{Rac} = 300 \text{ V}/U_{p-p} = 850 \text{ V}$ 

loose and taped

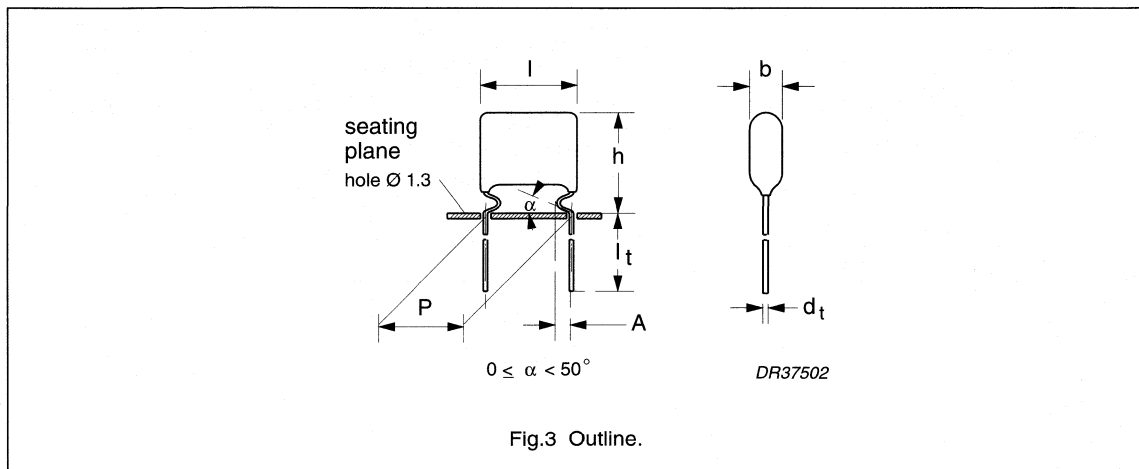
C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	$h = 16.0 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>					
680	$5.0 \times 13.0 \times 14.5$	0.55	10681	2000	1200
750		0.60	10751		
820	$5.5 \times 13.5 \times 14.5$	0.70	10821	2000	1100
910		0.70	10911		
1000		0.70	10102		
1100		0.70	10112		
1200		0.75	10122		
1300		0.75	10132		
1500		0.75	10152		
1600		0.80	10162		
1800	$6.0 \times 14.0 \times 14.5$	0.85	10182	1750	1000
2000		0.85	10202		
2200		0.90	10222		
2400		1.0	10242		
2700	$6.5 \times 14.5 \times 14.5$	1.1	10272	1500	900

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

**KP/MKP 375 GENERALDATA**
**PITCH 15 mm**

**Specific reference data for the 630 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	$> 400 \text{ V (AC)}$	

**Available 630 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 375 10...	preferred
		$\pm 3.5\%$	2222 375 11...	on request
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 375 14...	on request
		$\pm 3.5\%$	2222 375 15...	on request
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 5\%$	2222 375 12...	on request
		$\pm 3.5\%$	2222 375 13...	on request

**Note**

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



# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 630 \text{ V}; U_{Rac} = 300 \text{ V}/U_{p-p} = 850 \text{ V}$ 

loose and taped

C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = 15.0 <math>\pm</math> 0.4 mm; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = 2.5 +1.5/-0.5 mm</b>					
3000	5.0 $\times$ 14.0 $\times$ 18.5	1.1	10302	2000	1200
3300			10332		
3600	5.5 $\times$ 14.5 $\times$ 18.5	1.2	10362	2000	1100
3900			10392		
4300			10432		
4700			10472		
5100			10512		
5600			10562		
6200			6.0 $\times$ 15.0 $\times$ 18.5		
6800	10682				
7500	10752				
8200	10822				
9100	10912				
10000	10103				
11000	10113				
12000	10123				
13000	10133				
15000	10153				
16000	10163				
18000	6.5 $\times$ 15.5 $\times$ 18.5	1.4	10183	1500	900
20000			10203		
22000	7.0 $\times$ 16.0 $\times$ 18.5	1.5	10223	1500	800
24000	7.5 $\times$ 16.5 $\times$ 18.5	1.7	10243	1250	800
27000	8.0 $\times$ 17.0 $\times$ 18.5	1.9	10273	1250	750
30000			10303		
33000	8.5 $\times$ 17.5 $\times$ 18.5	2.3	10333	1000	700
36000	9.5 $\times$ 18.5 $\times$ 18.5	2.7	on request	900	600
39000					

### Note

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

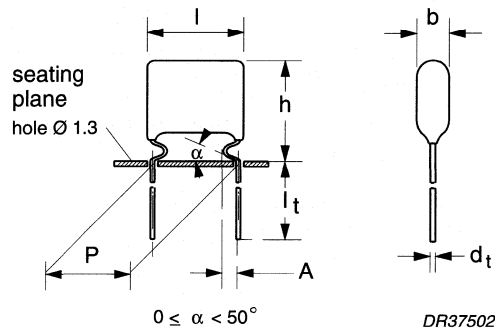
**KP/MKP 375 GENERALDATA**
**PITCH 22.5/27.5 mm**


Fig.4 Outline.

**Specific reference data for the 630 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: P = 22.5 mm P = 27.5 mm	$\leq 4 \times 10^{-4}$ $\leq 4 \times 10^{-4}$	$\leq 15 \times 10^{-4}$ $\leq 20 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	$> 400 \text{ V (AC)}$	

**Available 630 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 375 10...	preferred
		$\pm 3.5\%$	2222 375 11...	on request
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 375 14...	on request
		$\pm 3.5\%$	2222 375 15...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 375 12...	on request
		$\pm 3.5\%$	2222 375 13...	on request

**Note**

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

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 630 \text{ V}; U_{Rac} = 300 \text{ V}/U_{p-p} = 850 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.036	7.0 × 20.0 × 26.0	3.2	10363	650	550
0.039			10393		
0.043			10433		
0.047			10473		
0.051			10513		
0.056			10563		
0.062			10623		
0.068	7.5 × 20.5 × 26.0	3.4	10683	600	500
0.075	8.0 × 21.0 × 26.0	3.6	10753	550	500
0.082			10823		
0.091	8.5 × 21.5 × 26.0	3.8	10913	500	450
0.1	9.0 × 22.0 × 26.0	4.8	10104	450	450
0.11	9.5 × 22.5 × 26.0	5.0	10114	400	400
0.12	10.0 × 23.0 × 26.0	5.2	10124	400	400
<b>Pitch = <math>27.5 \pm 0.5 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.13	9.5 × 22.5 × 30.0	5.2	10134	500	400
0.15	10.0 × 23.0 × 30.0	5.6	10154	500	400
0.16	10.5 × 23.5 × 30.0	5.9	10164	450	350
0.18	11.0 × 24.0 × 30.0	6.3	10184	400	350
0.2	11.5 × 24.5 × 30.0	6.8	10204	400	350
0.22	12.5 × 25.5 × 30.0	7.5	10224	350	300
0.24	13.0 × 26.0 × 30.0	8.0	10244	300	300
0.27	13.5 × 26.5 × 30.0	8.5	10274	300	300

### Note

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

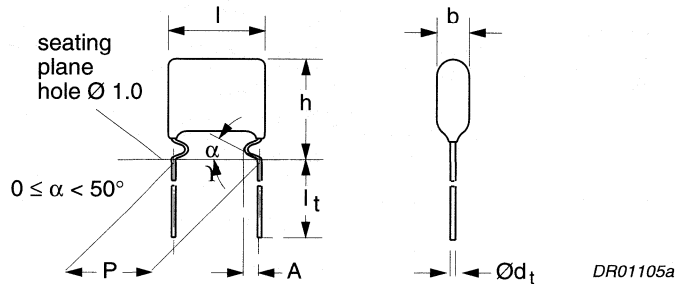
**KP/MKP 375 GENERALDATA**
**PITCH 10 mm**


Fig.5 Outline.

**Specific reference data for the 1000 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 6 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	>10000 V/ $\mu$ s	
R between leads	>100000 M $\Omega$	
R between interconnected leads and case	>100000 M $\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	>500 V (AC)	

**Available 1000 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5$ mm	$\pm 5\%$	2222 375 20...	preferred
		$\pm 3.5\%$	2222 375 21...	on request
	$l_t = 5.0 \pm 1.0$ mm	$\pm 5\%$	2222 375 24...	on request
		$\pm 3.5\%$	2222 375 25...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 375 22...	on request
		$\pm 3.5\%$	2222 375 23...	on request

**Note**

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

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 1000 \text{ V}; U_{Rac} = 400 \text{ V}/U_{p-p} = 1100 \text{ V}$ 

loose and taped

C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = 10.0 <math>\pm</math> 0.4 mm; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math>; A = 2.0 +1.0/-0.5 mm</b>					
100	5.0 $\times$ 13.0 $\times$ 14.5	0.55	20101	2000	1200
110			20111		
120			20121		
130			20131		
150	5.5 $\times$ 13.5 $\times$ 14.5	0.60	20151	2000	1100
160		0.60	20161		
180		0.60	20181		
200		0.60	20201		
220		0.60	20221		
240		0.60	20241		
270		0.60	20271		
300		0.60	20301		
330		0.65	20331		
360		0.65	20361		
390		0.65	20391		
430		0.65	20431		
470		0.65	20471		
510		0.65	20511		
560		0.65	20561		
620		0.70	20621		
680	0.70	20681			
750	0.70	20751			
820	0.70	20821			
910	0.75	20911			
1000	6.0 $\times$ 14.0 $\times$ 14.5	0.80	20102	1750	1000
1100		0.80	20112		
1200		0.85	20122		
1300		0.85	20132		
1500		0.90	20152		

**Note**

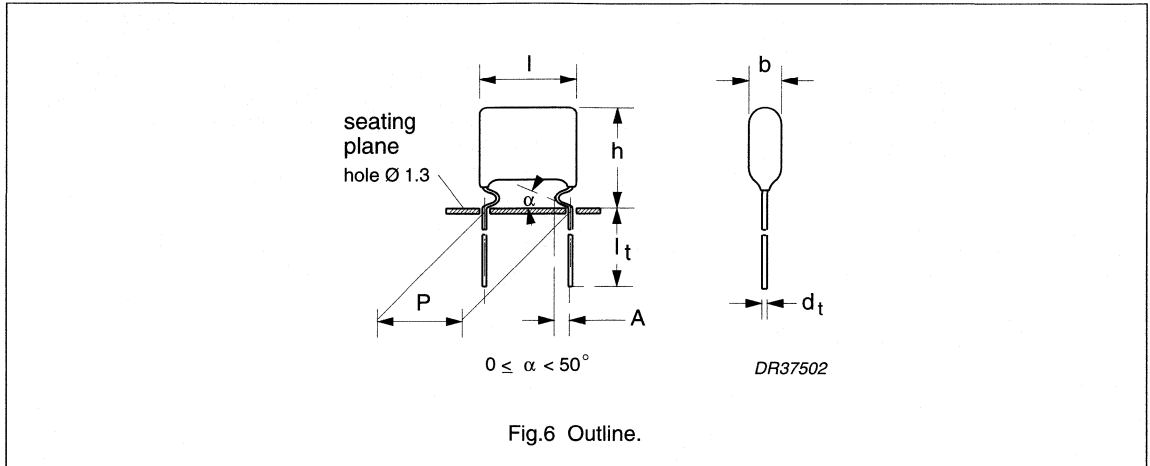
1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

KP/MKP 375

KP/MKP 375 GENERALDATA

PITCH 15 mm



**Specific reference data for the 1000 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	$> 500 \text{ V (AC)}$	

**Available 1000 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 375 20...	preferred
		$\pm 3.5\%$	2222 375 21...	on request
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 375 24...	on request
		$\pm 3.5\%$	2222 375 25...	on request
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 5\%$	2222 375 22...	on request
		$\pm 3.5\%$	2222 375 23...	on request

**Note**

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

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 1000 \text{ V}; U_{Rac} = 400 \text{ V}/U_{p-p} = 1100 \text{ V}$ 

loose and taped

C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 +1.5/-0.5 \text{ mm}</math></b>					
1600	5.5 × 14.5 × 18.5	1.2	20162	2000	1 100
1800			20182		
2000			20202		
2200			20222		
2400			20242		
2700	6.0 × 15.0 × 18.5	1.3	20272	2000	1 000
3000			20302		
3300			20332		
3600			20362		
3900			20392		
4300			20432		
4700			20472		
5100			20512		
5600			20562		
6200			20622		
6800	20682				
7500	7.0 × 16.0 × 18.5	1.5	20752	1500	800
8200			20822		
9100			20912		
10000	7.5 × 16.5 × 18.5	1.7	20103	1250	800
11000	8.0 × 17.0 × 18.5	1.9	20113	1250	750
12000			20123		
13000	8.5 × 17.5 × 18.5	2.3	20133	1000	700
15000	9.0 × 18.0 × 18.5	2.5	20153	1000	650

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

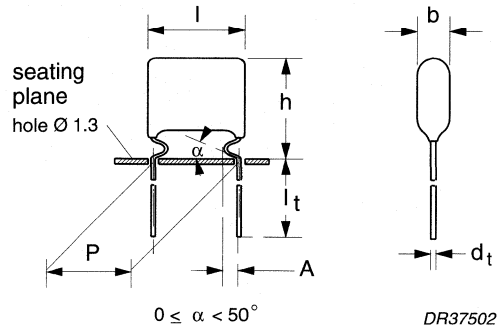
**KP/MKP 375 GENERALDATA**
**PITCH 22.5/27.5 mm**


Fig.7 Outline.

**Specific reference data for the 1000 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: P = 22.5 mm P = 27.5 mm	$\leq 3 \times 10^{-4}$ $\leq 4 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	>10000 V/ $\mu$ s	
R between leads	>100000 M $\Omega$	
R between interconnected leads and case	>100000 M $\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	>500 V (AC)	

**Available 1000 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5$ mm	$\pm 5\%$	2222 375 20...	preferred
		$\pm 3.5\%$	2222 375 21...	on request
	$l_t = 5.0 \pm 1.0$ mm	$\pm 5\%$	2222 375 24...	on request
		$\pm 3.5\%$	2222 375 25...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 375 22...	on request
		$\pm 3.5\%$	2222 375 23...	on request

**Note**

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



# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 1000 \text{ V}; U_{Rac} = 400 \text{ V}/U_{p-p} = 1100 \text{ V}$ 

loose and taped

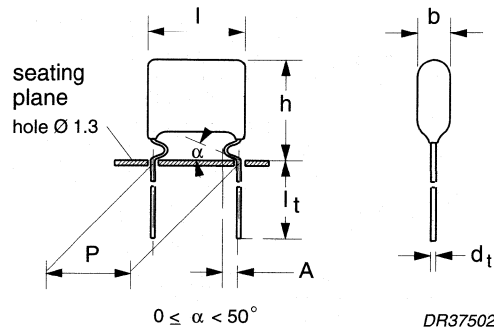
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 + 1.4/-0.5 \text{ mm}</math></b>					
0.016	6.0 × 19.0 × 26.0	2.8	20163	800	650
0.018			20183		
0.02	6.5 × 19.5 × 26.0	3.0	20203	750	600
0.022			20223		
0.024	7.0 × 20.0 × 26.0	3.2	20243	650	550
0.027	7.5 × 20.5 × 26.0	3.4	20273	600	500
0.03			20303		
0.033	8.0 × 21.0 × 26.0	3.6	20333	550	500
0.036	8.5 × 21.5 × 26.0	3.8	20363	500	450
0.039			20393		
0.043	9.0 × 22.0 × 26.0	4.0	20433	450	450
<b>Pitch = <math>27.5 \pm 0.5 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 + 1.4/-0.5 \text{ mm}</math></b>					
0.047	6.0 × 19.0 × 30.0	3.3	20473	1000	650
0.051	7.5 × 20.5 × 30.0	3.9	20513	750	500
0.056			20563		
0.062	8.0 × 21.0 × 30.0	4.2	20623	650	500
0.068	8.5 × 21.5 × 30.0	4.4	20683	550	450
0.075	9.0 × 22.0 × 30.0	4.6	20753	550	450
0.082	9.5 × 22.5 × 30.0	5.2	20823	500	400
0.091	10.0 × 23.0 × 30.0	5.6	20913	500	400
0.1	10.5 × 23.5 × 30.0	5.9	20104	450	350
0.11	11.0 × 24.0 × 30.0	6.2	20114	400	350
0.12	11.5 × 24.5 × 30.0	6.5	20124	400	350
0.13	12.0 × 25.0 × 30.0	6.8	20134	350	350
0.15	12.5 × 25.5 × 30.0	7.1	20154	350	300

### Note

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

**KP/MKP 375 GENERALDATA**
**PITCH 15 mm**

**Fig.8 Outline.**
**Specific reference data for the 1600 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 20 pC peak discharge	$> 550 \text{ V (AC)}$	

**Available 1600 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 375 30...	preferred
		$\pm 3.5\%$	2222 375 31...	on request
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 375 34...	on request
		$\pm 3.5\%$	2222 375 35...	on request
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 5\%$	2222 375 32...	on request
		$\pm 3.5\%$	2222 375 33...	on request

**Note**

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

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 1600 \text{ V}; U_{Rac} = 500 \text{ V}/U_{p-p} = 1400 \text{ V}$ 

loose and taped

C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 + 1.5/-0.5 \text{ mm}</math></b>					
680	5.5 × 14.5 × 18.5	0.75	30681	2000	1100
750			30751		
820			30821		
910	6.0 × 15.0 × 18.5	0.80	30911	2000	1000
1000		0.85	30102		
1100		0.85	30112		
1200		0.90	30122		
1300		0.95	30132		
1500	5.5 × 14.5 × 18.5	1.2	30152	2000	1100
1600			30162		
1800	6.0 × 15.0 × 18.5	1.3	30182	2000	1000
2000	6.5 × 15.5 × 18.5	1.4	30202	1500	900
2200			30222		
2400	7.0 × 16.0 × 18.5	1.5	30242	1500	800
2700	7.5 × 16.5 × 18.5	1.7	30272	1250	800
3000			30302		
3300	8.0 × 17.0 × 18.5	1.9	30332	1250	750
3600	8.5 × 17.5 × 18.5	2.3	30362	1000	700
3900	9.0 × 18.0 × 18.5	2.5	30392	1000	650
4300			30432		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

KP/MKP 375

KP/MKP 375 GENERALDATA

PITCH 22.5/27.5 mm

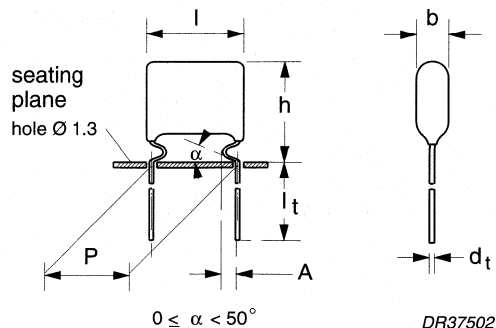


Fig.9 Outline.

### Specific reference data for the 1600 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: P = 22.5 mm P = 27.5 mm	$\leq 3 \times 10^{-4}$ $\leq 4 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	>10000 V/ $\mu$ s	
R between leads	>100000 M $\Omega$	
R between interconnected leads and case	>100000 M $\Omega$	
Ionization voltage (typical value) at 20 pC peak discharge	>550 V (AC)	

### Available 1600 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5$ mm	$\pm 5\%$	2222 375 30...	preferred
		$\pm 3.5\%$	2222 375 31...	on request
	$l_t = 5.0 \pm 1.0$ mm	$\pm 5\%$	2222 375 34...	on request
		$\pm 3.5\%$	2222 375 35...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 375 32...	on request
		$\pm 3.5\%$	2222 375 33...	on request

### Note

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

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 1600 \text{ V}; U_{Rac} = 500 \text{ V}/U_{p-p} = 1400 \text{ V}$ 

loose and taped

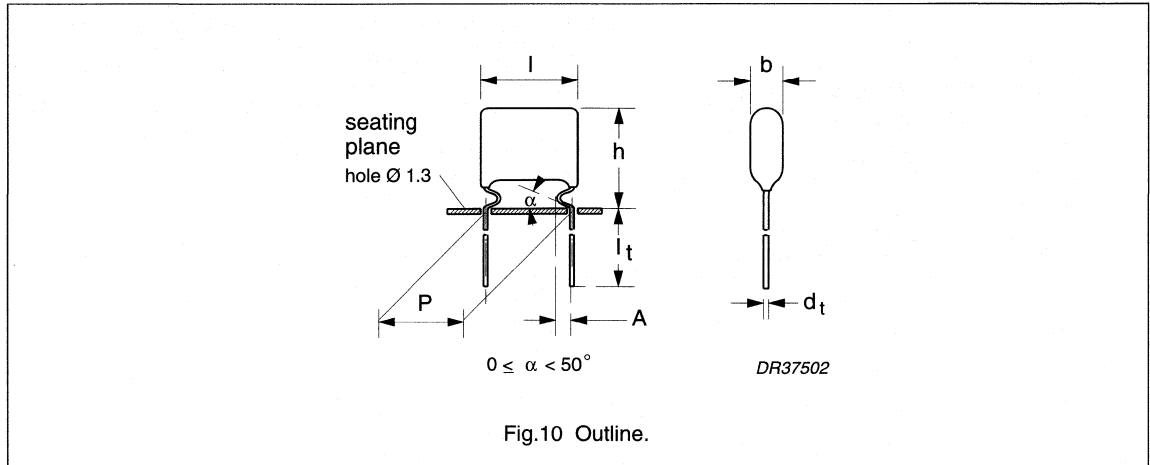
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 + 1.4/-0.5 \text{ mm}</math></b>					
0.0047	6.0 × 19.0 × 26.0	2.4	30472	800	650
0.0051			30512		
0.0056			30562		
0.0062	6.5 × 19.5 × 26.0	2.6	30622	750	600
0.0068			30682		
0.0075	7.0 × 20.0 × 26.0	2.8	30752	650	550
0.0082			30822		
0.0091	7.5 × 20.5 × 26.0	2.9	30912	600	500
0.01	8.0 × 21.0 × 26.0	3.2	30103	550	500
0.011	8.5 × 21.5 × 26.0	3.4	30113	500	450
0.012			30123		
0.013	9.0 × 22.0 × 26.0	3.6	30133	450	450
0.015	9.5 × 22.5 × 26.0	4.0	30153	400	400
0.016	10.0 × 23.0 × 26.0	4.3	30163	400	400
0.018	10.5 × 23.5 × 26.0	4.7	30183	350	350
<b>Pitch = <math>27.5 \pm 0.5 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 + 1.4/-0.5 \text{ mm}</math></b>					
0.02	9.0 × 22.0 × 30.0	4.4	30203	550	450
0.022	9.5 × 22.5 × 30.0	4.6	30223	500	400
0.024	10.0 × 23.0 × 30.0	5.0	30243	500	400
0.027	10.5 × 23.5 × 30.0	5.4	30273	450	350
0.03	11.0 × 24.0 × 30.0	5.8	30303	400	350
0.033	11.5 × 24.5 × 30.0	6.2	30333	400	350
0.036	12.0 × 25.0 × 30.0	6.6	30363	350	350
0.039	12.5 × 25.5 × 30.0	7.0	30393	350	300

### Note

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

**KP/MKP 375 GENERALDATA**
**PITCH 15 mm**

**Specific reference data for the 2000 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	≤ 3 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	> 10000 V/μs	
R between leads	> 100000 MΩ	
R between interconnected leads and case	> 100000 MΩ	
Ionization voltage (typical value) at 20 pC peak discharge	> 600 V (AC)	

**Available 2000 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ± 0.5 mm	±5%	2222 375 40...	preferred
		±3.5%	2222 375 41...	on request
	l <sub>t</sub> = 5.0 ± 1.0 mm	±5%	2222 375 44...	on request
		±3.5%	2222 375 45...	on request
Taped on reel	H = 16.0 mm; note 1	±5%	2222 375 42...	on request
		±3.5%	2222 375 43...	on request

**Note**

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

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 2000 \text{ V}; U_{Rac} = 600 \text{ V}/U_{p-p} = 1700 \text{ V}$ 

loose and taped

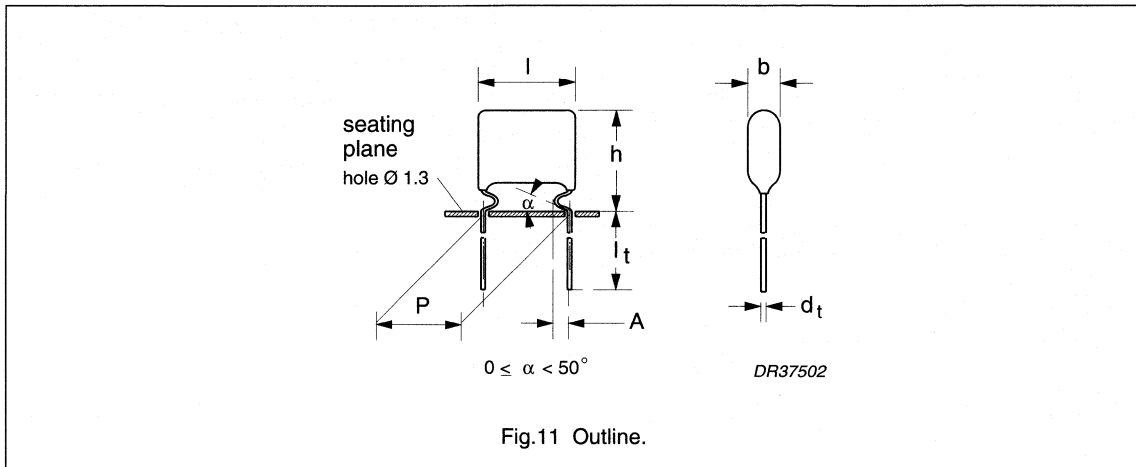
C (pF)	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}; A = 2.5 +1.4/-0.5 \text{ mm}</math></b>					
100	5.5 × 14.5 × 18.5	0.75	40101	2000	1100
110		0.75	40111		
120		0.75	40121		
130		0.75	40131		
150		0.75	40151		
160		0.75	40161		
180		0.75	40181		
200		0.75	40201		
220		0.75	40221		
240		0.75	40241		
270		0.75	40271		
300		0.75	40301		
330		0.75	40331		
360		0.75	40361		
390		0.75	40391		
430		0.75	40431		
470		0.80	40471		
510	0.80	40511			
560	0.80	40561			
620	6.0 × 15.0 × 18.5	0.85	40621	2000	1000
680		0.85	40681		
750		0.90	40751		
820	6.5 × 15.5 × 18.5	0.95	40821	1500	900
910	5.5 × 14.5 × 18.5	1.2	40911	2000	1100
1000	6.0 × 15.0 × 18.5	1.3	40102	2000	1000
1100			40112		
1200			40122		
1300	6.5 × 15.5 × 18.5	1.4	40132	1500	900
1500	7.0 × 16.0 × 18.5	1.5	40152	1500	800
1600	7.5 × 16.5 × 18.5	1.7	40162	1250	800
1800			40182		
2000	8.0 × 17.0 × 18.5	1.9	40202	1250	750
2200	8.5 × 17.5 × 18.5	2.3	40222	1000	700
2400	9.0 × 18.0 × 18.5	2.5	40242	1000	650
2700	9.5 × 18.5 × 18.5	2.7	40272	900	600

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

**KP/MKP 375 GENERALDATA**
**PITCH 22.5/27.5 mm**

**Specific reference data for the 2000 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: P = 22.5 mm P = 27.5 mm	$\leq 3 \times 10^{-4}$ $\leq 4 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	>10000 V/ $\mu$ s	
R between leads	>100000 M $\Omega$	
R between interconnected leads and case	>100000 M $\Omega$	
Ionization voltage (typical value) at 20 pC peak discharge	>600 V (AC)	

**Available 2000 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5$ mm	$\pm 5\%$	2222 375 40...	preferred
		$\pm 3.5\%$	2222 375 41...	on request
	$l_t = 5.0 \pm 1.0$ mm	$\pm 5\%$	2222 375 44...	on request
		$\pm 3.5\%$	2222 375 45...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 375 42...	on request
		$\pm 3.5\%$	2222 375 43...	on request

**Note**

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



# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 2000 \text{ V}; U_{Rac} = 600 \text{ V}/U_{p-p} = 1700 \text{ V}$ 

loose and taped

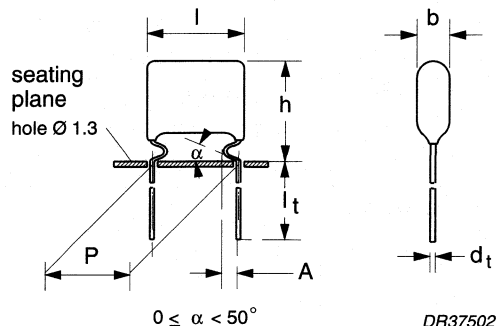
C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.5 \text{ mm}$	short leads	H = 16.0 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.003	6.0 × 19.0 × 26.0	2.2	40302	800	650
0.0033			40332		
0.0036			40362		
0.0039			40392		
0.0043	6.5 × 19.5 × 26.0	2.4	40432	750	600
0.0047			40472		
0.0051	7.0 × 20.0 × 26.0	2.6	40512	650	550
0.0056			40562		
0.0062	7.5 × 20.5 × 26.0	2.8	40622	600	500
0.0068	8.0 × 21.0 × 26.0	3.0	40682	550	500
0.0075			40752		
0.0082	8.5 × 21.5 × 26.0	3.2	40822	500	450
0.0091	9.0 × 22.0 × 26.0	3.5	40912	450	450
0.01	9.5 × 22.5 × 26.0	3.8	40103	400	400
<b>Pitch = <math>27.5 \pm 0.5 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; A = <math>2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.011	9.0 × 22.0 × 30.0	4.4	40113	550	450
0.012	9.5 × 22.5 × 30.0	4.6	40123	500	400
0.013	10.0 × 23.0 × 30.0	5.0	40133	500	400
0.015	10.5 × 23.5 × 30.0	5.4	40153	450	350
0.016	11.0 × 24.0 × 30.0	5.8	40163	400	350
0.018	11.5 × 24.5 × 30.0	6.2	40183	400	350
0.02	12.5 × 25.5 × 30.0	7.3	40203	350	300
0.022	13.0 × 26.0 × 30.0	8.1	40223	300	300

### Note

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

**KP/MKP 375 GENERALDATA**
**PITCH 22.5/27.5 mm**

**Fig.12 Outline.**
**Specific reference data for the 2500 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: P = 22.5 mm P = 27.5 mm	$\leq 3 \times 10^{-4}$ $\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 10 \times 10^{-4}$
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub>	>10000 V/μs	
R between leads	>100000 MΩ	
R between interconnected leads and case	>100000 MΩ	
Ionization voltage (typical value) at 20 pC peak discharge	>900 V (AC)	

**Available 2500 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ±0.5 mm	±5%	2222 375 91...	on request
		±3.5%	2222 375 91...	on request
	l <sub>t</sub> = 5.0 ±1.0 mm	±5%	2222 375 .....	on request
		±3.5%	2222 375 .....	on request
Taped on reel	H = 16.0 mm; note 1	±5%	2222 375 .....	on request
		±3.5%	2222 375 .....	on request

**Note**

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

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

 $U_{Rdc} = 2500 \text{ V}; U_{Rac} = 880 \text{ V}/U_{p-p} = 2500 \text{ V}$ 

loose

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 375 ..... AND PACKAGING					
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$					
			P = 22.5 $\pm$ 0.4 mm			P = 27.5 $\pm$ 0.4 mm		
			last 5 digits of catalogue number		SPQ	last 5 digits of catalogue number		SPQ
			C-tol = $\pm 5\%$	C-tol = $\pm 3.5\%$		C-tol = $\pm 5\%$	C-tol = $\pm 3.5\%$	
<b><math>d_t = 0.80 \pm 0.08 \text{ mm}; A = 2.5 +1.4/-0.5 \text{ mm}</math></b>								
0.001	7.0 $\times$ 20.0 $\times$ 30.0	3.7	91001	91002	800	91003	91004	800
0.0011			91005	91006		91007	91008	
0.0012			91011	91012		91013	91014	
0.0013			91015	91016		91017	91018	
0.0015			91021	91022		91023	91024	
0.0016			91025	91026		91027	91028	
0.0018			91031	91032		91033	91034	
0.0020			7.5 $\times$ 20.5 $\times$ 30.0	3.9		91035	91036	
0.0022	8.0 $\times$ 21.0 $\times$ 30.0	4.2	91041	91042	550	91043	91044	550
0.0024			91045	91046		91047	91048	
0.0025			91051	91052		91053	91054	
0.0027	8.5 $\times$ 21.5 $\times$ 30.0	4.4	91055	91056	550	91057	91058	550
0.0030	9.0 $\times$ 22.0 $\times$ 30.0	4.4	91061	91062	550	91063	91064	550
0.0033	9.5 $\times$ 22.5 $\times$ 30.0	4.6	91065	91066	500	91067	91068	500
0.0036	10.0 $\times$ 23.0 $\times$ 30.0	5.0	91071	91072	500	91073	91074	500
0.0039	10.5 $\times$ 23.5 $\times$ 30.0	5.4	91075	91076	450	91077	91078	450
0.0043	11.0 $\times$ 24.0 $\times$ 30.0	5.8	91081	91082	400	91083	91084	400
0.0047	11.5 $\times$ 24.5 $\times$ 30.0	6.2	91085	91086	400	91087	91088	400
0.0051	12.0 $\times$ 25.0 $\times$ 30.0	6.6	91091	91092	350	91093	91094	350
0.0056	12.5 $\times$ 25.5 $\times$ 30.0	7.0	91095	91096	350	91097	91098	350
0.0062	13.5 $\times$ 26.5 $\times$ 30.0	8.5	91101	91102	300	91103	91104	300
0.0068	14.0 $\times$ 27.5 $\times$ 30.0	10.0	91105	91106	300	91107	91108	300

# AC and pulse metallized polypropylene film capacitors

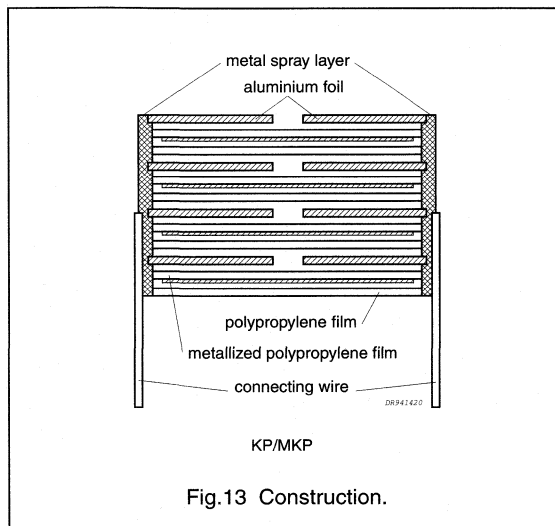
## KP/MKP 375

### CONSTRUCTION

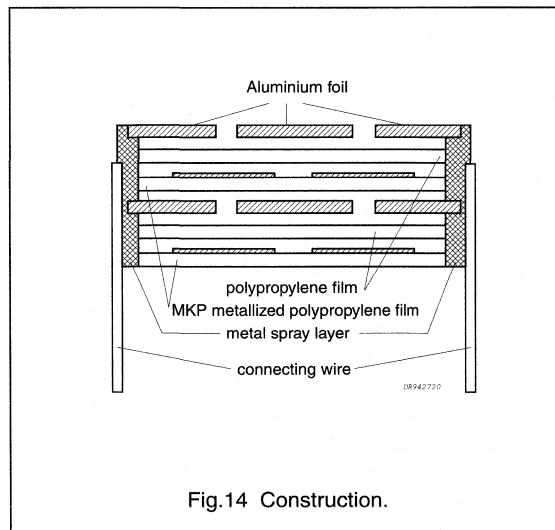
#### Description

- Series-constructed, impregnated polypropylene film, aluminium foil and metallized internal electrode
- Protected by a hard, water-repellent, solvent-resistant epoxy lacquer
- Radial copper leads, solder-coated.

FOR KP/MKP 630 V - 2000 V



FOR KP/MKP 2500 V



### Mounting

#### NORMAL USE

The capacitors are designed for printed-circuit boards applications. 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 this handbook, Chapter "Packaging".

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

- For pitches of  $\leq 15$  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  $23 \pm 1$  °C, an atmospheric pressure of 86 to 106 kPa and a relative humidity of  $50 \pm 2\%$ .

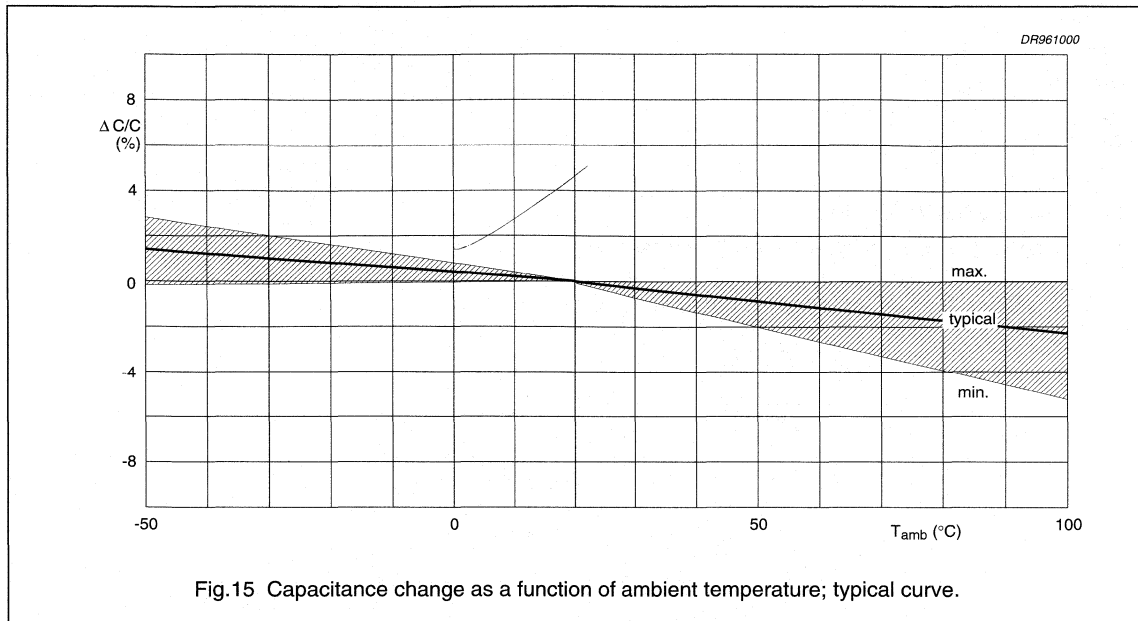
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

# AC and pulse metallized polypropylene film capacitors

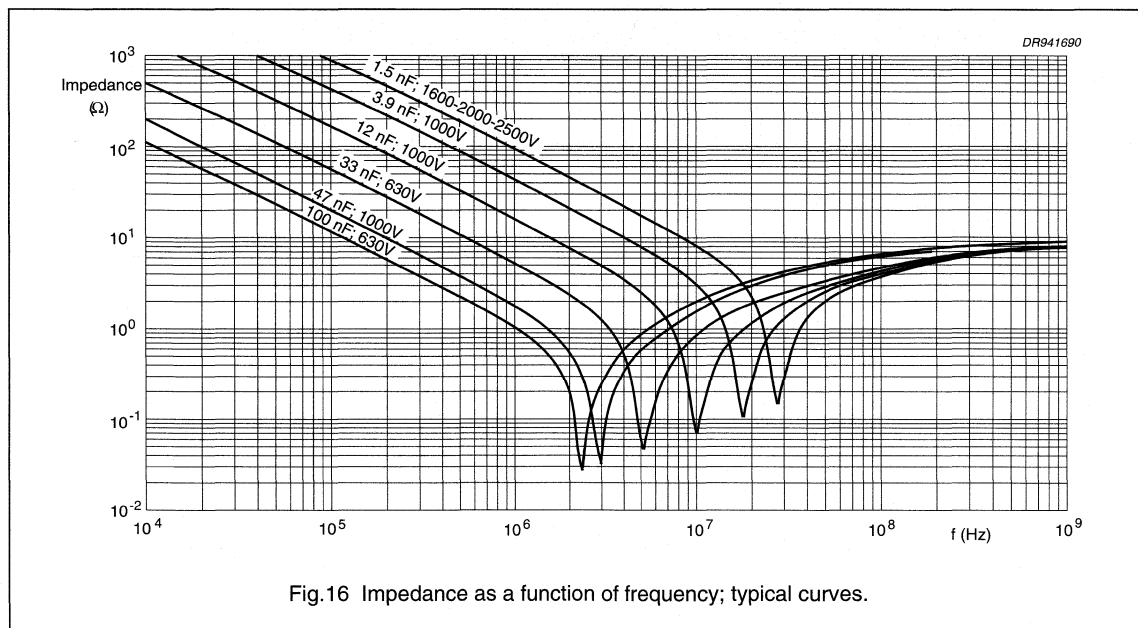
KP/MKP 375

## Capacitance

All capacitance values are specified at 1 kHz.



## Impedance



# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

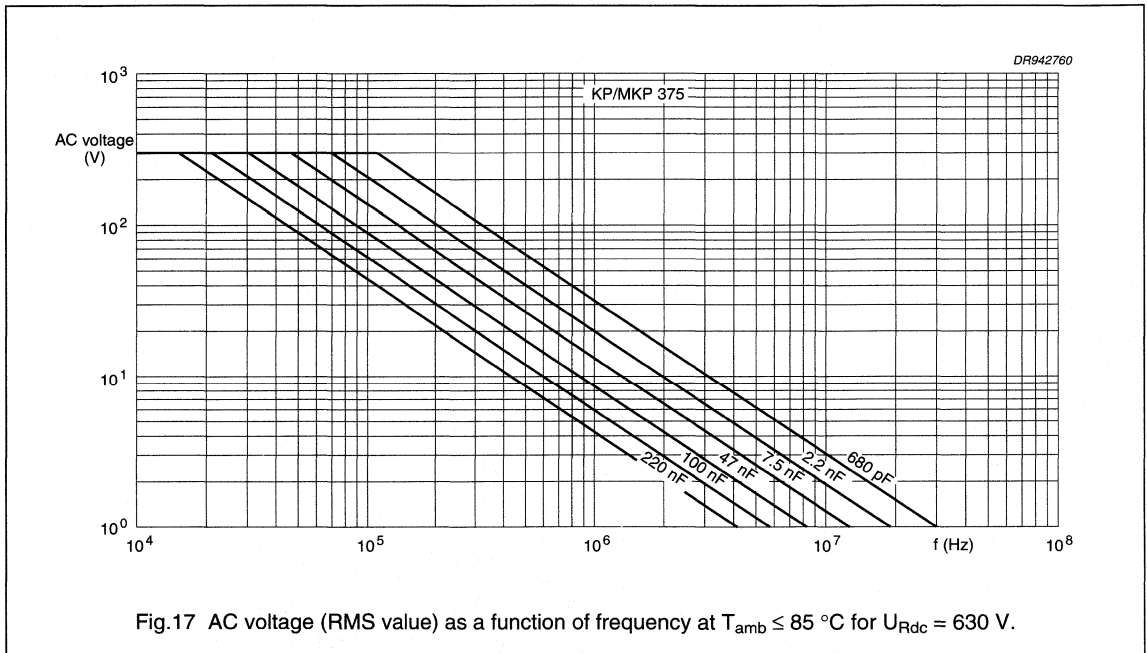
### Temperature

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

### Voltage

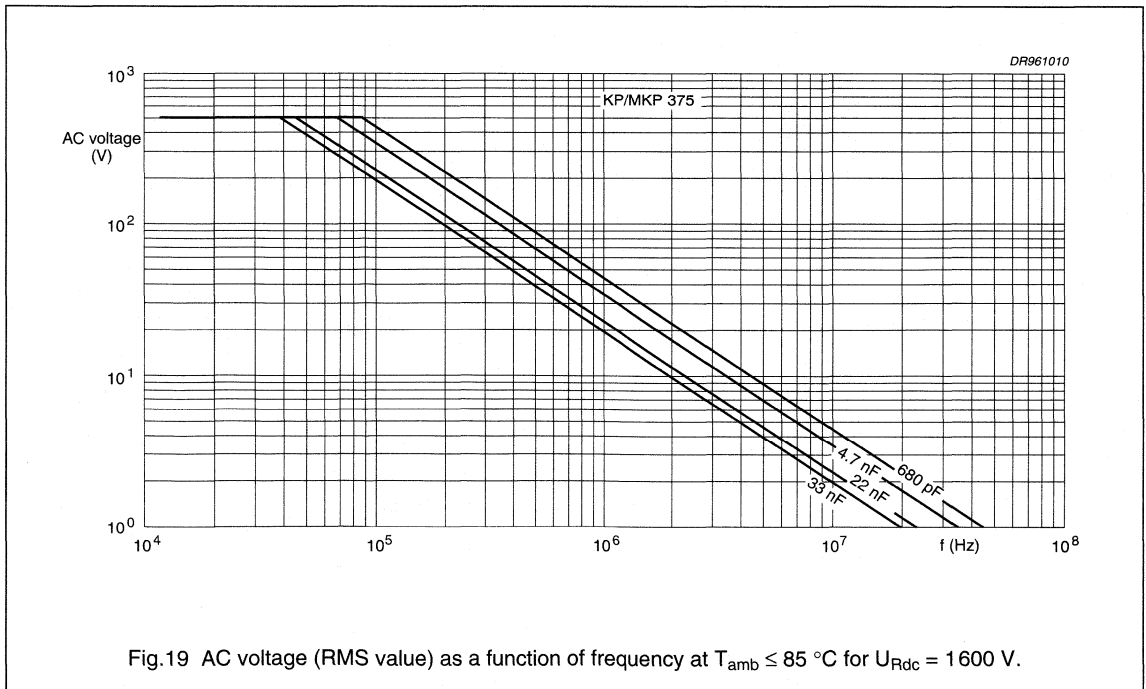
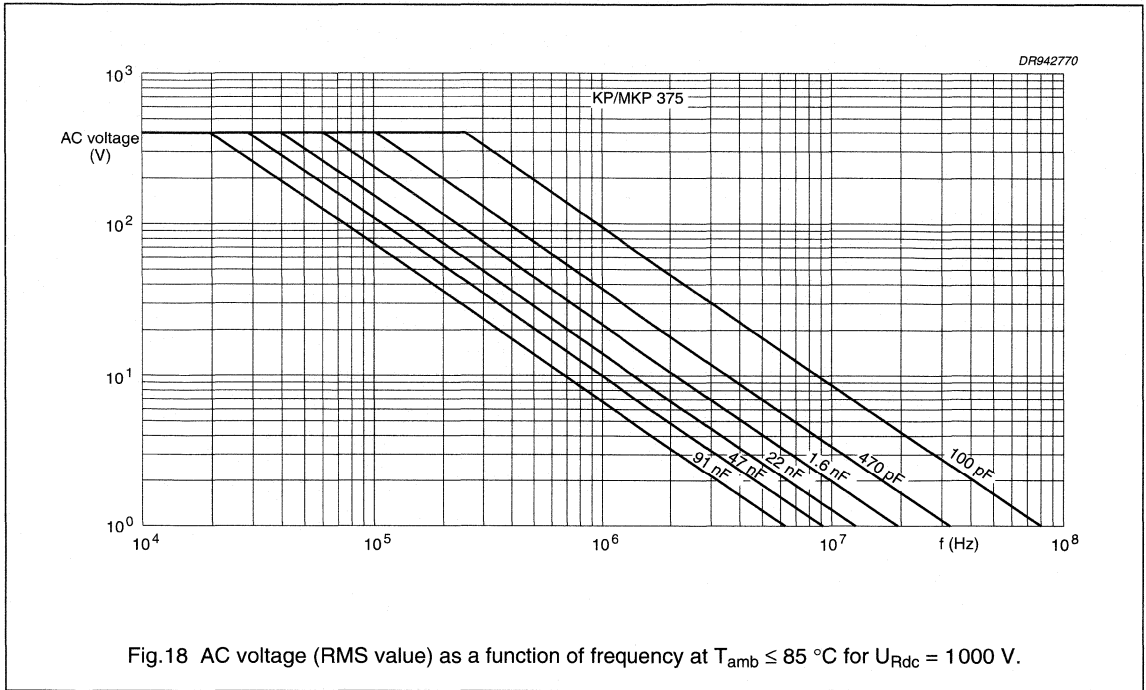
- Category voltage:
  - $U_{\text{cdc}} = 0.7 \times U_{\text{Rdc}}$  for  $T = 100$  °C
  - $U_{\text{cac}} = 0.7 \times U_{\text{Rac}}$  for  $T = 100$  °C
- Test voltage between leads:
  - $1.6 \times U_{\text{Rdc}}$
  - $1.4 \times U_{\text{Rdc}}$  for 2500 V (KP/MKP)
- Test voltage between interconnected leads and case (foil method): 2840 V (DC).

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



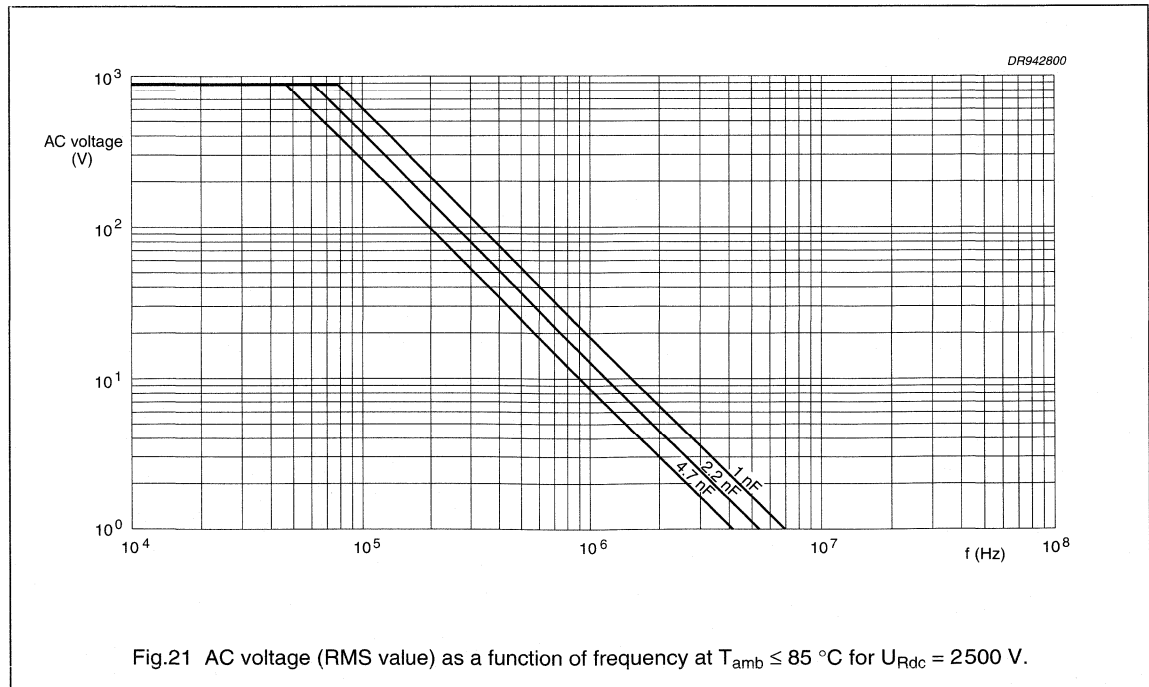
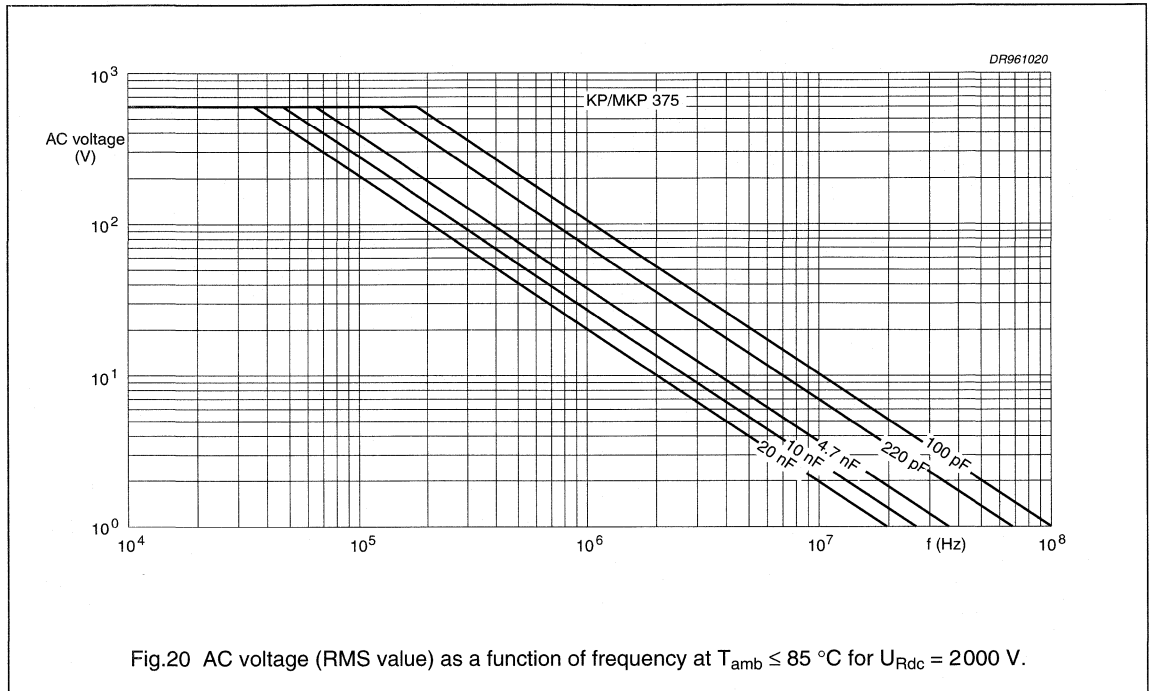
# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375



# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375





# AC and pulse metallized polypropylene film capacitors

KP/MKP 375

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

The maximum RMS voltage in Figs 17 to 21 has to be multiplied by a factor given in Fig.22.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 26 and 27.

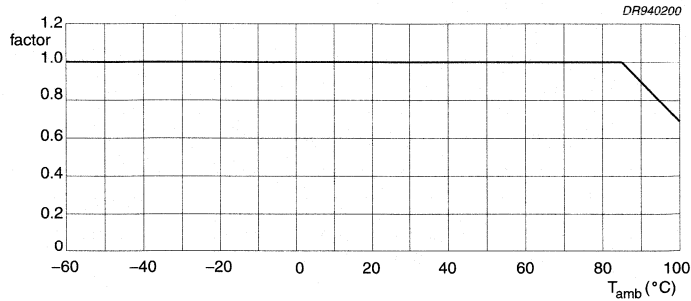


Fig.22 Multiplying factor as a function of temperature.

### Tangent of loss angle; see Figs 23 and 24

PITCH (mm)	kHz	TANGENT OF LOSS ANGLE				
		630 V	1 000 V	1 600 V	2 000 V	2 500 V
10	10	$\leq 6 \times 10^{-4}$	$\leq 6 \times 10^{-4}$	—	—	—
	100	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	—	—	—
15	10	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	—
	100	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	—
22.5	10	$\leq 4 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$
	100	$\leq 15 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
27.5	10	$\leq 4 \times 10^{-4}$	$\leq 4 \times 10^{-4}$	$\leq 4 \times 10^{-4}$	$\leq 4 \times 10^{-4}$	$\leq 3 \times 10^{-4}$
	100	$\leq 20 \times 10^{-4}$	$\leq 15 \times 10^{-4}$	$\leq 15 \times 10^{-4}$	$\leq 15 \times 10^{-4}$	$\leq 10 \times 10^{-4}$

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

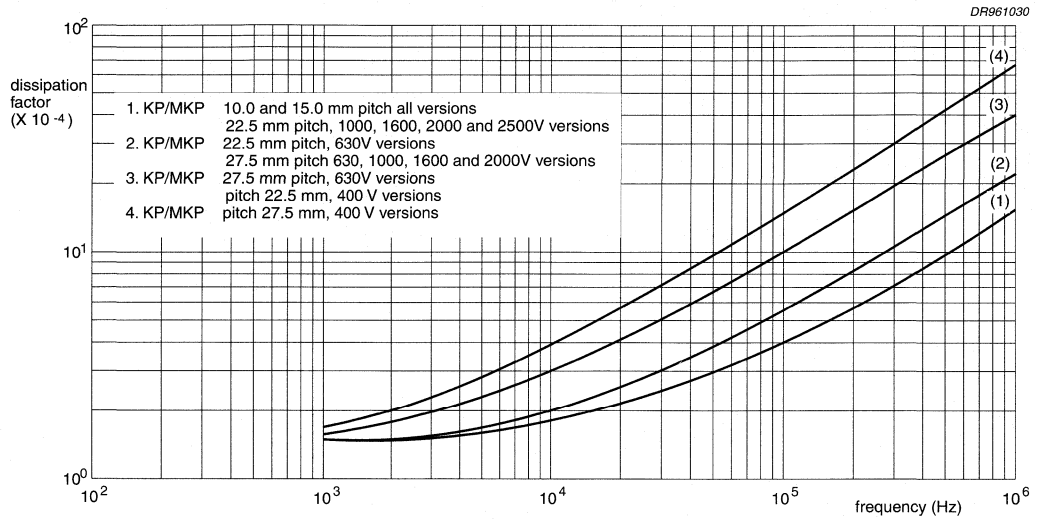


Fig.23 Tangent of loss angle as a function of frequency; typical curves.

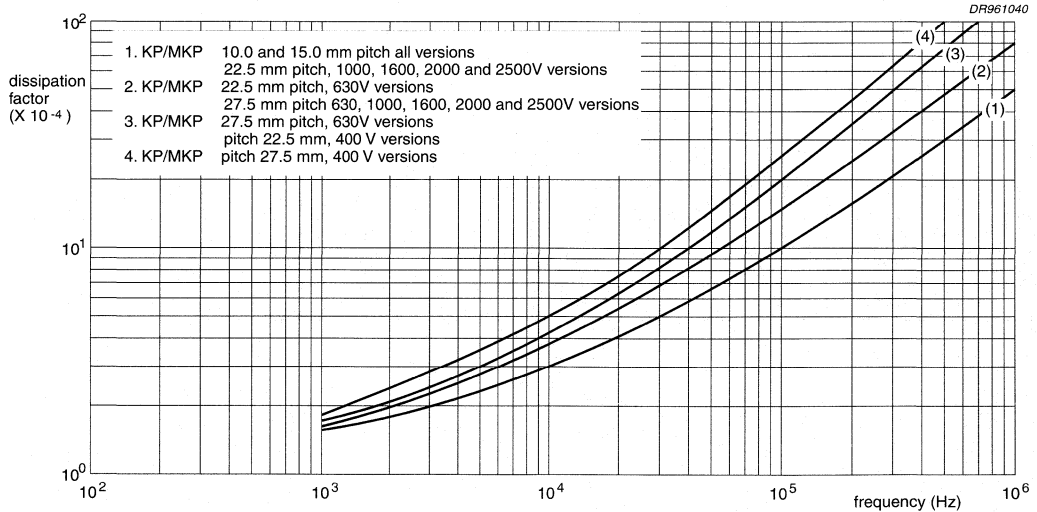


Fig.24 Tangent of loss angle as a function of frequency; maximum curves.

# AC and pulse metallized polypropylene film capacitors

KP/MKP 375

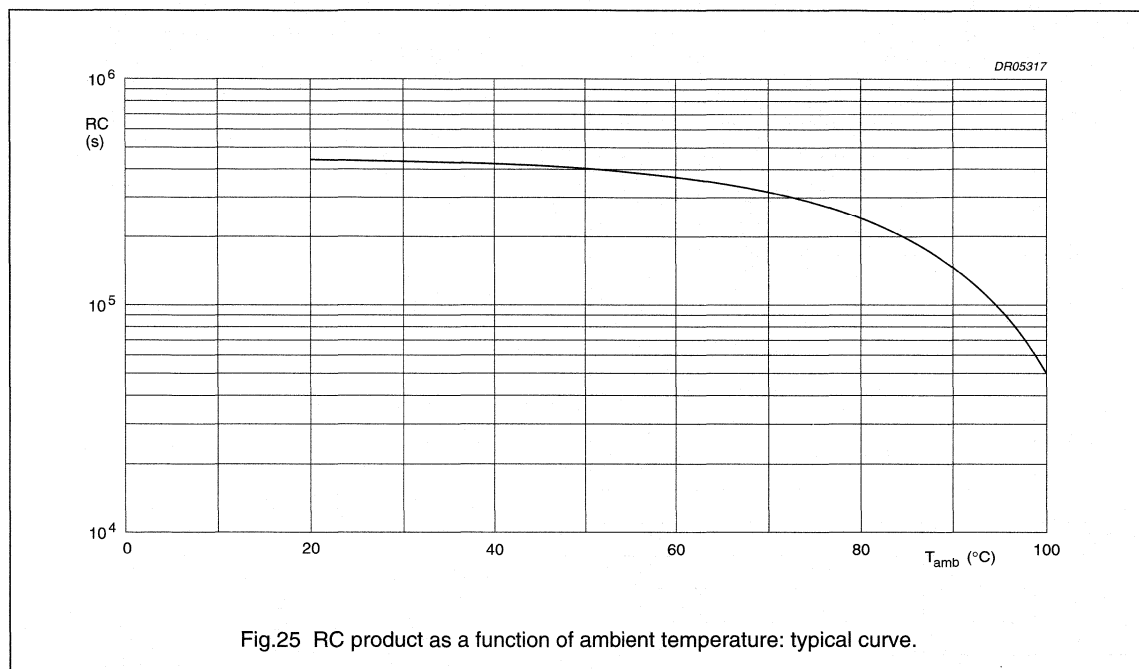
## Rated voltage pulse slope $(dU/dt)_R$

$>10\,000\text{ V}/\mu\text{s}$  (limited by network conditions).

## Insulation resistance

The insulation resistance is measured after a voltage of  $500 \pm 50\text{ V}$  has been applied for 1 minute  $\pm 5$  seconds, at  $T_{\text{amb}} = 20\text{ }^\circ\text{C}$ :

- R between leads  $>100\,000\text{ M}\Omega$ .



# AC and pulse metallized polypropylene film capacitors

KP/MKP 375

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Figs 26 and 27)

b <sub>max</sub> (mm)	PITCH (mm)			
	10	15	22.5	27.5
4.0	1	3	—	—
4.5	2	4	—	—
5.0	3	4	9	10
5.5	4	5	10	11
6.0	4	5	10	11
6.5	5	6	11	12
7.0	—	6	11	12
7.5	—	7	12	13
8.0	—	7	12	14
8.5	—	8	13	14
9.0	—	8	13	15
9.5	—	9	14	15
10.0	—	9	14	16
10.5	—	—	14	17
11.0	—	—	—	17
11.5	—	—	—	18
12.0	—	—	—	18
12.5	—	—	—	19
13.0	—	—	—	19
13.5	—	—	—	19
14.0	—	—	—	19
14.5	—	—	—	20
15.0	—	—	—	20
15.5	—	—	—	21
16.0	—	—	—	21

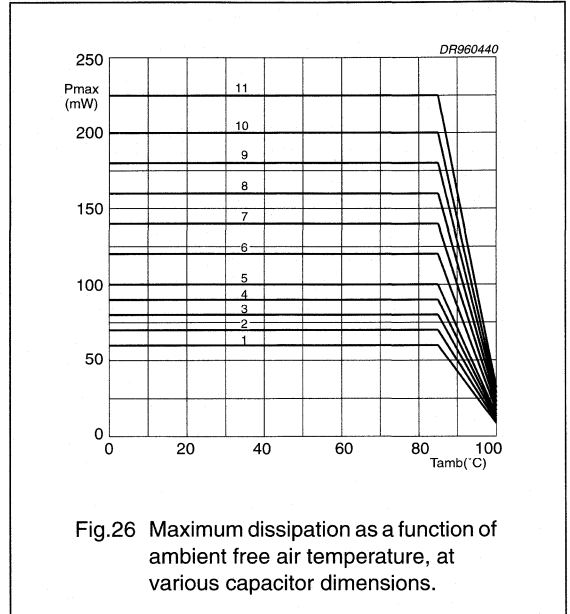


Fig.26 Maximum dissipation as a function of ambient free air temperature, at various capacitor dimensions.

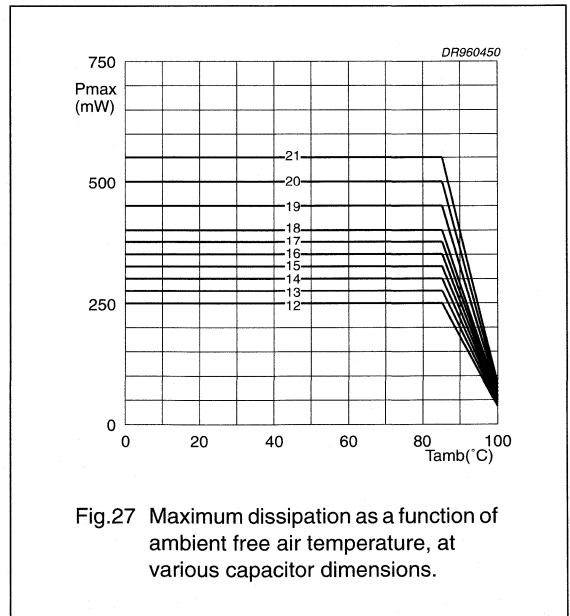


Fig.27 Maximum dissipation as a function of ambient free air temperature, at various capacitor dimensions.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

### Application notes<sup>(1)</sup>

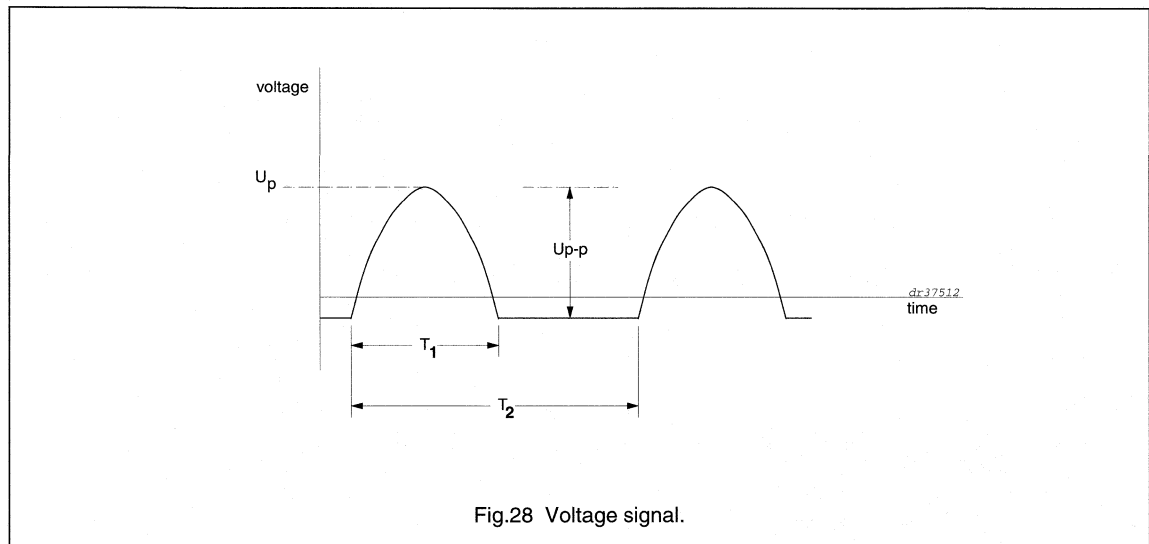
To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. There is no limit for the peak current ( $I_p$ ) or voltage pulse slope ( $dU/dt$ ) in the application.
4. The dissipated power shall not be greater than the maximum permissible power dissipation as stated in Figs 26 and 27.
5. The free air ambient temperature for the capacitor does not exceed the category temperature (= maximum application temperature).

Example:  $C = 10 \text{ nF} - 1600 \text{ V}$ , KP/MKP - type used for the voltage signal in Fig.28.

This is a half sinewave pulse with:  $U_{p-p} = 1200 \text{ V}$ ;  $U_p = 1100 \text{ V}$ ;  $T_1 = 12 \text{ } \mu\text{s}$ ;  $T_2 = 64 \text{ } \mu\text{s}$ .

The ambient temperature is  $50 \text{ }^\circ\text{C}$ .



### Checking the conditions

1. The peak voltage  $U_p = 1100 \text{ V}$  is lower than  $1600 \text{ V}$  (DC).
2. The peak-to-peak voltage  $1200 \text{ V}$  is lower than  $2 \times \sqrt{2} \times 500 \text{ V}$  (AC) =  $1414 U_{p-p}$ .
3. The voltage pulse slope: of no consideration.
4. The dissipated power is  $170 \text{ mW}$  as calculated with Fourier terms.  
This is less than  $340 \text{ mW}$ , allowed for a capacitor with dimensions:  $b_{\max} = 8 \text{ mm}$  and pitch =  $22.5 \text{ mm}$ .
5. The free air ambient temperature is more than  $50 \text{ }^\circ\text{C}$  and lower than  $100 \text{ }^\circ\text{C}$ .

(1) Peak-to-peak current tables for S-correction application, are available on request.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

### MARKING

#### Product marking

CAPACITORS WITH PITCH 10 TO 27.5 mm

The capacitors are marked in black ink on the top with the following information:

1. Capacitance code in accordance with "IEC 62"
2. Capacitance tolerance: J =  $\pm 5\%$ ; A = 3.5%
3. Rated peak-to-peak voltage (e.g. 1700 V<sub>p-p</sub>)
4. Manufacturer's type designation (375)
5. Code for dielectric material (KP/MKP)
6. Manufacturer's emblem
7. Year and month of manufacturing code (only for pitch  $\geq 22.5$  mm).

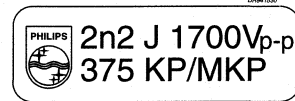


Fig.29 Example of marking.

#### Package marking

The package containing the capacitors is marked as shown in Fig.30.

LINE	MARKING EXPLANATION
1.	Manufacturer's name
2.	Country of origin
3.	Sub-family
4.	Type description
5.	Capacitance value, tolerance, rated DC-voltage and climatic category ("IEC 68-1")
6.	Rated peak-to-peak voltage
7.	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO
8.	Product type description
9.	Quantity and production period, year and week code
10.	Product code (12NC)

Fig.30 Barcode label.

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

### 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  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 1\% + 5 \text{ pF}$
Component solvent resistance		$\Delta \tan \delta \leq 5 \times 10^{-4}$
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours	$ \Delta C/C  \leq 2\%$ ( $C > 0.0056 \mu\text{F}$ ) $ \Delta C/C  \leq 3\% + 5 \text{ pF}$ ( $C \leq 0.0056 \mu\text{F}$ )
Shock: "IEC 68-2-27"	half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$\Delta \tan \delta \leq 5 \times 10^{-4}$
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 100 °C	$ \Delta C/C  \leq 3\% + 5 \text{ pF}$
Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30"	2 hours; -55 °C	$\Delta \tan \delta \leq 10 \times 10^{-4}$
Cold: "IEC 68-2-1"		$R_{\text{ins}} \geq 50\%$ of specified value
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		

# AC and pulse metallized polypropylene film capacitors

## KP/MKP 375

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 1\% + 5 \text{ pF}$ $\Delta \tan \delta \leq 5 \times 10^{-4}$ $R_{\text{ins}} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-17"	1000 hours; 85 °C $1.25 \times U_{\text{Rac}}$ (RMS); 50 Hz	$ \Delta C/C  \leq 2\%$ ( $C > 0.0056 \mu\text{F}$ ) $ \Delta C/C  \leq 3\% + 5 \text{ pF}$ ( $C \leq 0.0056 \mu\text{F}$ ) $\Delta \tan \delta \leq 10 \times 10^{-4}$ $R_{\text{ins}} \geq 50\%$ of specified value
Heat storage: "IEC 384-17"	2000 hours; 100 °C	$ \Delta C/C  \leq 3\%$ ( $C > 0.0056 \mu\text{F}$ ) $ \Delta C/C  \leq 5\% + 5 \text{ pF}$ ( $C \leq 0.0056 \mu\text{F}$ ) $\Delta \tan \delta \leq 10 \times 10^{-4}$
Resistance to soldering heat with preheating: "IEC 384-17"	body temperature: 100 °C; bath temperature: 260 °C; dwell time: 10 s	$ \Delta C/C  \leq 2\% + 5 \text{ pF}$ $\Delta \tan \delta \leq 5 \times 10^{-4}$
Passive flammability: "IEC 695-2-2"	class C	no burning
Endurance (DC): "IEC 384-17"	2000 hours: $1.25 \times U_{\text{Rdc}}$ ; 85 °C $1.25 \times U_{\text{Cdc}}$ ; 100 °C	$ \Delta C/C  \leq 3\%$ ( $C > 0.0056 \mu\text{F}$ ) $ \Delta C/C  \leq 4\% + 5 \text{ pF}$ ( $C \leq 0.0056 \mu\text{F}$ ) $\Delta \tan \delta \leq 10 \times 10^{-4}$ $R_{\text{ins}} \geq 50\%$ of specified value

### Note

- For detailed information, see "Type specification".

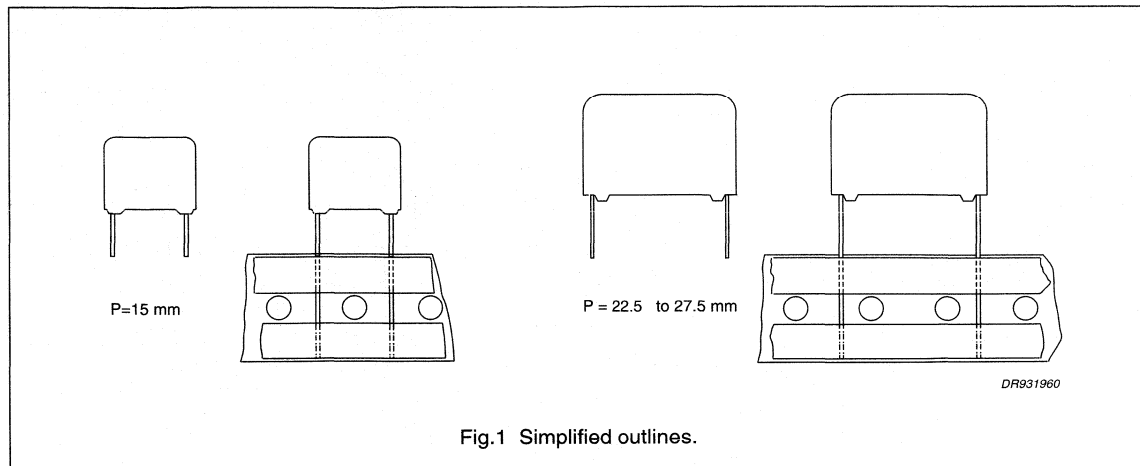


# AC and pulse metallized polypropylene film capacitors

## KP 376 KP/MMKP 376

KP AND KP/MMKP RADIAL POTTED CAPACITORS

PITCH 15/22.5/27.5 mm



### FEATURES

- 15.0 to 27.5 mm lead pitch
- Supplied loose in box and taped on reel.

### APPLICATIONS

- Where high currents and steep pulses occur
- For deflection circuits in television receivers.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E24 series)	0.001 to 0.82 $\mu$ F
Capacitance tolerance	$\pm 5\%$ ; $\pm 3.5\%$
Rated voltage (DC)	250 V; 630 V; 1000 V; 1600 V; 2000 V
Rated voltage (AC)	125 V; 300 V; 400 V; 500 V; 600 V
Rated peak-to-peak voltage	350 V; 850 V; 1100 V; 1400 V; 1700 V
Climatic category	55/100/56
Maximum application temperature	100 °C
Rated temperature	85 °C
Reference specification	IEC 384-13 for 250 V version IEC 384-17 for 630 V to 2000 V versions
Performance grade, 630 to 2000 V versions: for $C > 4.7$ nF for $C \leq 4.7$ nF	grade 1 (long life) grade 2 (general purpose)
Stability grade, 630 to 2000 V versions	grade 2
Stability class, 250 version	class 3

# AC and pulse metallized polypropylene film capacitors

## KP 376 KP/MMKP 376

### KP 376 GENERAL DATA

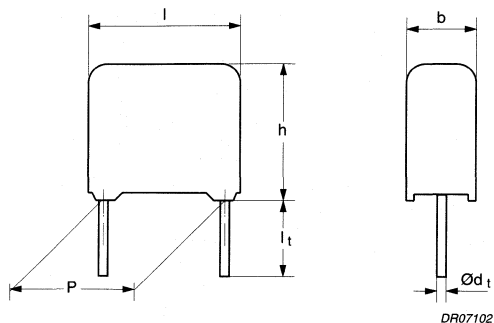
**PITCH 27.5 mm**


Fig.2 Outline.

### Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: P = 27.5 mm	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	$> 400 \text{ V (AC)}$	

### Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 376 42...	on request
	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 376 48...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 376 45...	on request

### Note

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

# AC and pulse metallized polypropylene film capacitors

## KP 376

 $U_{Rdc} = 250 \text{ V}; U_{Rac} = 125 \text{ V}/U_{p-p} = 350 \text{ V}$ 
**loose and taped**

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 376 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.22	$9.0 \times 19.0 \times 31.0$	6.2	42224	100	400
0.24	$11.0 \times 21.0 \times 31.0$	8.3	42244	100	300
0.27		8.3	42274		
0.3		9.0	42304		
0.33	$13.0 \times 23.0 \times 31.0$	11.0	42334	100	250
0.36		11.0	42364		
0.39		11.0	42394		
0.43		11.0	42434		
0.47		11.5	42474		
0.51	$15.0 \times 25.0 \times 31.0$	14.2	42514	100	200
0.56		14.2	42564		
0.62	$18.0 \times 28.0 \times 31.0$	19.0	42624	100	150
0.68		19.0	42684		
0.75		19.0	42754		
0.82		19.5	42824		

# AC and pulse metallized polypropylene film capacitors

## KP 376 KP/MMKP 376

### KP/MMKP 376 GENERAL DATA

### PITCH 15/22.5/27.5 mm

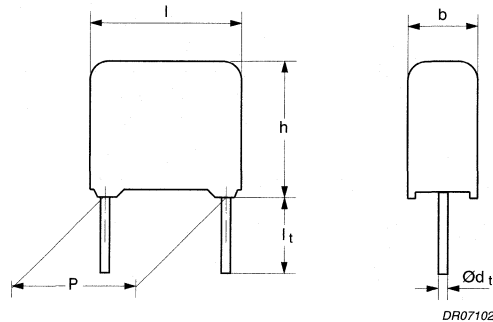


Fig.3 Outline.

### Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
P = 15.0 mm	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
P = 22.5 mm	$\leq 3 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
P = 27.5 mm	$\leq 4 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	$> 400 \text{ V (AC)}$	

### Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 376 62...	on request
		$\pm 3.5\%$	2222 376 63...	on request
	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 376 68...	on request
		$\pm 3.5\%$	2222 376 69...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 5\%$	2222 376 65...	on request
		$\pm 3.5\%$	2222 376 66...	on request

### Note

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

# AC and pulse metallized polypropylene film capacitors

## KP/MMKP 376

 $U_{Rdc} = 630 \text{ V}; U_{Rac} = 300 \text{ V}/U_{p-p} = 850 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 376 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = 15.0 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.0068 0.0075 0.0082 0.0091	5.0 $\times$ 11.0 $\times$ 17.5	1.1	62682 62752 62822 62912	1000	1100
0.01 0.011 0.012 0.013	6.0 $\times$ 12.0 $\times$ 17.5	1.5	62103 62113 62123 62133	1000	900
0.015 0.016 0.018	7.0 $\times$ 13.5 $\times$ 17.5	2.0	62153 62163 62183	1000	800
0.02 0.022	8.5 $\times$ 15.0 $\times$ 17.5	2.6	62203 62223	1000	650
<b>Pitch = 22.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.024 0.027 0.03	6.0 $\times$ 15.5 $\times$ 26.0	2.8	62243 62273 62303	200	600
0.033 0.036 0.039	7.0 $\times$ 16.5 $\times$ 26.0	3.5	62333 62363 62393	200	550
0.043 0.047 0.051 0.056	8.5 $\times$ 18.0 $\times$ 26.0	4.5 4.5 4.5 5.1	62433 62473 62513 62563	200	450
<b>Pitch = 27.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.062 0.068 0.075	9.0 $\times$ 19.0 $\times$ 31.0	6.2	62623 62683 62753	100	400
0.082 0.091 0.1 0.11	11.0 $\times$ 21.0 $\times$ 31.0	8.3	62823 62913 62104 62114	100	300
0.12 0.13 0.15 0.16	13.0 $\times$ 23.0 $\times$ 31.0	10.8	62124 62134 62154 62164	100	250
0.18 0.2	15.0 $\times$ 25.0 $\times$ 31.0	13.0	62184 62204	100	200
0.22 0.24 0.27	18.0 $\times$ 28.0 $\times$ 31.0	19.0	62224 62244 62274	100	150

# AC and pulse metallized polypropylene film capacitors

## KP 376 KP/MMKP 376

### KP/MMKP 376 GENERAL DATA

### PITCH 15/22.5/27.5 mm

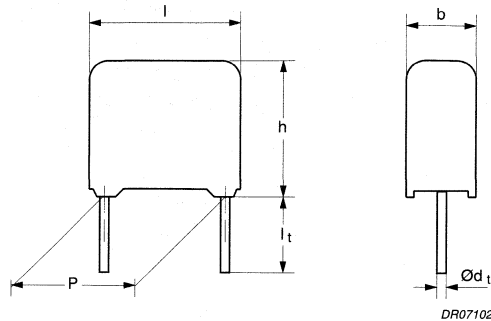


Fig.4 Outline.

### Specific reference data for the 1000 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
P = 15.0 mm	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
P = 22.5 mm	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
P = 27.5 mm	$\leq 3 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	$> 500 \text{ V (AC)}$	

### Available 1000 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 376 72...	on request
		$\pm 3.5\%$	2222 376 73...	on request
	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 376 78...	on request
		$\pm 3.5\%$	2222 376 79...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 5\%$	2222 376 75...	on request
		$\pm 3.5\%$	2222 376 76...	on request

### Note

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

# AC and pulse metallized polypropylene film capacitors

## KP/MMKP 376

 $U_{Rdc} = 1000 \text{ V}^{(1)}$ ;  $U_{Rac} = 400 \text{ V}/U_{p-p} = 1100 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 376 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = 15.0 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.0047 0.0051 0.0056	5.0 $\times$ 11.0 $\times$ 17.5	1.1	72472	1000	1100
			72512		
			72562		
0.0062 0.0068 0.0075 0.0082	6.0 $\times$ 12.0 $\times$ 17.5	1.5	72622	1000	900
			72682		
			72752		
			72822		
0.0091 0.01 0.011 0.012	7.0 $\times$ 13.5 $\times$ 17.5	2.0	72912	1000	800
			72103		
			72113		
			72123		
<b>Pitch = 22.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.013	6.0 $\times$ 15.5 $\times$ 26.0	2.8	72133	200	600
0.015 0.016 0.018	7.0 $\times$ 16.5 $\times$ 26.0	3.5	72153	200	550
			72163		
			72183		
0.02 0.022 0.024 0.027 0.03 0.033 0.036	8.5 $\times$ 18.0 $\times$ 26.0	4.5	72203	200	450
			72223		
			72243		
			72273		
			72303		
			72333		
			72363		
0.039	10.0 $\times$ 19.5 $\times$ 26.0	5.4	72393	200	350
<b>Pitch = 27.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.043 0.047 0.051	9.0 $\times$ 19.0 $\times$ 31.0	6.2	72433	100	400
			72473		
			72513		
0.056 0.062 0.068 0.075	11.0 $\times$ 21.0 $\times$ 31.0	8.3	72563	100	300
			72623		
			72683		
			72753		
0.082 0.091 0.1	13.0 $\times$ 23.0 $\times$ 31.0	10.8	72823	100	250
			72913		
			72104		
0.11 0.12 0.13 0.15	15.0 $\times$ 25.0 $\times$ 31.0	13.0	72114	100	200
			72124		
			72134		
			72154		
0.16 0.18	18.0 $\times$ 28.0 $\times$ 31.0	19.0	72164	100	150
			72184		

### Note

1. For  $C \geq 0.11 \mu\text{F}$ :  $U_{Rdc} = 1000 - 2.75 (C - 100) \text{ V}$  (C in nF). Capacitors are still marked with 1000 V.

# AC and pulse metallized polypropylene film capacitors

# KP 376 KP/MMKP 376

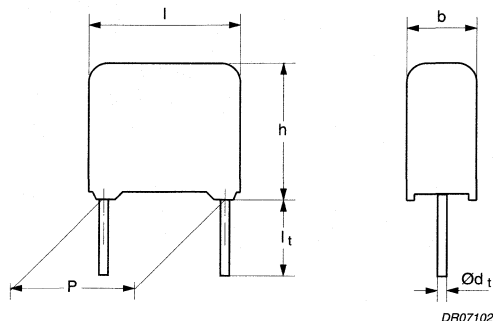
**KP/MMKP 376 GENERAL DATA**
**PITCH 15/22.5/27.5 mm**


Fig.5 Outline.

**Specific reference data for the 1600 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
P = 15.0 mm	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
P = 22.5 mm	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
P = 27.5 mm	$\leq 3 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	$> 10000 \text{ V}/\mu\text{s}$	
R between leads	$> 100000 \text{ M}\Omega$	
R between interconnected leads and case	$> 100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 20 pC peak discharge	$> 550 \text{ V (AC)}$	

**Available 1600 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 376 82...	on request
		$\pm 3.5\%$	2222 376 83...	on request
	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 376 88...	on request
		$\pm 3.5\%$	2222 376 89...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 376 85...	on request
		$\pm 3.5\%$	2222 376 86...	on request

**Note**

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



# AC and pulse metallized polypropylene film capacitors

## KP/MMKP 376

 $U_{Rdc} = 1600 \text{ V}; U_{Rac} = 500 \text{ V}/U_{p-p} = 1400 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 376 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = 15.0 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.0018	5.0 $\times$ 11.0 $\times$ 17.5	1.1	82182	1000	1 100
0.002	6.0 $\times$ 12.0 $\times$ 17.5	1.5	82202	1000	900
0.0022			82222		
0.0024			82242		
0.0027	7.0 $\times$ 13.5 $\times$ 17.5	2.0	82272	1000	800
0.003			82302		
0.0033			82332		
0.0036	8.5 $\times$ 15.0 $\times$ 17.5	2.6	82362	1000	650
0.0039			82392		
0.0043			82432		
0.0047			82472		
<b>Pitch = 22.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.0051	6.0 $\times$ 15.5 $\times$ 26.0	2.8	82512	200	600
0.0056			82562		
0.0062			82622		
0.0068			82682		
0.0075	7.0 $\times$ 16.5 $\times$ 26.0	3.5	82752	200	550
0.0082			82822		
0.0091			82912		
0.01	8.5 $\times$ 18.0 $\times$ 26.0	4.5	82103	200	450
0.011			82113		
0.012			82123		
0.013			82133		
0.015	10.0 $\times$ 19.5 $\times$ 26.0	5.4	82153	200	350
<b>Pitch = 27.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.016	9.0 $\times$ 19.0 $\times$ 31.0	6.2	82163	100	400
0.018	11.0 $\times$ 21.0 $\times$ 31.0	7.4	82183	100	300
0.02			82203		
0.022			82223		
0.024			82243		
0.027	13.0 $\times$ 23.0 $\times$ 31.0	10.2	82273	100	250
0.03			82303		
0.033			82333		
0.036			82363		
0.039	15.0 $\times$ 25.0 $\times$ 31.0	13.0	82393	100	200
0.043			82433		
0.047			82473		
0.051	18.0 $\times$ 28.0 $\times$ 31.0	19.0	82513	100	150
0.056			82563		

AC and pulse  
metallized polypropylene film capacitors

KP 376  
KP/MMKP 376

KP/MMKP 376 GENERAL DATA

PITCH 15/22.5/27.5 mm

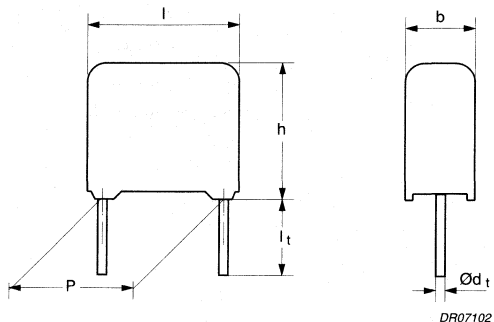


Fig.6 Outline.

Specific reference data for the 2000 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
P = 15.0 mm	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
P = 22.5 mm	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
P = 27.5 mm	$\leq 3 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	>10000 V/ $\mu$ s	
R between leads	>100000 M $\Omega$	
R between interconnected leads and case	>100000 M $\Omega$	
Ionization voltage (typical value) at 20 pC peak discharge	>600 V (AC)	

Available 2000 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 5.0 \pm 1.0$ mm	$\pm 5\%$	2222 376 92...	on request
		$\pm 3.5\%$	2222 376 93...	on request
	$l_t = 3.5 \pm 0.3$ mm	$\pm 5\%$	2222 376 98...	on request
		$\pm 3.5\%$	2222 376 99...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 376 95...	on request
		$\pm 3.5\%$	2222 376 96...	on request

Note

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

# AC and pulse metallized polypropylene film capacitors

## KP/MMKP 376

 $U_{Rdc} = 2000 \text{ V}; U_{Rac} = 600 \text{ V}/U_{p-p} = 1700 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 376 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = 15.0 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.001 0.0011	5.0 $\times$ 11.0 $\times$ 17.5	1.1	92102 92112	1000	1100
0.0012 0.0013 0.0015 0.0016	6.0 $\times$ 12.0 $\times$ 17.5	1.5	92122 92132 92152 92162	1000	900
0.0018 0.002	7.0 $\times$ 13.5 $\times$ 17.5	2.0	92182 92202	1000	800
0.0022 0.0024 0.0027 0.003	8.5 $\times$ 15.0 $\times$ 17.5	2.6	92222 92242 92272 92302	1000	650
<b>Pitch = 22.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.0033 0.0036 0.0039	6.0 $\times$ 15.5 $\times$ 26.0	2.8	92332 92362 92392	200	600
0.0043 0.0047 0.0051	7.0 $\times$ 16.5 $\times$ 26.0	3.5	92432 92472 92512	200	550
0.0056 0.0062 0.0068 0.0075 0.0082	8.5 $\times$ 18.0 $\times$ 26.0	4.5	92562 92622 92682 92752 92822	200	450
0.0091 0.01	10.0 $\times$ 19.5 $\times$ 26.0	5.4	92912 92103	200	350
<b>Pitch = 27.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.011 0.012 0.013 0.015	11.0 $\times$ 21.0 $\times$ 31.0	7.4	92113 92123 92133 92153	100	300
0.016 0.018 0.02 0.022	13.0 $\times$ 23.0 $\times$ 31.0	10.2	92163 92183 92203 92223	100	250
0.024 0.027	15.0 $\times$ 25.0 $\times$ 31.0	13.0	92243 92273	100	200
0.03 0.033	18.0 $\times$ 28.0 $\times$ 31.0	19.0	92303 92333	100	150

# AC and pulse metallized polypropylene film capacitors

KP 376  
KP/MMKP 376

## CONSTRUCTION

### Description

- Low-inductive wound cell of aluminium foil and polypropylene 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.

### 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 this handbook, Chapter "Packaging".

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

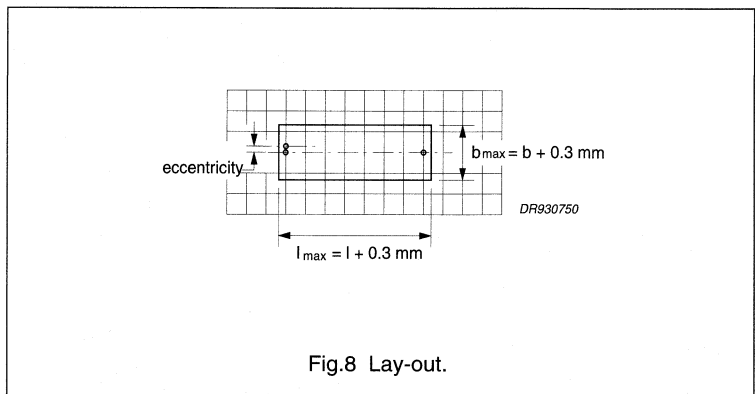
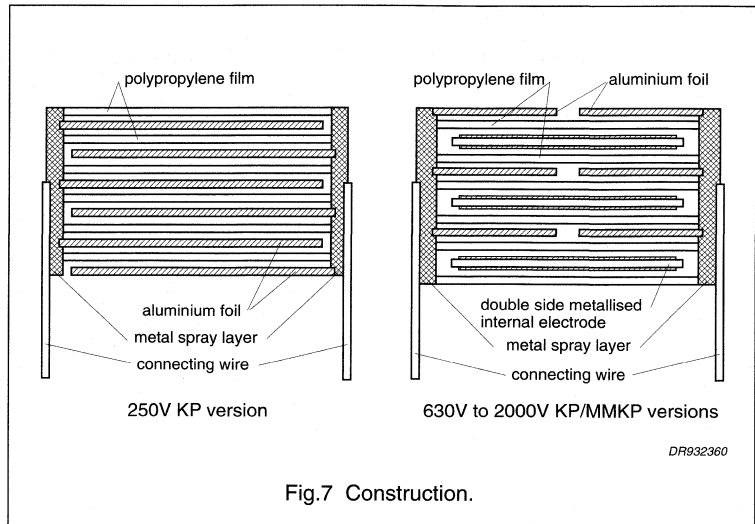
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

- For pitches of  $\leq 15$  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 Fig.8:

- Eccentricity as in Fig.8. 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:  $h_{\max} \leq h + 0.3$  mm.



## RATINGS AND CHARACTERISTICS

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

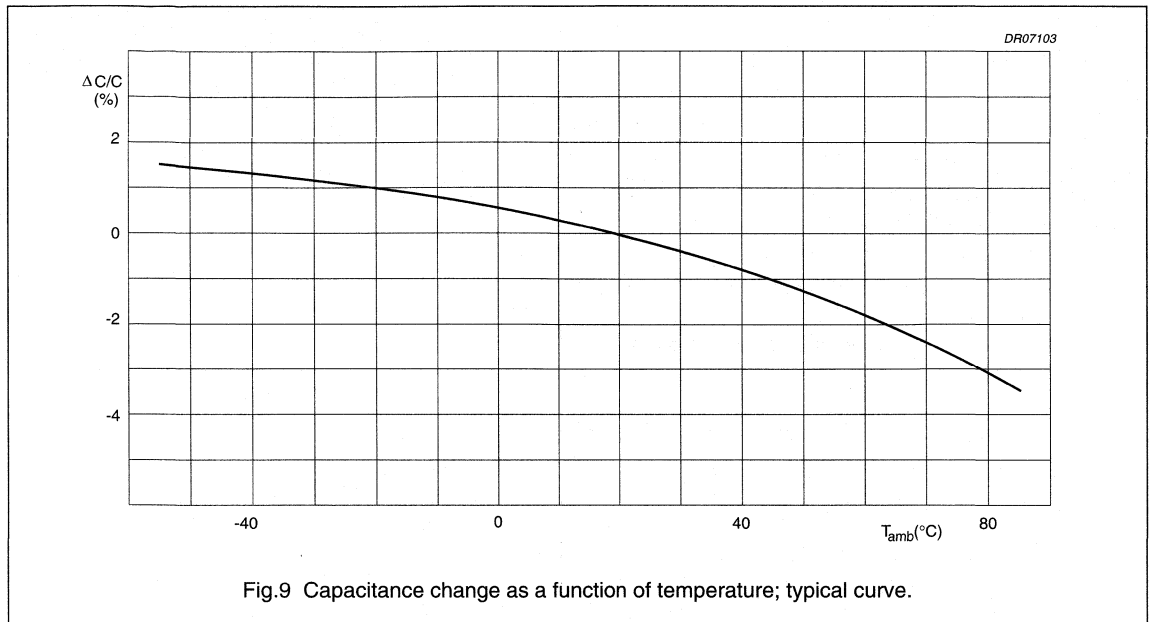
For reference testing, a conditioning period shall be applied of  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

# AC and pulse metallized polypropylene film capacitors

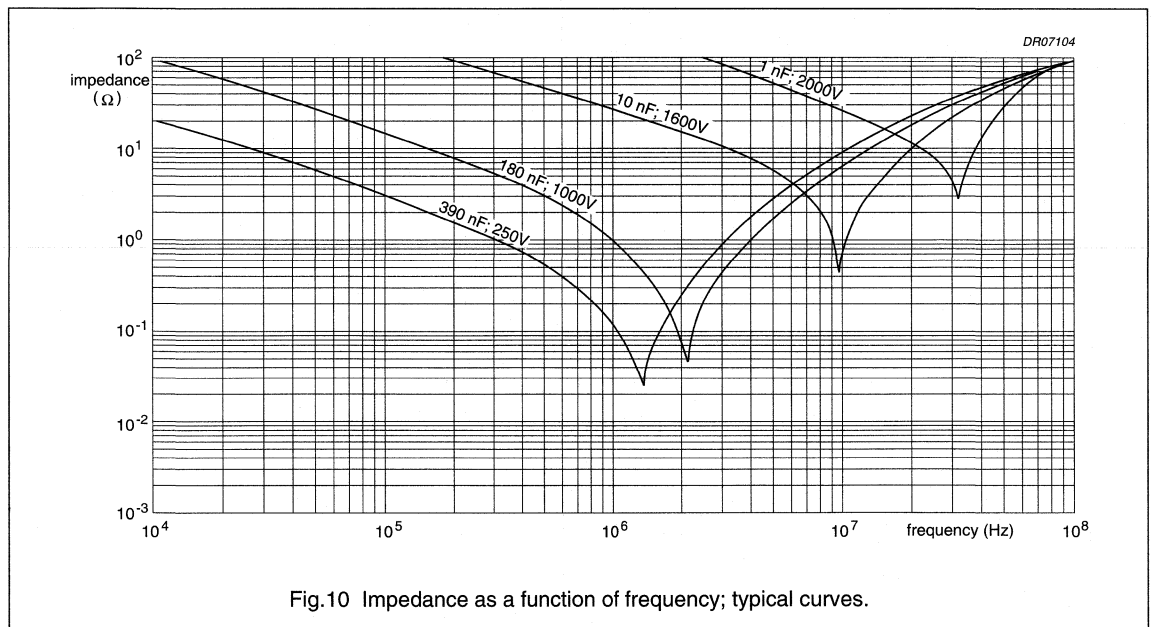
KP/MMKP 376

## Capacitance

All capacitance values are specified at 1 kHz.



## Impedance



# AC and pulse metallized polypropylene film capacitors

KP 376  
KP/MMKP 376

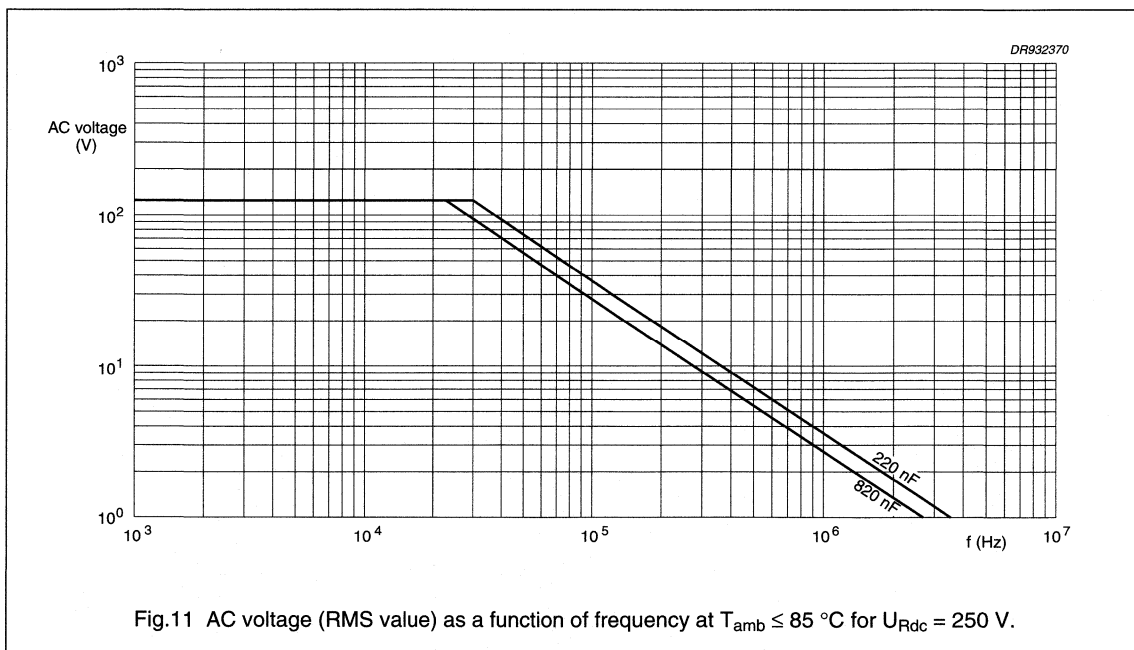
## Temperature

- Temperature characteristics related to  $20 \pm 2 \text{ }^\circ\text{C}$ :
  - 55 to  $+20 \text{ }^\circ\text{C}$ :  $0\% \leq \Delta C/C \leq 3.75\%$
  - 20 to  $100 \text{ }^\circ\text{C}$ :  $-7\% \leq \Delta C/C \leq 0\%$
- Storage temperature:  $T_{\text{stg}} = -25$  to  $+40 \text{ }^\circ\text{C}$  with RH maximum 80% without condensation.

## Voltage

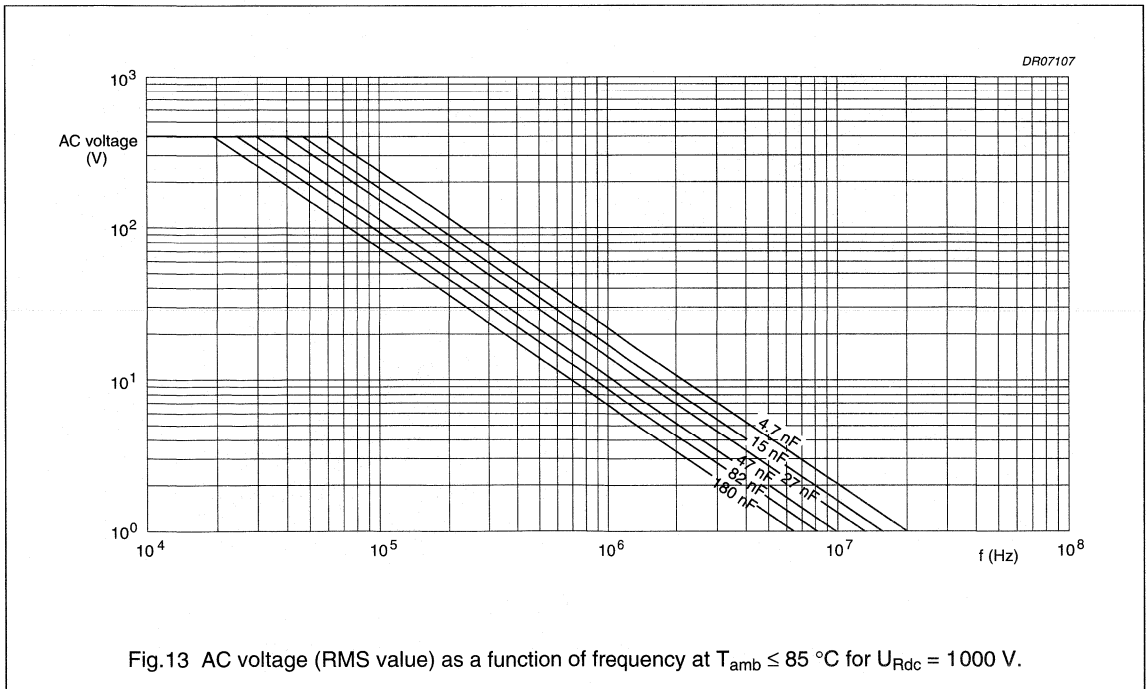
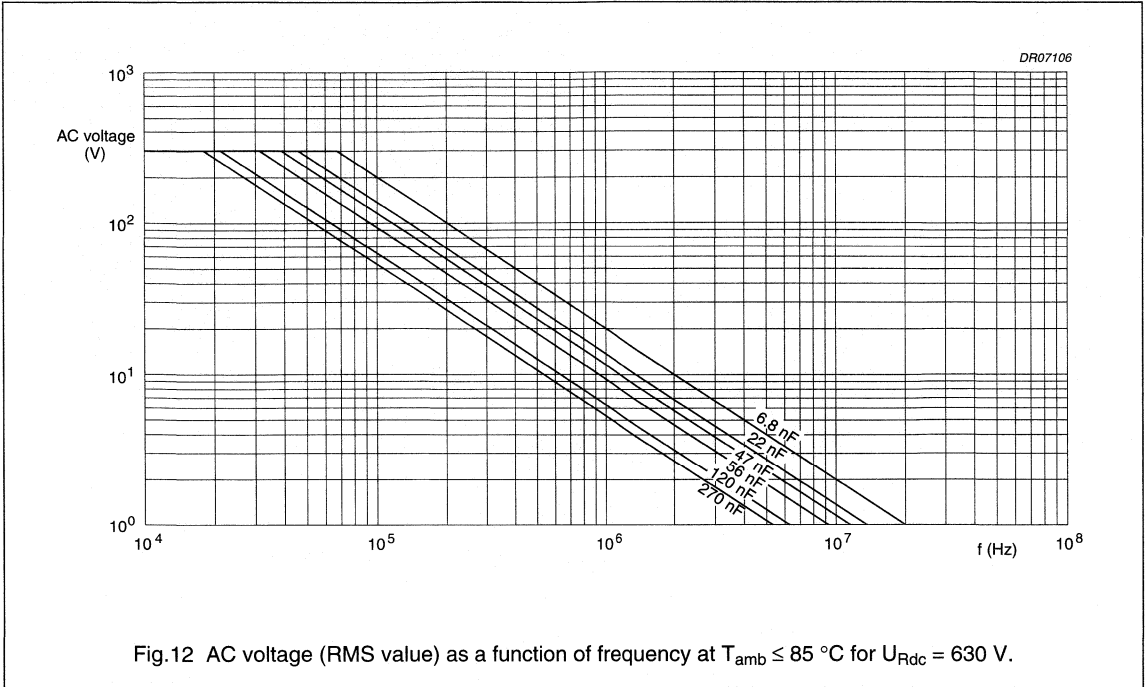
- Category voltage:
  - $U_{\text{Cdc}} = 0.7 \times U_{\text{Rdc}}$  for  $T = 100 \text{ }^\circ\text{C}$
  - $U_{\text{Cac}} = 0.7 \times U_{\text{Rac}}$  for  $T = 100 \text{ }^\circ\text{C}$
- Test voltage between leads:  $1.6 \times U_{\text{Rdc}}$
- Test voltage between interconnected leads and case (foil method): 2840 V (DC).

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



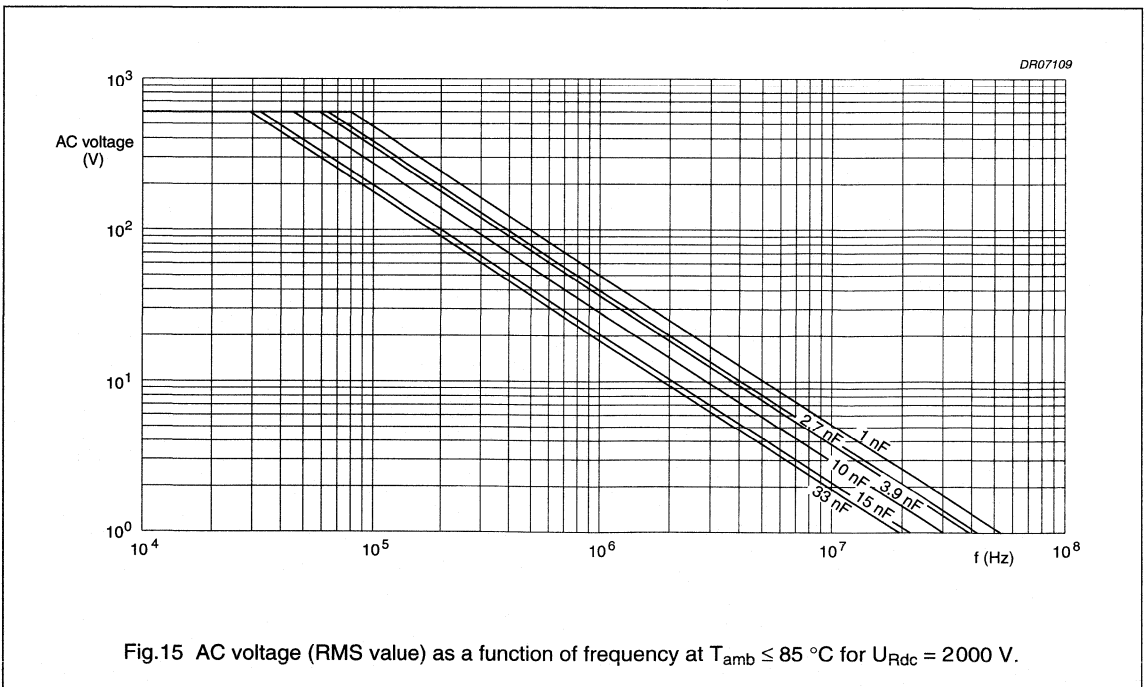
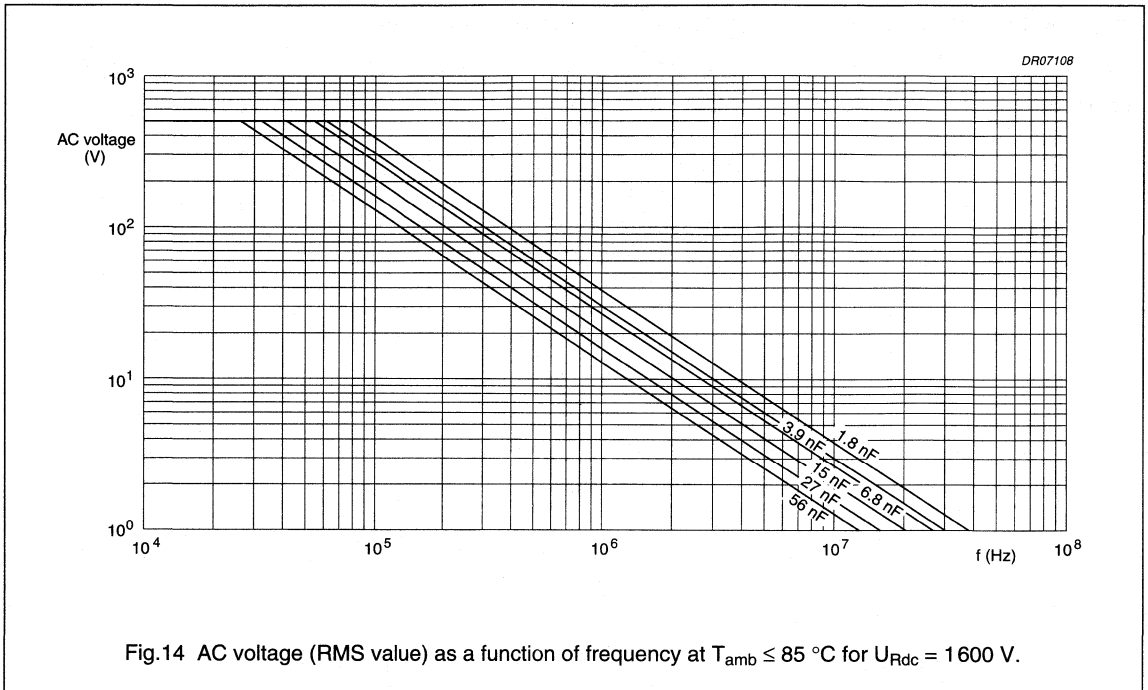
AC and pulse  
metallized polypropylene film capacitors

KP 376  
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# AC and pulse metallized polypropylene film capacitors

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

The maximum RMS voltage in Figs 11 to 15 has to be multiplied by a factor given in Fig.16.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 19 and 20.

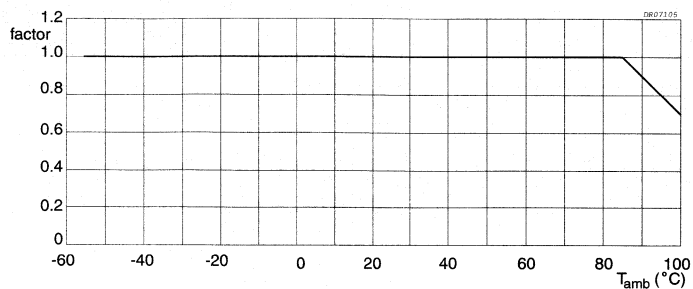


Fig.16 Multiplying factor as a function of temperature.

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Tangent of loss angle

RATED VOLTAGE $U_R$ (V)	TANGENT OF LOSS ANGLE					
	at 10 kHz			at 100 kHz		
	P = 15.0 mm	P = 22.5 mm	P = 27.5 mm	P = 15.0 mm	P = 22.5 mm	P = 27.5 mm
250	–	–	$\leq 10 \times 10^{-4}$	–	–	$\leq 25 \times 10^{-4}$
630	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 4 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
1000	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
1600	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
2000	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$

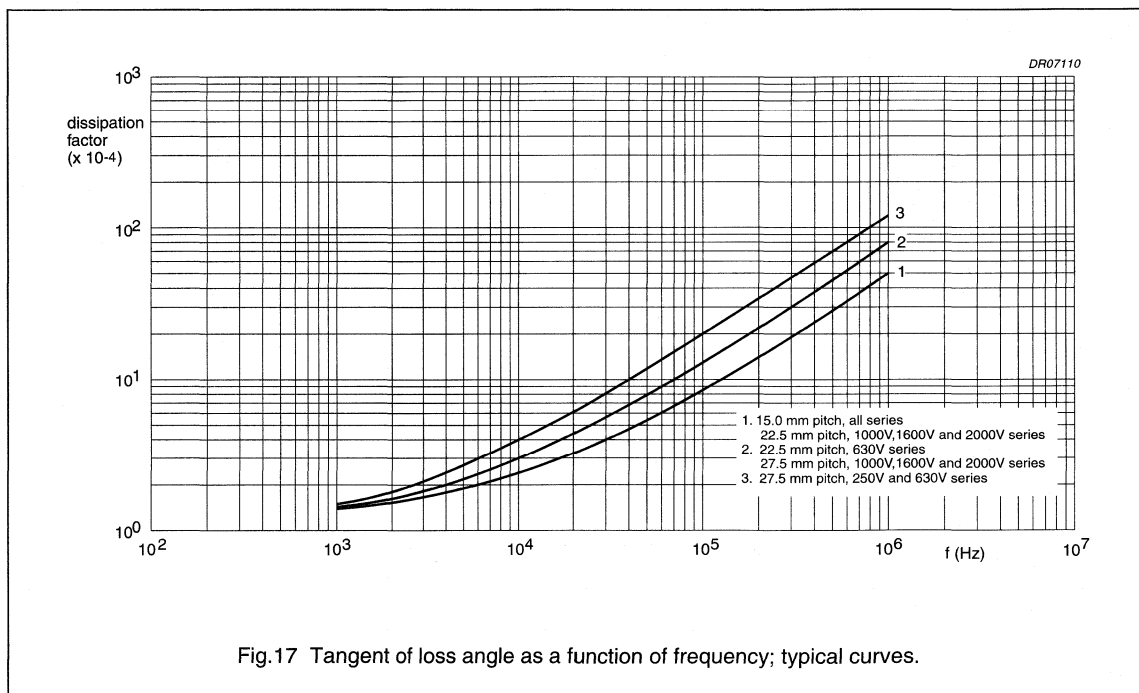


Fig.17 Tangent of loss angle as a function of frequency; typical curves.

# AC and pulse metallized polypropylene film capacitors

KP/MMKP 376

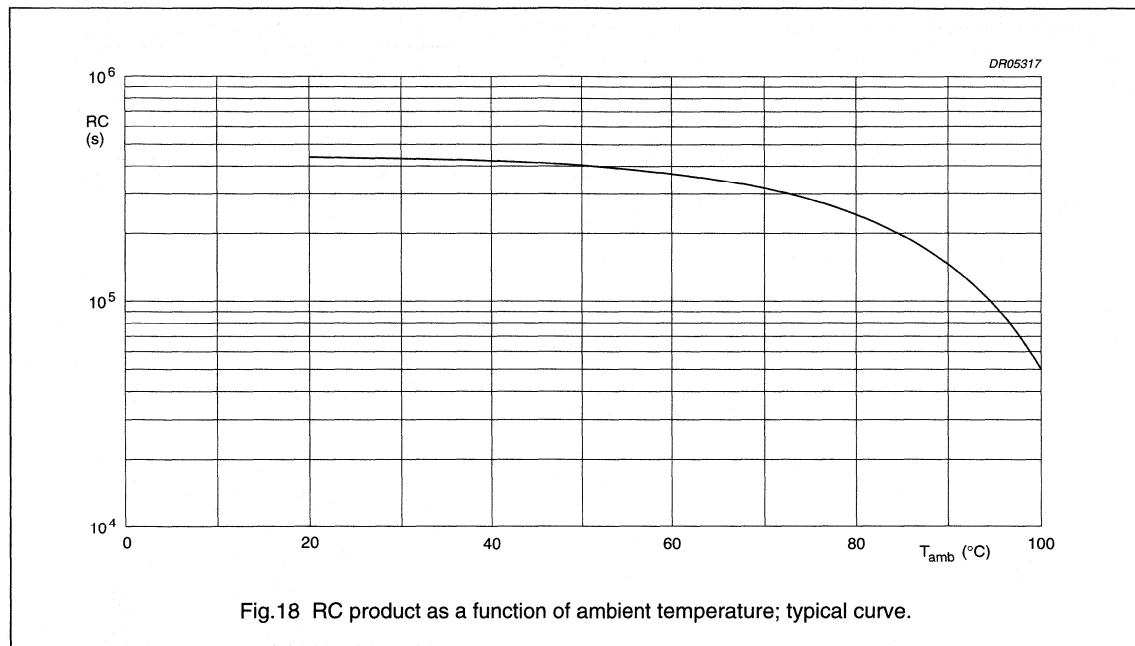
## Rated voltage pulse slope $(dU/dt)_R$

- $>10000 \text{ V}/\mu\text{s}$  (limited by network conditions).

## Insulation resistance

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $100 \pm 15 \text{ V}$  for the 250 V version and  $500 \pm 50 \text{ V}$  for the 630 V to 2000 V versions, at  $T_{\text{amb}} = 20 \text{ }^\circ\text{C}$ :

- R between leads:  $>100000 \text{ M}\Omega$
- R between interconnected leads and case:  $>100000 \text{ M}\Omega$ .



# AC and pulse metallized polypropylene film capacitors

KP 376  
KP/MMKP 376

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Figs 19 and 20)

$b_{max}$ (mm)	PITCH (mm)		
	15	22.5	27.5
5.0	1	–	–
6.0	2	5	–
7.0	3	6	–
8.5	4	7	–
9.0	–	–	9
10.0	–	8	–
11.0	–	–	10
13.0	–	–	11
15.0	–	–	12
18.0	–	–	13

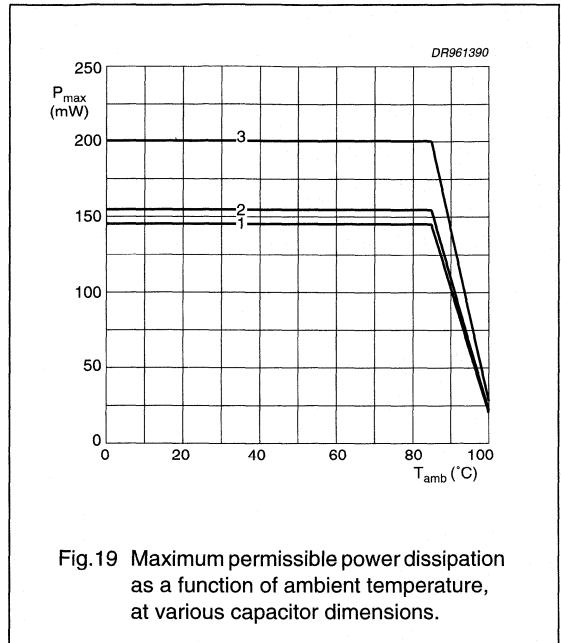


Fig.19 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

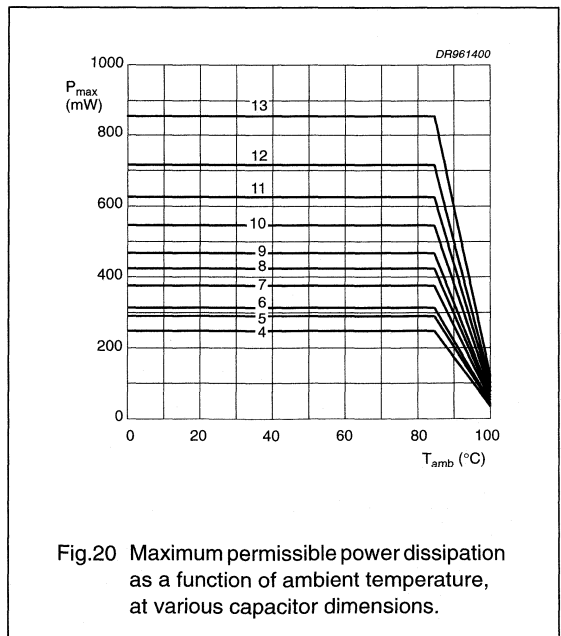


Fig.20 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

# AC and pulse metallized polypropylene film capacitors

## KP/MMKP 376

### Application note<sup>(1)</sup>

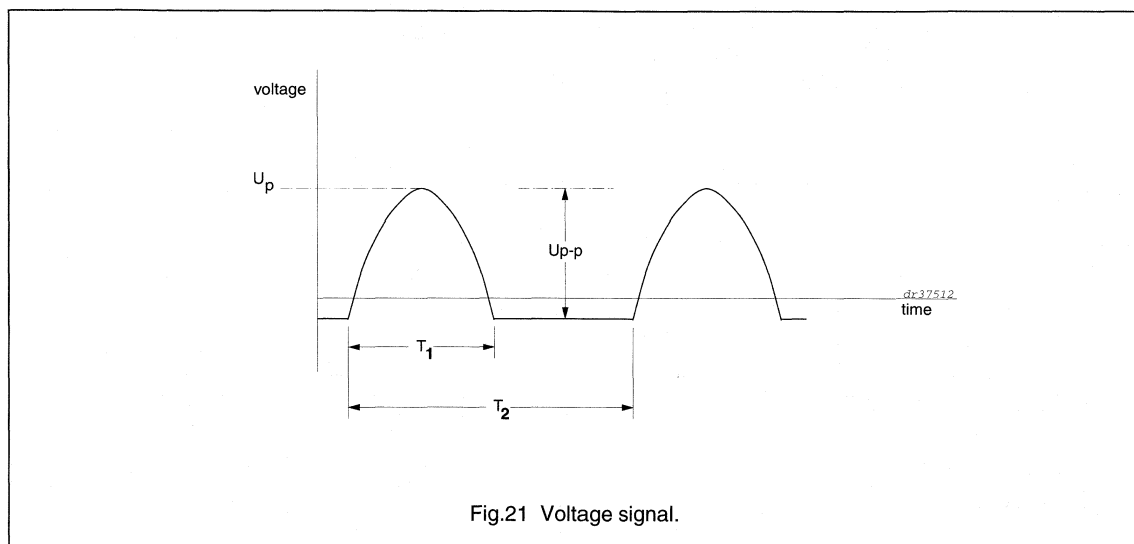
To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. There is no limit for the peak current ( $I_p$ ) or voltage pulse slope ( $dU/dt$ ) in the application.
4. The dissipated power shall not be greater than the maximum permissible power dissipation stated in Figs 19 and 20.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.

Example:  $C = 10 \text{ nF} - 1600 \text{ V}$ , KP/MMKP - type used for the voltage signal in Fig.21.

This is a half sinewave pulse with:  $U_{p-p} = 1200 \text{ V}$ ;  $U_p = 1100 \text{ V}$ ;  $T_1 = 12 \text{ } \mu\text{s}$ ;  $T_2 = 64 \text{ } \mu\text{s}$ .

The ambient temperature is  $50 \text{ }^\circ\text{C}$ .



### Checking the conditions

1. The peak voltage  $U_p = 1100 \text{ V}$  is lower than  $1600 \text{ V}$  (DC).
2. The peak-to-peak voltage  $1200 \text{ V}$  is lower than  $2 \times \sqrt{2}$  times  $500 \text{ V}$  (AC) =  $1414 U_{p-p}$ .
3. The voltage pulse slope: of no consideration.
4. The dissipated power is  $170 \text{ mW}$  as calculated with Fourier terms.  
This is less than  $370 \text{ mW}$ , allowed for a capacitor with dimensions:  $b_{\max} = 8.5$  and pitch =  $22.5 \text{ mm}$ .
5. The free air ambient temperature is more than  $50 \text{ }^\circ\text{C}$ , and lower than  $100 \text{ }^\circ\text{C}$ .

(1) Peak-to-peak current tables for S-correction application, are available on request.

# AC and pulse metallized polypropylene film capacitors

## KP 376 KP/MMKP 376

### MARKING

#### Product marking

CAPACITORS WITH PITCH 15 mm

The capacitors are marked on the top by laser print with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: J =  $\pm 5\%$ ; A =  $\pm 3.5\%$
3. Rated voltage (DC) (e.g. 630 V)
4. Manufacturer's type designation (376)
5. Code for dielectric material (KP/MMKP).

The capacitors are marked on the side by laser print with the following information:

1. Manufacturer (PHILIPS)
2. Code for factory of origin (HQ)
3. Year and week of manufacture (e.g. 9238).

CAPACITORS WITH PITCH 22.5 OR 27.5 mm

The capacitors are marked on the top by laser print with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: J =  $\pm 5\%$ ; A =  $\pm 3.5\%$
3. Rated voltage (DC) (e.g. 1000 V)
4. Manufacturer's type designation (376)
5. Code for dielectric material: KP for 250 V version; KP/MMKP for 630 V to 2000 V versions
6. Manufacturer (PHILIPS)
7. Code for factory of origin (HQ)
8. Year and week of manufacture (e.g. 9210).

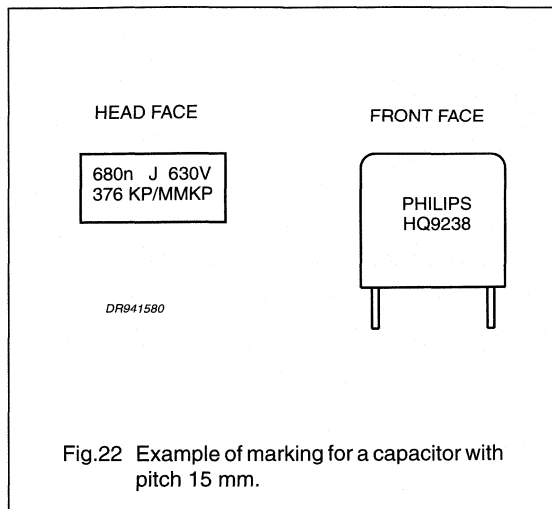


Fig.22 Example of marking for a capacitor with pitch 15 mm.

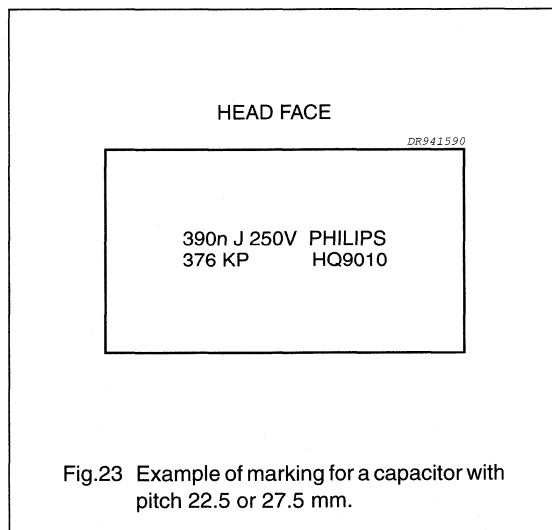


Fig.23 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.

# AC and pulse metallized polypropylene film capacitors

## KP/MMKP 376

### Package marking

The package containing the capacitors is marked as shown in Fig.24.

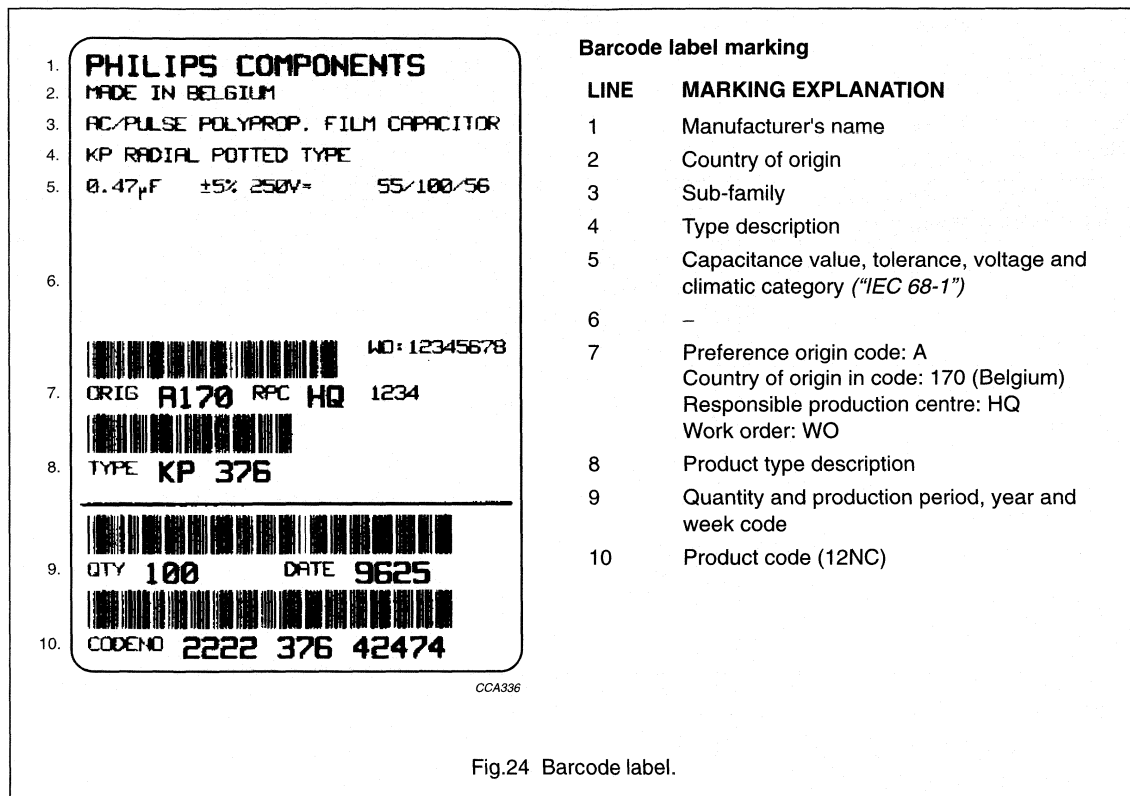


Fig.24 Barcode label.

AC and pulse  
metallized polypropylene film capacitors

KP 376  
KP/MMKP 376

**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  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 1\%$
Component solvent resistance		$\Delta \tan \delta \leq 10 \times 10^{-4}$
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours	$ \Delta C/C  \leq 2\%$ (C > 0.0047 μF)
Shock: "IEC 68-2-27"		$ \Delta C/C  \leq 3\%$ (C ≤ 0.0047 μF)
	half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 1\%$ (250 V) $\Delta \tan \delta \leq 10 \times 10^{-4}$
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 100 °C	$ \Delta C/C  \leq 3\%$
Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30"		$\Delta \tan \delta \leq 20 \times 10^{-4}$
Cold: "IEC 68-2-1"	2 hours; -55 °C	$R_{ins} \geq 50\%$ of specified value
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		



# AC and pulse metallized polypropylene film capacitors

## KP/MMKP 376

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 1\%$ $\Delta \tan \delta \leq 10 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-13" for: 250 V version "IEC 384-17" for: 630 V to 2000 version	250 V: 1 000 hours; $1.25 \times U_{Rac}$ ; 85 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 20 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
	>250 V: 1 000 hours; 85 °C $1.25 \times U_{Rac}$ ; (RMS); 50 Hz	$ \Delta C/C  \leq 2\%$ $\Delta \tan \delta \leq 15 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-13" for: 250 V version "IEC 384-17" for: 630 V to 2000 version	250 V: 2 000 hours; $1.5 \times U_{Rdc}$ ; 85 °C $1.5 \times U_{Cdc}$ ; 100 °C	$ \Delta C/C  \leq 2\%$ $\Delta \tan \delta$ : as specified in Section "Tangent of loss angle" of this specification or $1.4 \times$ initial value $R_{ins} \geq 50\%$ of specified value
	>250 V: 2 000 hours; $1.25 \times U_{Rdc}$ ; 85 °C $1.25 \times U_{Cdc}$ ; 100 °C	$ \Delta C/C  \leq 3\%$ $\Delta \tan \delta \leq 20 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-13" for: 250 V version "IEC 384-17" for: 630 V to 2000 version	2000 hours; 85 °C	$ \Delta C/C  \leq 2\%$ (250 V) $ \Delta C/C  \leq 3\%$ (>250 V) $\Delta \tan \delta \leq 20 \times 10^{-4}$
Resistance to soldering heat with preheating: "IEC 384-13" for: 250 V version "IEC 384-17" for: 630 V to 2000 version	body temperature: 100 °C; bath temperature: 260 °C; dwell time: 10 s	$ \Delta C/C  \leq 2\%$ $\Delta \tan \delta \leq 10 \times 10^{-4}$
Passive flammability: "IEC 695-2-2"	class C	no burning

### Note

- For detailed information, see "Type specification"

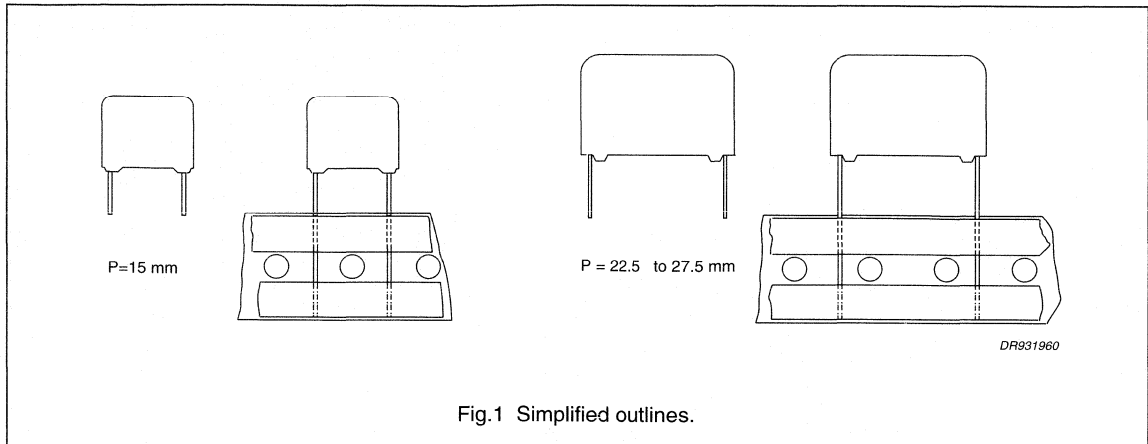


# AC and pulse metallized polypropylene film capacitors

## MKP/MKP 378

MKP/MKP RADIAL POTTED CAPACITORS

PITCH 15/22.5/27.5 mm



### FEATURES

- 15 to 27.5 mm lead pitch
- Low contact resistance
- Low loss dielectric
- Small dimensions for high density packaging
- Supplied loose in box and taped on reel.

### APPLICATIONS<sup>(1)</sup>

- Where steep pulses occur e.g. SMPS (switch mode power supplies)
- Motor control circuits
- S-correction.

(1) It is not advised to use these products as resonance capacitors in fly-back applications.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E24 series)	0.001 to 0.68 $\mu$ F
Capacitance tolerance	$\pm$ 5%
Rated voltage (DC) available on request	630 V; 1000 V; 1600 V; 2000 V; 2500 V 5000 V
Rated voltage (AC) available on request	300 V; 400 V; 500 V; 600 V; 675 V 1200 V
Rated peak-to-peak voltage available on request	850 V; 1130 V; 1400 V; 1700 V; 1900 V 3400 V
Climatic category	55/085/56
Rated temperature (DC)	85 °C
Rated temperature (AC)	70 °C
Maximum application temperature	85 °C
Reference specification	IEC 384-17
Performance grade	grade 1 (long life)
Stability grade: pitch 15 mm pitch 22.5 and 27.5 mm	grade 2 grade 1

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## MKP/MKP 378 GENERAL DATA

PITCH 15 mm

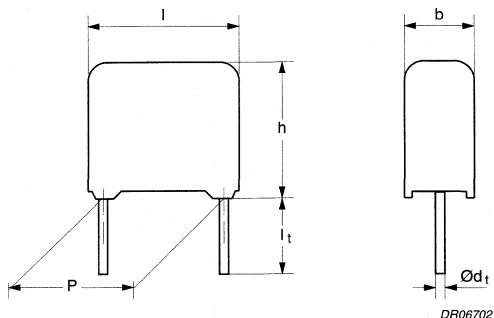


Fig.2 Outline.

## Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.051 \mu\text{F}$	$\leq 8 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	500 V/ $\mu\text{s}$	
R between leads, for $C \leq 1 \mu\text{F}$	>100000 M $\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	>400 V (AC)	

## Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 378 64...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 378 62...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 378 65...	on request

## Available 630 V DC versions on request

C ( $\mu\text{F}$ )	Pitch = $15.0 \pm 0.4 \text{ mm}$ ; $b \times h \times l = 8.5 \text{ mm} \times 15.0 \text{ mm} \times 17.5 \text{ mm}$		
	LOOSE IN BOX; SPQ = 1000		REEL; SPQ = 650
	$l_t = 3.5 \pm 0.3 \text{ mm}$	$l_t = 5.0 \pm 1.0 \text{ mm}$	H = 18.5 mm <sup>(1)</sup>
0.056	2222 378 90042	2222 378 90043	2222 378 90044
0.062	2222 378 90046	2222 378 90047	2222 378 90048

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 300 \text{ V}$ / $U_{p-p} = 850 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
Pitch = $15.0 \pm 0.4 \text{ mm}$ ; $d_t = 0.80 \pm 0.08 \text{ mm}$			C-tol = $\pm 5\%$		
0.015	5.0 × 11.0 × 17.5	1.2	64153	1000	1100
0.016			64163		
0.018			64183		
0.02			64203		
0.022			64223		
0.024	6.0 × 12.0 × 17.5	1.4	64243	1000	900
0.027			64273		
0.03			64303		
0.033			64333		
0.036	7.0 × 13.5 × 17.5	1.9	64363	1000	800
0.039			64393		
0.043			64433		
0.047	8.5 × 15.0 × 17.5	2.6	64473	1000	650
0.051			64513		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

MKP/MKP 378 GENERAL DATA

PITCH 22.5/27.5 mm

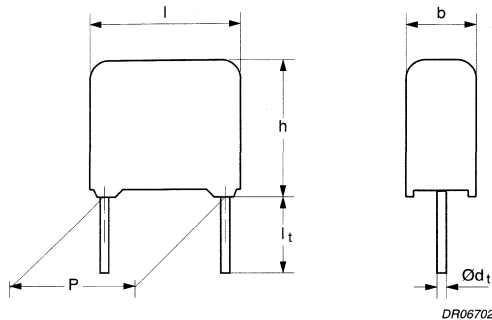


Fig.3 Outline.

## Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
$C \leq 0.18 \mu\text{F}$	$\leq 8 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
$0.20 \mu\text{F} \leq C \leq 0.30 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
$0.33 \mu\text{F} \leq C \leq 0.39 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
$0.43 \mu\text{F} \leq C \leq 0.51 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 40 \times 10^{-4}$
$C > 0.51 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 45 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :		
$P = 22.5 \text{ mm}$	370 V/ $\mu\text{s}$	
$P = 27.5 \text{ mm}$	230 V/ $\mu\text{s}$ ( $b < 15 \text{ mm}$ )	
$P = 27.5 \text{ mm}$	120 V/ $\mu\text{s}$ ( $b \geq 15 \text{ mm}$ )	
R between leads, for $C \leq 1 \mu\text{F}$	>100000 M $\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	>400 V (AC)	

## Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 378 64...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 378 62...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 5\%$	2222 378 65...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 300 \text{ V}$ / $U_{p-p} = 850 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.056	6.0 × 15.5 × 26.0	2.6	64563	200	600
0.062			64623		
0.068	7.0 × 16.5 × 26.0	3.2	64683	200	550
0.075			64753		
0.082			64823		
0.091			64913		
0.1	8.5 × 18.0 × 26.0	4.4	64104	200	450
0.11			64114		
0.12			64124		
0.13			64134		
0.15	10.0 × 19.5 × 26.0	5.5	64154	200	350
0.16			64164		
0.18			64184		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.2	11.0 × 21.0 × 31.0	7.8	64204	100	300
0.22			64224		
0.24			64244		
0.27			64274		
0.3	13.0 × 23.0 × 31.0	10.4	64304	100	250
0.33			64334		
0.36			64364		
0.39			64394		
0.43	15.0 × 25.0 × 31.0	12.8	64434	100	200
0.47			64474		
0.51			64514		
0.56	18.0 × 28.0 × 31.0	17.2	64564	100	150
0.62			64624		
0.68			64684		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## MKP/MKP 378 GENERAL DATA

PITCH 15 mm

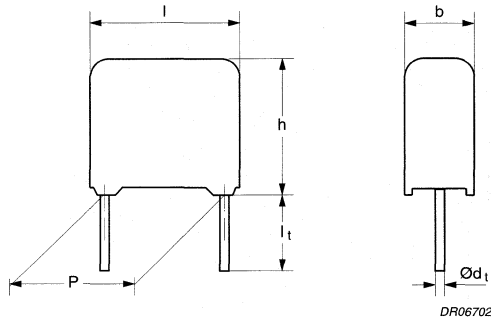


Fig.4 Outline.

## Specific reference data for the 1000 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.011 \mu\text{F}$	$\leq 6 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	1300 V/ $\mu\text{s}$	
R between leads, for $C \leq 1 \mu\text{F}$	$>100000 \text{ M}\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	$>500 \text{ V (AC)}$	

## Available 1000 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 378 74...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 378 72...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 378 75...	on request

## Available 1000 V DC versions on request

C ( $\mu\text{F}$ )	Pitch = $15.0 \pm 0.4 \text{ mm}$ ; $b \times h \times l = 8.5 \text{ mm} \times 15.0 \text{ mm} \times 17.5 \text{ mm}$		
	LOOSE IN BOX; SPQ = 1000		REEL; SPQ = 650
	$l_t = 3.5 \pm 0.3 \text{ mm}$	$l_t = 5.0 \pm 1.0 \text{ mm}$	H = 18.5 mm <sup>(1)</sup>
0.012	2222 378 90051	2222 378 90052	2222 378 90053
0.013	2222 378 90055	2222 378 90056	2222 378 90057
0.015	2222 378 90059	2222 378 90061	2222 378 90062
0.016	2222 378 90064	2222 378 90065	2222 378 90066
0.018	2222 378 90068	2222 378 90069	2222 378 90071

## Note

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



# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

 $U_{Rdc} = 1000 \text{ V}$ ;  $U_{Rac} = 400 \text{ V}$ / $U_{p-p} = 1130 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.003	$5.0 \times 11.0 \times 17.5$	1.2	74302	1000	1100
0.0033			74332		
0.0036			74362		
0.0039			74392		
0.0043			74432		
0.0047			74472		
0.0051			74512		
0.0056			74562		
0.0062			74622		
0.0068			74682		
0.0075	74752				
0.0082	$6.0 \times 12.0 \times 17.5$	1.4	74822	1000	900
0.0091			74912		
0.01			74103		
0.011			74113		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

## MKP/MKP 378

### MKP/MKP 378 GENERAL DATA

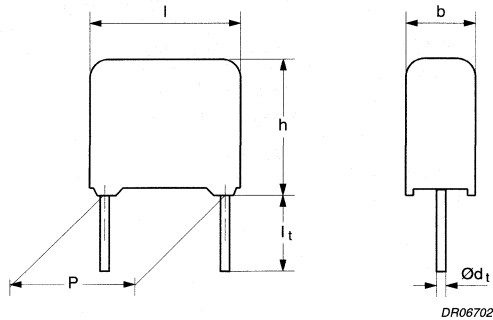
**PITCH 22.5/27.5 mm**


Fig.5 Outline.

### Specific reference data for the 1000 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.051 \mu\text{F}$ $0.056 \mu\text{F} \leq C \leq 0.22 \mu\text{F}$	$\leq 6 \times 10^{-4}$ $\leq 8 \times 10^{-4}$	$\leq 15 \times 10^{-4}$ $\leq 20 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : $P = 22.5 \text{ mm}$ $P = 27.5 \text{ mm}$ $P = 27.5 \text{ mm}$	1200 V/ $\mu\text{s}$ 600 V/ $\mu\text{s}$ ( $b < 15 \text{ mm}$ ) 300 V/ $\mu\text{s}$ ( $b \geq 15 \text{ mm}$ )	
R between leads, for $C \leq 1 \mu\text{F}$	>100000 M $\Omega$	
Ionization voltage (typical value) at 50 pC peak discharge	>500 V (AC)	

### Available 1000 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 378 74...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 378 72...	on request
Taped on reel	$H = 18.5 \text{ mm}$ ; note 1	$\pm 5\%$	2222 378 75...	on request

### Note

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

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

 $U_{Rdc} = 1000 \text{ V}$ ;  $U_{Rac} = 400 \text{ V}$ / $U_{p-p} = 1130 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.012	6.0 × 15.5 × 26.0	2.6	74123	200	600
0.013			74133		
0.015			74153		
0.016			74163		
0.018			74183		
0.02	7.0 × 16.5 × 26.0	3.2	74203	200	550
0.022			74223		
0.024			74243		
0.027	8.5 × 18.0 × 26.0	4.4	74273	200	450
0.03			74303		
0.033			74333		
0.036			74363		
0.039	10.0 × 19.5 × 26.0	5.5	74393	200	350
0.043			74433		
0.047			74473		
0.051			74513		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.056	11.0 × 21.0 × 31.0	7.8	74563	100	300
0.062			74623		
0.068			74683		
0.075			74753		
0.082			74823		
0.091	13.0 × 23.0 × 31.0	10.4	74913	100	250
0.1			74104		
0.11			74114		
0.12	15.0 × 25.0 × 31.0	12.8	74124	100	200
0.13			74134		
0.15			74154		
0.16	18.0 × 28.0 × 31.0	17.5	74164	100	150
0.18			74184		
0.2			74204		
0.22			74224		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

MKP/MKP 378 GENERAL DATA

PITCH 22.5/27.5 mm

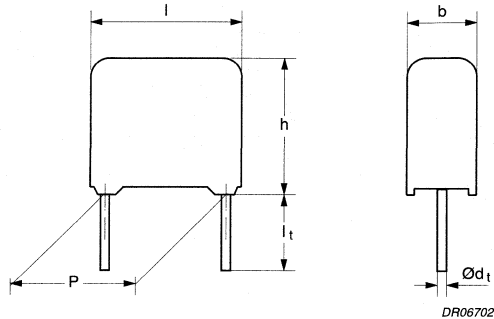


Fig.6 Outline.

## Specific reference data for the 1600 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.022 \mu\text{F}$ $0.024 \mu\text{F} \leq C \leq 0.10 \mu\text{F}$	$\leq 5 \times 10^{-4}$ $\leq 6 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : P = 22.5 mm P = 27.5 mm P = 27.5 mm	1600 V/μs 900 V/μs (b < 15 mm) 450 V/μs (b ≥ 15 mm)	
R between leads, for C ≤ 1 μF	>100000 MΩ	
Ionization voltage (typical value) at 20 pC peak discharge	>600 V (AC)	

## Available 1600 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	±5%	2222 378 84...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	±5%	2222 378 82...	on request
Taped on reel	H = 18.5 mm; note 1	±5%	2222 378 85...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

 $U_{Rdc} = 1600 \text{ V}$ ;  $U_{Rac} = 500 \text{ V}$ / $U_{p-p} = 1400 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.0056	6.0 × 15.5 × 26.0	2.6	84562	200	600
0.0062			84622		
0.0068			84682		
0.0075	7.0 × 16.5 × 26.0	3.2	84752	200	550
0.0082			84822		
0.0091			84912		
0.01			84103		
0.011	8.5 × 18.0 × 26.0	4.4	84113	200	450
0.012			84123		
0.013			84133		
0.015			84153		
0.016			84163		
0.018	10.0 × 19.5 × 26.0	5.5	84183	200	350
0.02			84203		
0.022			84223		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.024	11.0 × 21.0 × 31.0	7.8	84243	100	300
0.027			84273		
0.03			84303		
0.033			84333		
0.036			84363		
0.039	13.0 × 23.0 × 31.0	10.4	84393	100	250
0.043			84433		
0.047			84473		
0.051			84513		
0.056	15.0 × 25.0 × 31.0	12.8	84563	100	200
0.062			84623		
0.068			84683		
0.075	18.0 × 28.0 × 31.0	17.2	84753	100	150
0.082			84823		
0.091			84913		
0.1			84104		

**Note**

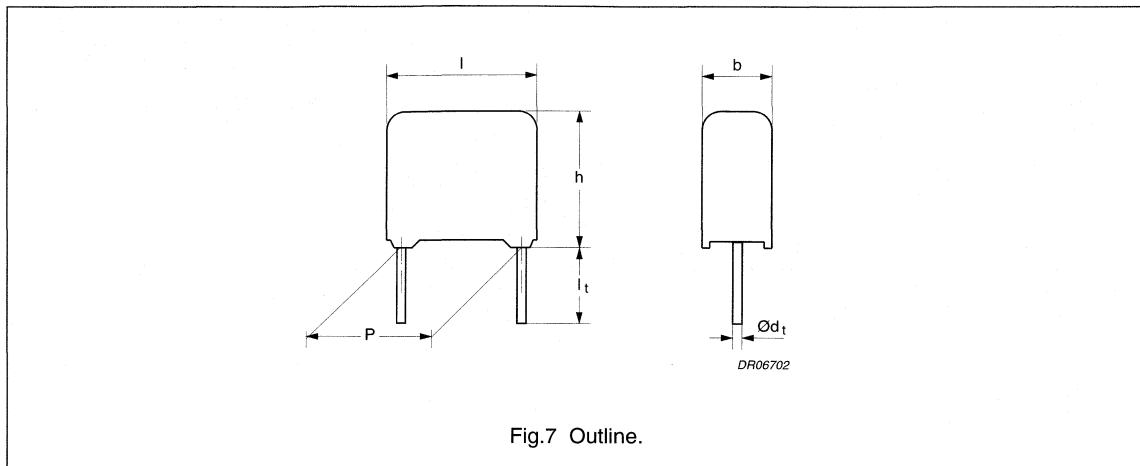
1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## MKP/MKP 378 GENERAL DATA

PITCH 22.5/27.5 mm



## Specific reference data for the 2000 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.051 \mu\text{F}$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : P = 22.5 mm P = 27.5 mm P = 27.5 mm	2000 V/ $\mu\text{s}$ 1200 V/ $\mu\text{s}$ (b < 15 mm) 600 V/ $\mu\text{s}$ (b $\geq$ 15 mm)	
R between leads, for $C \leq 1 \mu\text{F}$	>100000 M $\Omega$	
Ionization voltage (typical value) at 20 pC peak discharge	>700 V (AC)	

## Available 2000 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 378 94...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 378 92...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 378 95...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

 $U_{Rdc} = 2000 \text{ V}$ ;  $U_{Rac} = 600 \text{ V}/U_{p-p} = 1700 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.0033 0.0036	6.0 × 15.5 × 26.0	2.6	94332 94362	200	600
0.0039 0.0043 0.0047 0.0051	7.0 × 16.5 × 26.0	3.2	94392 94432 94472 94512	200	550
0.0056 0.0062 0.0068 0.0075 0.0082	8.5 × 18.0 × 26.0	4.4	94562 94622 94682 94752 94822	200	450
0.0091 0.01 0.011 0.012	10.0 × 19.5 × 26.0	5.5	94912 94103 94113 94123	200	350
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.013 0.015 0.016 0.018 0.02	11.0 × 21.0 × 31.0	7.8	94133 94153 94163 94183 94203	100	300
0.022 0.024 0.027	13.0 × 23.0 × 31.0	10.4	94223 94243 94273	100	250
0.030 0.033 0.036	15.0 × 25.0 × 31.0	12.8	94303 94333 94363	100	200
0.039 0.043 0.047 0.051	18.0 × 28.0 × 31.0	17.5	94393 94433 94473 94513	100	150

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## MKP/MKP 378 GENERAL DATA

PITCH 22.5/27.5 mm

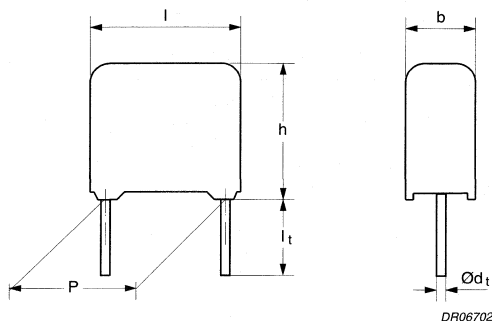


Fig.8 Outline.

## Specific reference data for the 2500 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.030 \mu\text{F}$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : P = 22.5 mm P = 27.5 mm P = 27.5 mm	2000 V/ $\mu\text{s}$ 2000 V/ $\mu\text{s}$ (b < 15 mm) 1000 V/ $\mu\text{s}$ (b $\geq$ 15 mm)	
R between leads, for $C \leq 1 \mu\text{F}$	>100000 M $\Omega$	
Ionization voltage (typical value) at 5 pC peak discharge	>900 V (AC)	

## Available 2500 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 378 04...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 378 02...	on request
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 378 05...	on request

## Note

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



# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

 $U_{Rdc} = 2500 \text{ V}; U_{Rac} = 675 \text{ V}/U_{p-p} = 1900 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	short leads	H = 18.5 mm
			last 5 digits of catalogue number	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.002	6.0 × 15.5 × 26.0	2.6	04202	200	600
0.0022			04222		
0.0024			04242		
0.0027			04272		
0.003	7.0 × 16.5 × 26.0	3.2	04302	200	550
0.0033			04332		
0.0036			04362		
0.0039	8.5 × 18.0 × 26.0	4.4	04392	200	450
0.0043			04432		
0.0047			04472		
0.0051			04512		
0.0056			04562		
0.0062	10.0 × 19.5 × 26.0	5.5	04622	200	350
0.0068			04682		
0.0075			04752		
0.0082			04822		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.0091	11.0 × 21.0 × 31.0	7.8	04912	100	300
0.01			04103		
0.011			04113		
0.012	13.0 × 23.0 × 31.0	10.4	04123	100	250
0.013			04133		
0.015			04153		
0.018	15.0 × 25.0 × 31.0	12.8	04183	100	200
0.02			04203		
0.022	18.0 × 28.0 × 31.0	17.2	04223	100	150
0.024			04243		
0.027			04273		
0.03			04303		

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

Available on request

loose and taped

PITCH	$d_t$	CAPACITANCE RANGE ( $\mu\text{F}$ ) <sup>(1)</sup>
<b><math>U_{Rdc} = 3000 \text{ V}; U_{Rac} = 800 \text{ V}/U_{p-p} = 2300 \text{ V}</math></b>		
22.5 $\pm$ 0.4 mm	0.80 $\pm$ 0.08 mm	0.0015 to 0.0047
27.5 $\pm$ 0.4 mm		0.0051 to 0.018
<b><math>U_{Rdc} = 4000 \text{ V}; U_{Rac} = 1000 \text{ V}/U_{p-p} = 2800 \text{ V}</math></b>		
27.5 $\pm$ 0.4 mm	0.80 $\pm$ 0.08 mm	0.0010 to 0.010
<b><math>U_{Rdc} = 5000 \text{ V}; U_{Rac} = 1200 \text{ V}/U_{p-p} = 3400 \text{ V}</math></b>		
27.5 $\pm$ 0.4 mm	0.80 $\pm$ 0.08 mm	0.0010 to 0.0062

**Note**

1. E24 series.

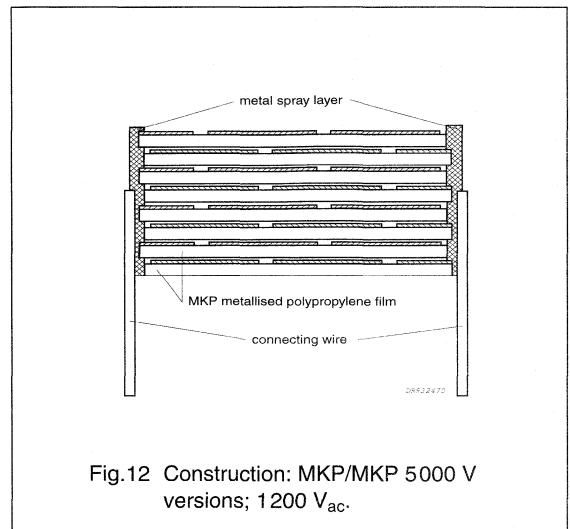
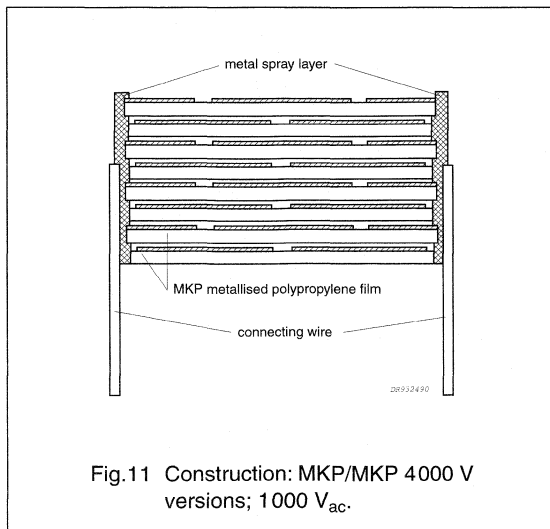
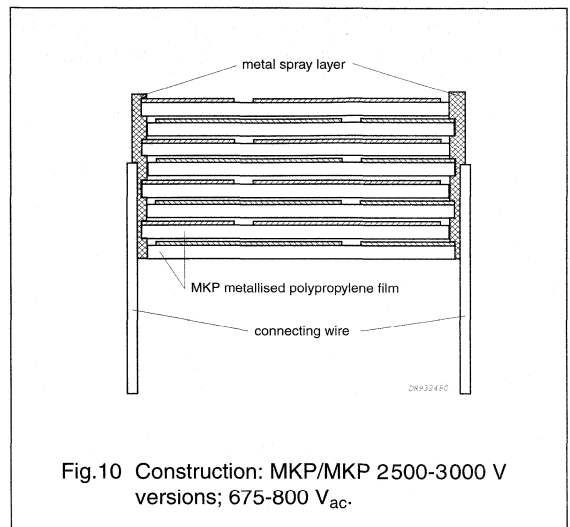
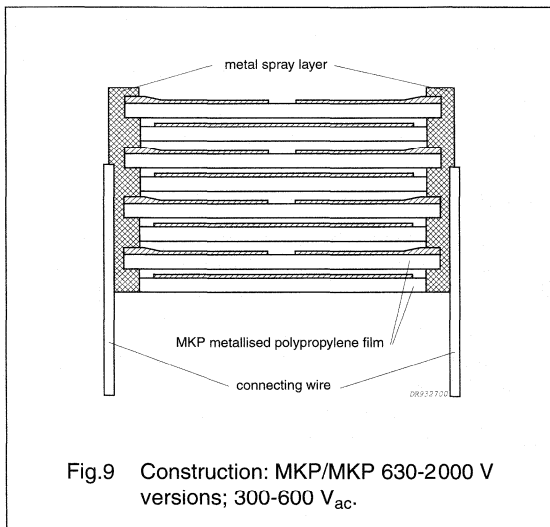
# AC and pulse metallized polypropylene film capacitors

## MKP/MKP 378

### CONSTRUCTION

#### Description

- Low-inductive wound cell of metallized polypropylene (PP) film, potted with epoxy resin in a flame-retardant polypropylene case
- Radial leads, solder-coated:
  - Copper clad steel wire (pitch = 6e)
  - Copper wire (pitch = 9e and 11e)
- Small stand-off pips allow removal of solder flux etc. during cleaning of the printed-circuit board.



# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## 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 this handbook, Chapter "Packaging".

### 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 of 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 Fig.13:

- Eccentricity as in Fig.13. 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:  $h_{\max} \leq h + 0.3 \text{ mm}$ .

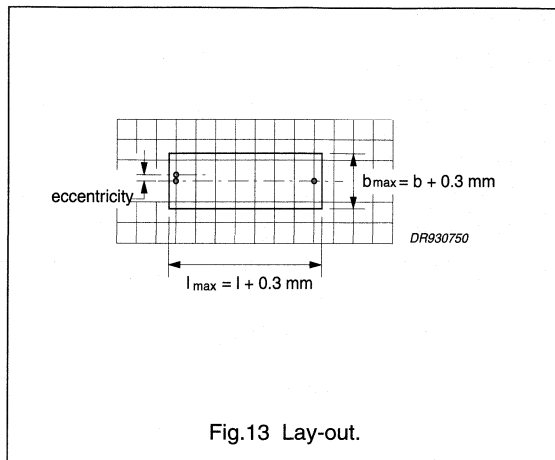


Fig.13 Lay-out.

## RATINGS AND CHARACTERISTICS

Unless otherwise specified, all electrical values apply at 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  $50 \pm 2\%$ .

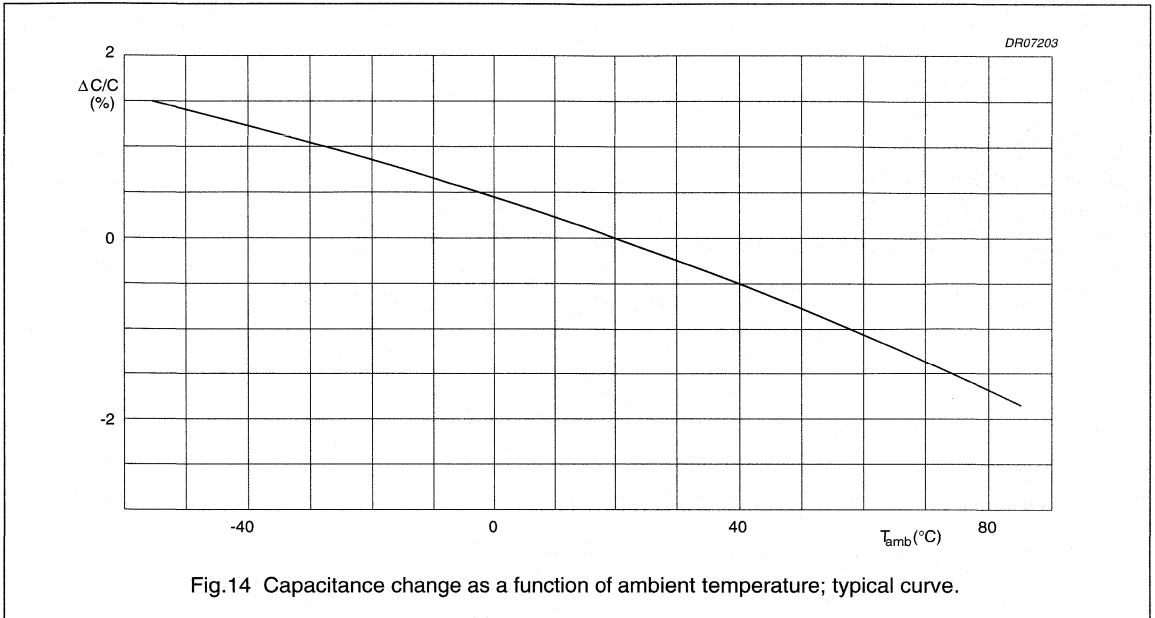
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

# AC and pulse metallized polypropylene film capacitors

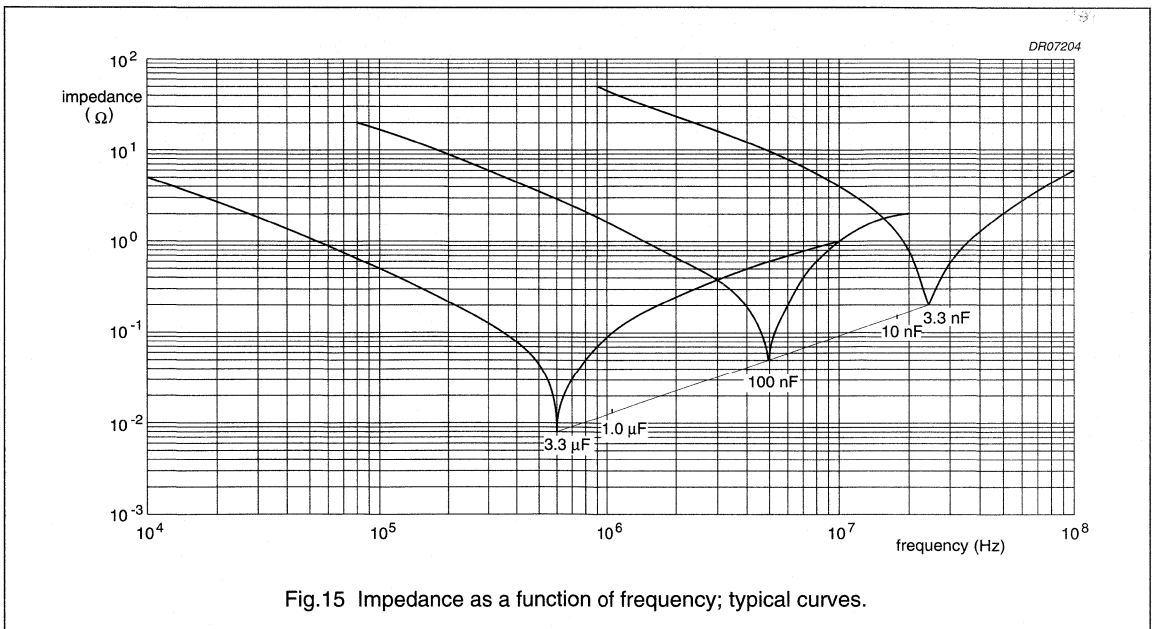
MKP/MKP 378

## Capacitance

All capacitance values are specified at 1 kHz.



## Impedance



# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## Temperature

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

## Voltage

- Category voltage:

$$U_{\text{Cdc}} = U_{\text{Rdc}} \text{ for } T = 85 \text{ °C}$$

$$U_{\text{Cac}} = 0.7 \times U_{\text{Rac}} \text{ for } T = 85 \text{ °C}$$

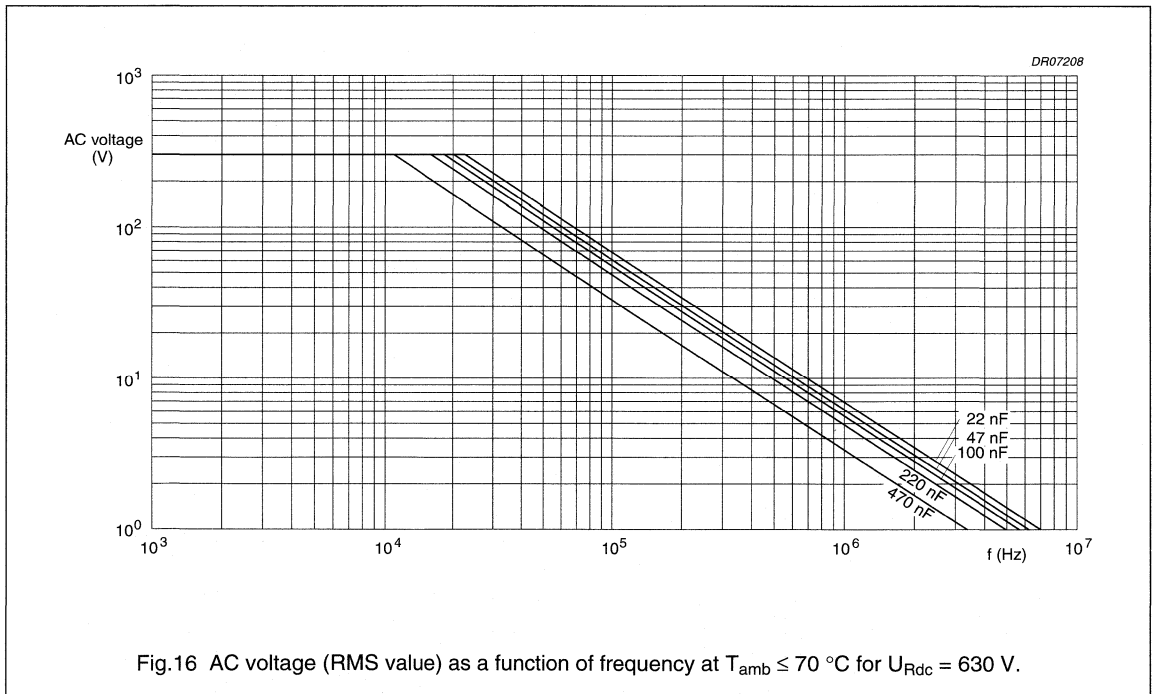
- Test voltage between leads:

$$1.6 \times U_{\text{Rdc}} \text{ for } U_{\text{Rdc}} < 2500 \text{ V}$$

$$1.4 \times U_{\text{Rdc}} \text{ for } U_{\text{Rdc}} \geq 2500 \text{ V}$$

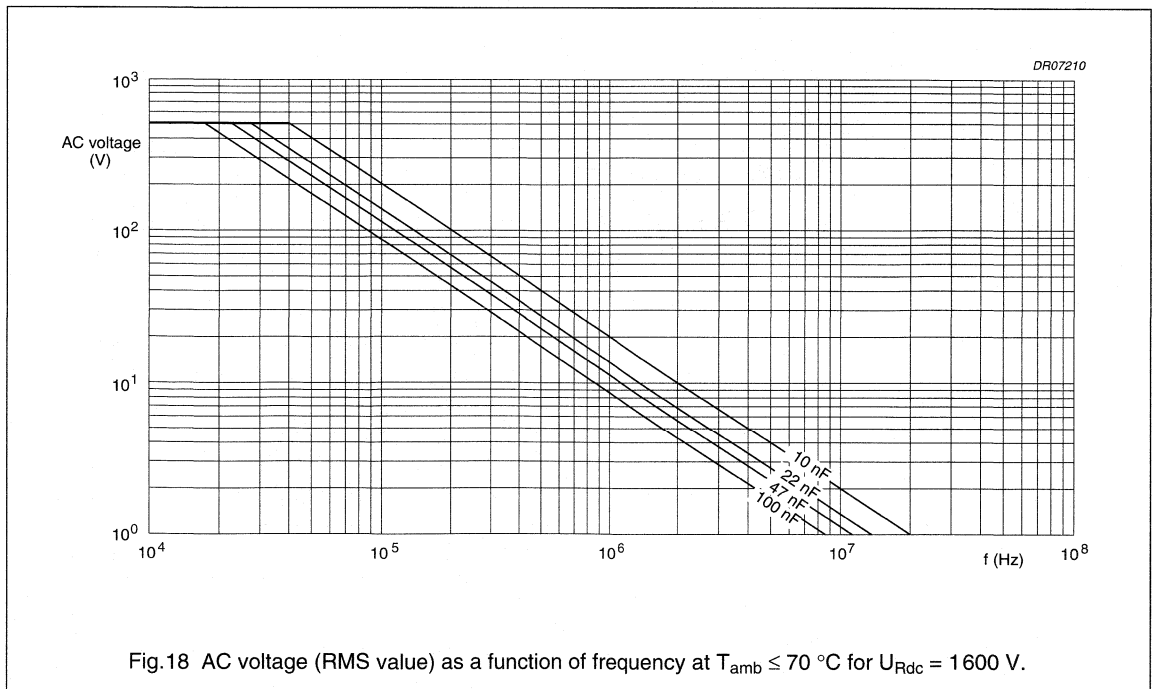
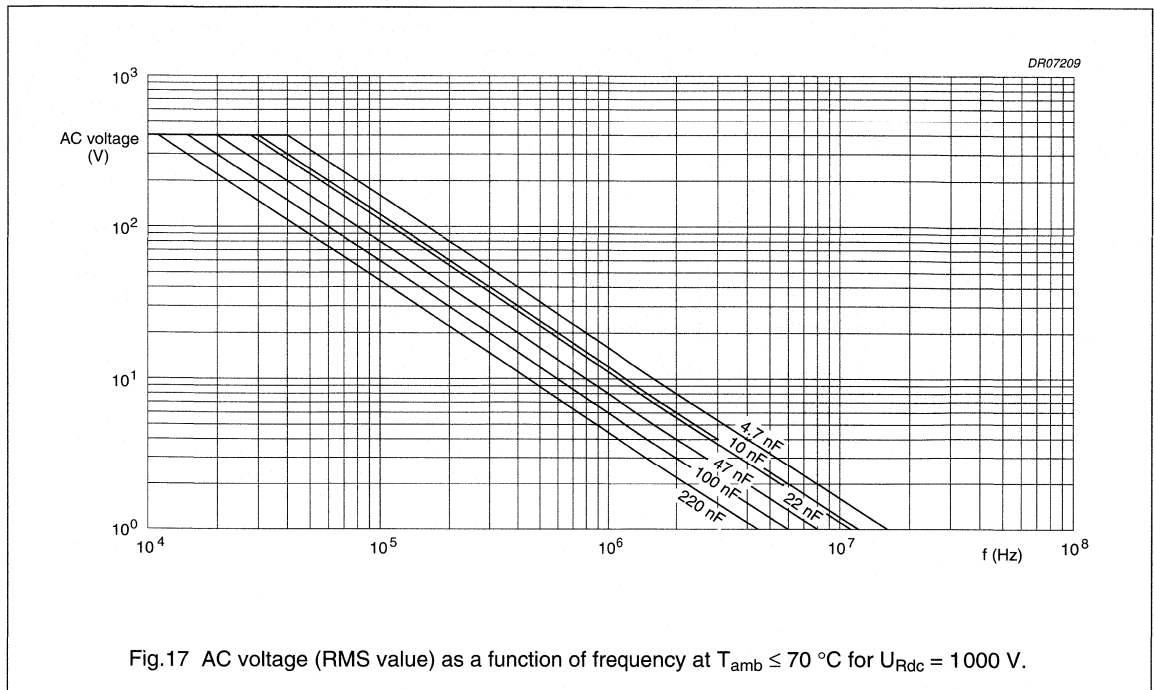
- Test voltage between interconnected leads and case (foil method): 2840 V (DC).

## Maximum RMS voltage (sinewave) as a function of frequency for $T_{\text{amb}} \leq 70$ °C



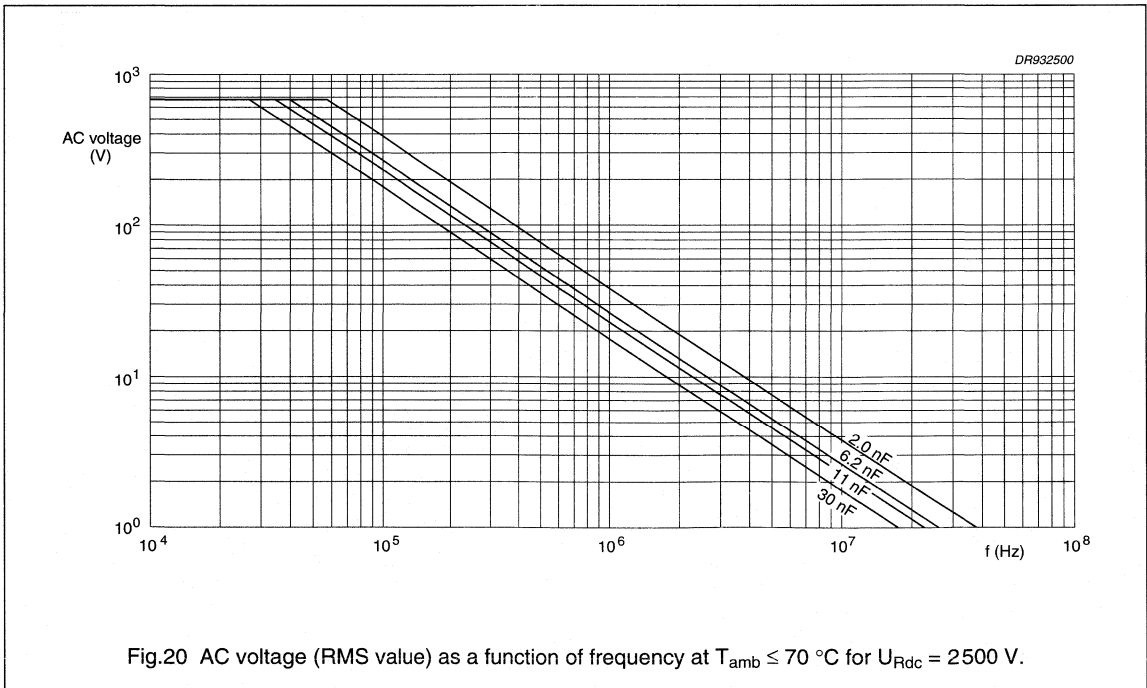
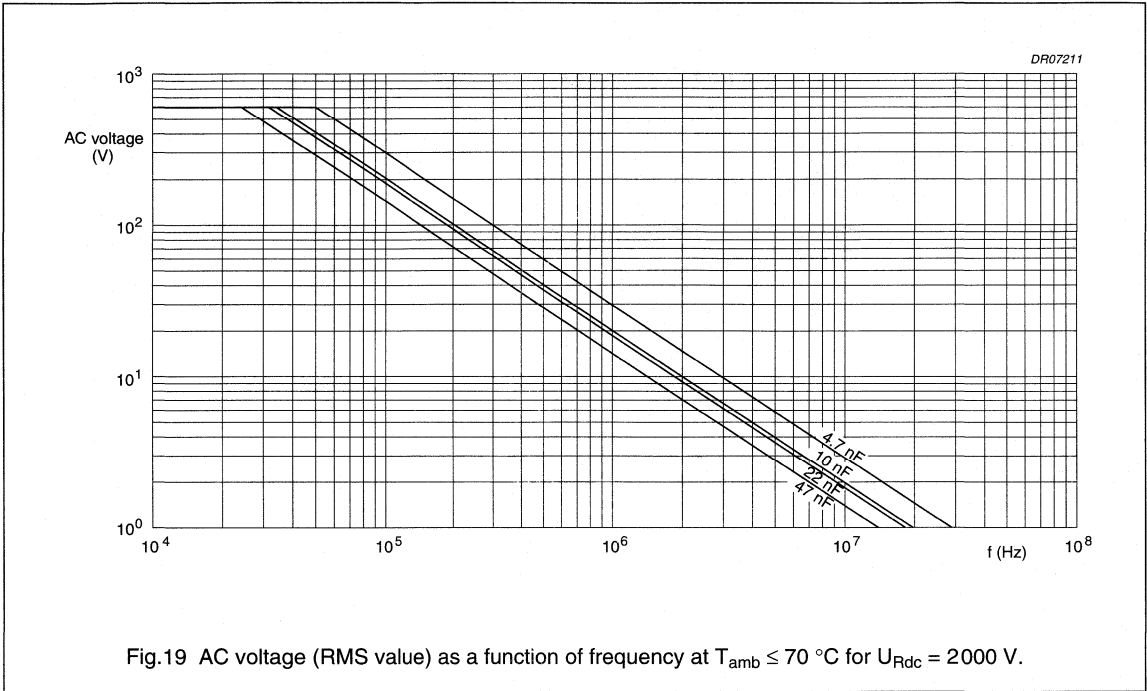
# AC and pulse metallized polypropylene film capacitors

## MKP/MKP 378



AC and pulse metallized polypropylene film capacitors

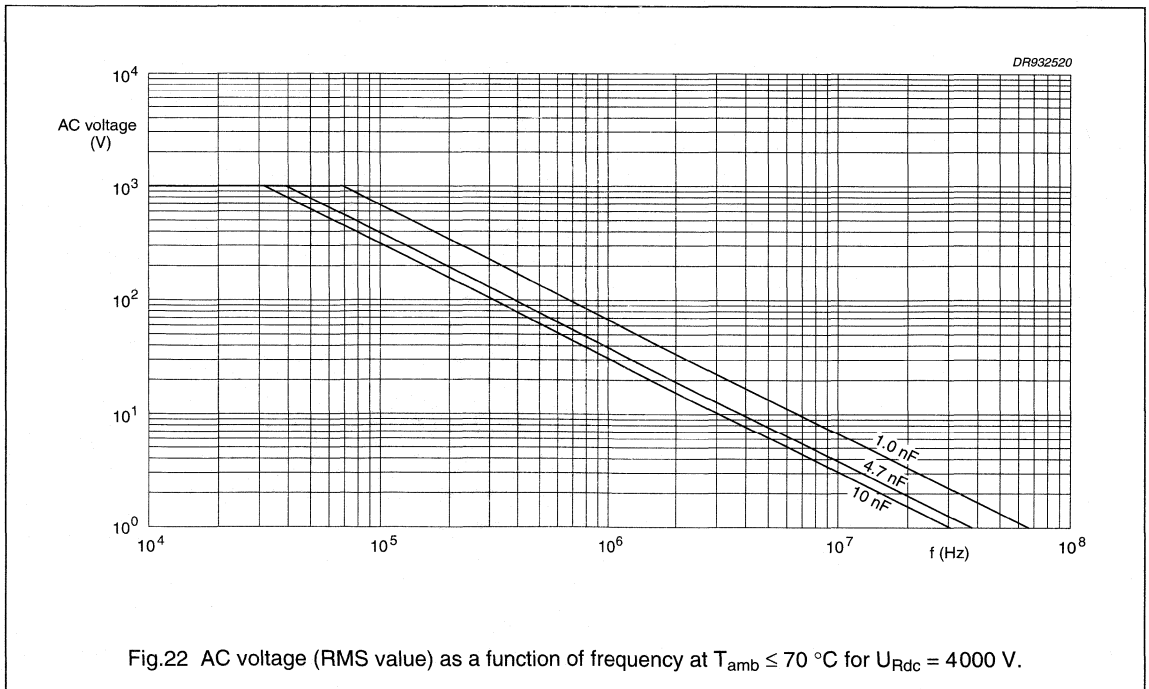
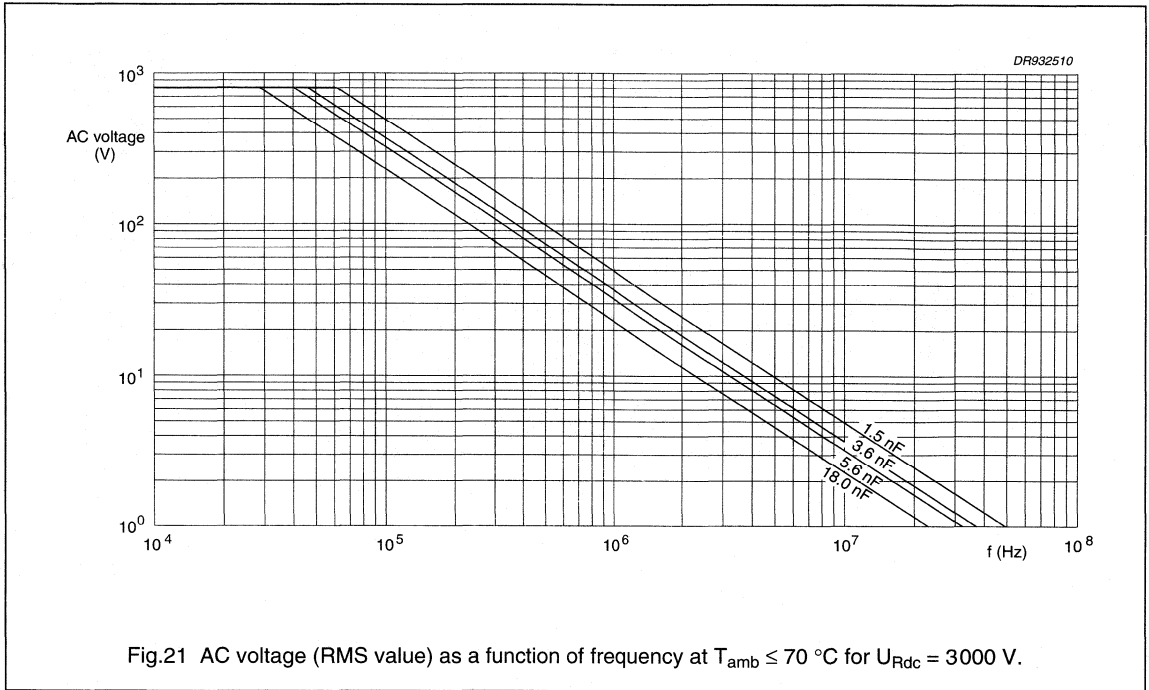
MKP/MKP 378





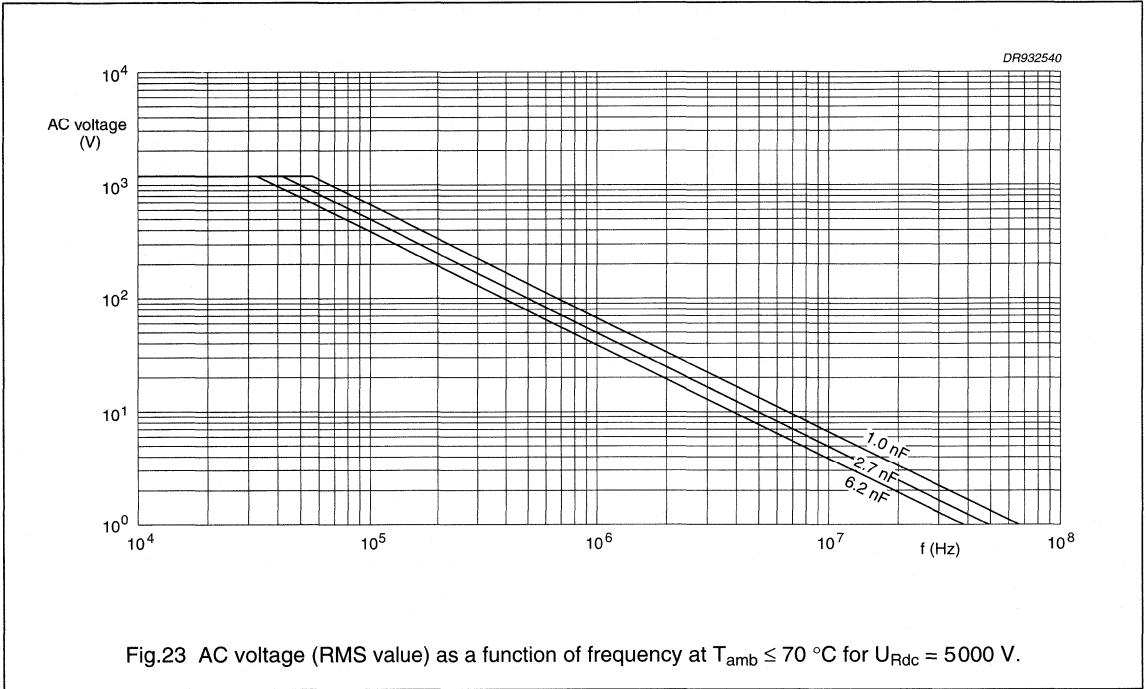
AC and pulse  
metallized polypropylene film capacitors

MKP/MKP 378



AC and pulse  
metallized polypropylene film capacitors

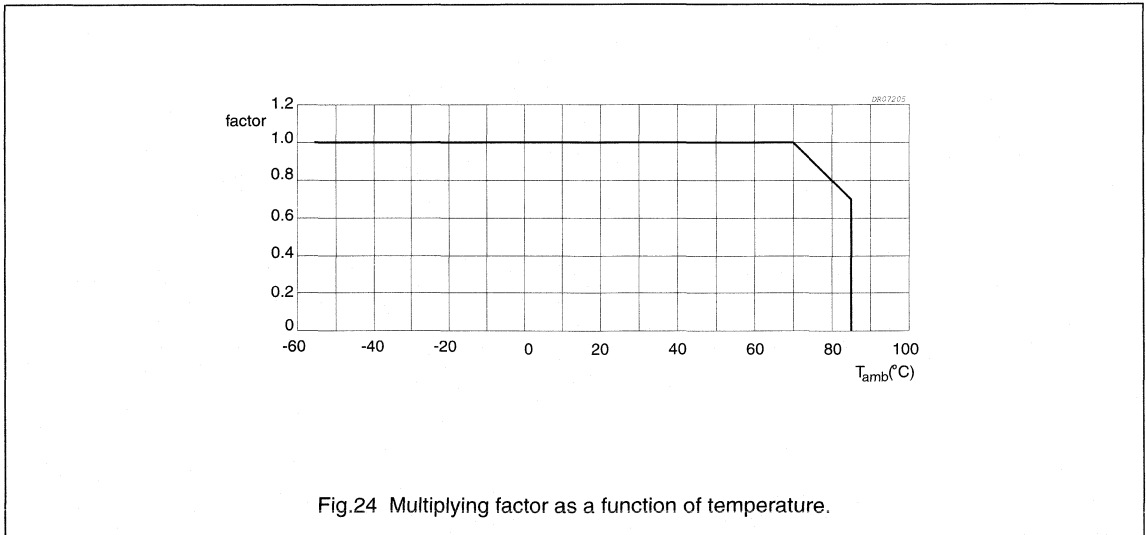
MKP/MKP 378



**Maximum RMS voltage (sinewave) as a function of frequency for  $T_{amb} > 70\text{ }^{\circ}\text{C}$  (voltage derating)**

The maximum RMS voltage in Figs 16 to 23 has to be multiplied by a factor given in Fig.24.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 27 and 28.

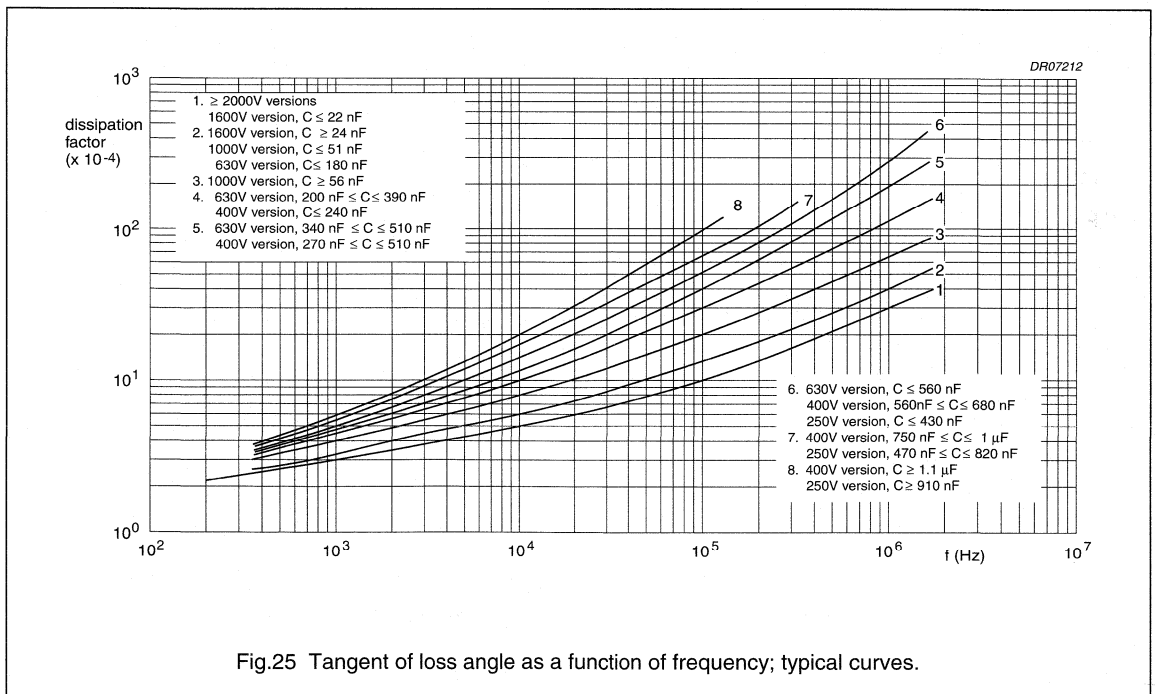


# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## Tangent of loss angle

RATED VOLTAGE		CAPACITANCE ( $\mu\text{F}$ )	TANGENT OF LOSS ANGLE	
$U_{\text{Rdc}}$ (V)	$U_{\text{Rac}}$ (V)		at 10 kHz	at 100 kHz
630	300	$\leq 0.18$	$\leq 8 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
		0.2 to 0.3	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
		0.33 to 0.39	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
		0.43 to 0.51	$\leq 10 \times 10^{-4}$	$\leq 40 \times 10^{-4}$
		0.56 to 0.68	$\leq 10 \times 10^{-4}$	$\leq 45 \times 10^{-4}$
1000	400	$\leq 0.051$	$\leq 6 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
		0.056 to 0.22	$\leq 8 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
1600	500	0.0056 to 0.022	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
		0.024 to 0.1	$\leq 6 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
2000	600	0.0033 to 0.051	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
2500	675	$\leq 0.030$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
3000	800	$\leq 0.018$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
4000	1000	$\leq 0.010$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
5000	1200	$\leq 0.0062$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$



# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## Rated voltage pulse slope

**Table 1** Rated voltage pulse slope (dU/dt)<sub>R</sub>

RATED VOLTAGE		MAXIMUM RATED PULSE LOAD (V/μs)			
		P = 15.0 mm	P = 22.5 mm	P = 27.5 mm	
U <sub>Rdc</sub> (V)	U <sub>Rac</sub> (V)			b < 15 mm	b ≥ 15 mm
630	300	500	370	230	120
1000	400	1300	1200	600	300
1600	500	–	1600	900	450
2000	600	–	2000	1200	600
2500	675	–	2000	2000	1000
3000	800	–	2000	2000	1000
4000	1000	–	–	2000	1000
5000	1200	–	–	2000	1000

If the pulse voltage is lower than the rated voltage, the values of the specific reference data may be multiplied by U<sub>Rdc</sub> and divided by the applied peak-to-peak voltage.

The rated voltage pulse slope is valid for ambient temperatures up to 70 °C. For higher temperatures a derating factor of 3% per Kelvin shall be applied.

## Insulation resistance

The insulation resistance is measured after a voltage has been applied for 1 minute ±5 seconds, the voltage being 500 ±50 V:

- R between leads, for C ≤ 1 μF: >100000 MΩ
- RC between leads, for C > 1 μF: >100000 s
- R between interconnected leads and case (foil method): >100000 MΩ.

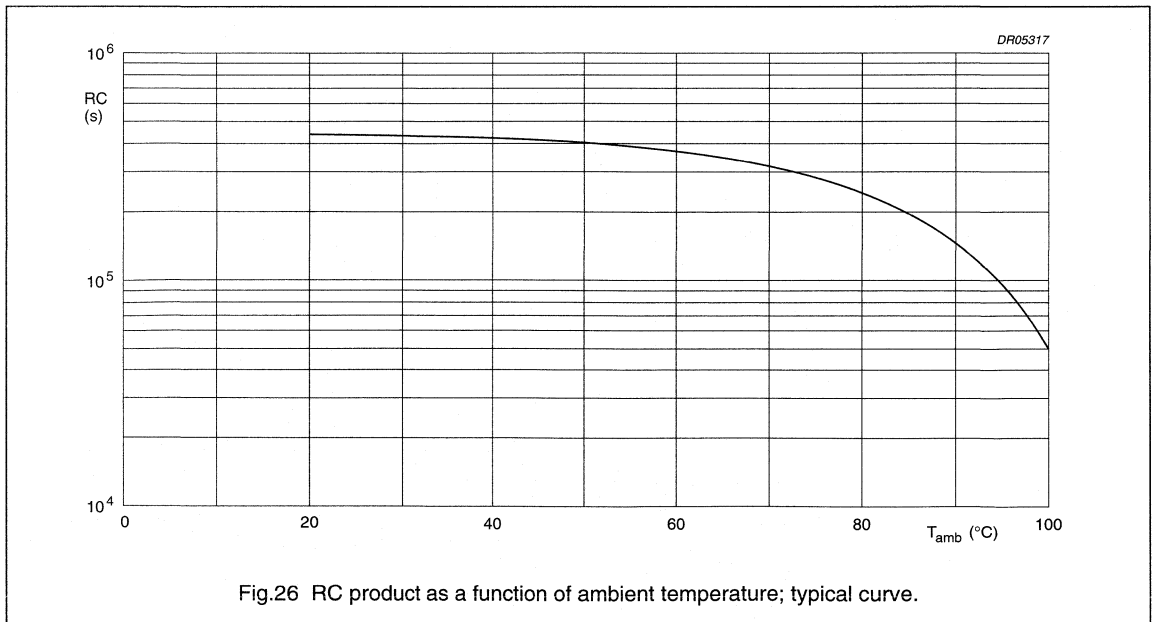


Fig.26 RC product as a function of ambient temperature; typical curve.

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Figs 27 and 28)

$b_{\max}$ (mm)	PITCH (mm)		
	15	22.5	27.5
5.0	1	—	—
6.0	2	5	—
7.0	3	6	—
8.5	4	7	—
10.0	—	8	—
11.0	—	—	9
13.0	—	—	10
15.0	—	—	11
18.0	—	—	12

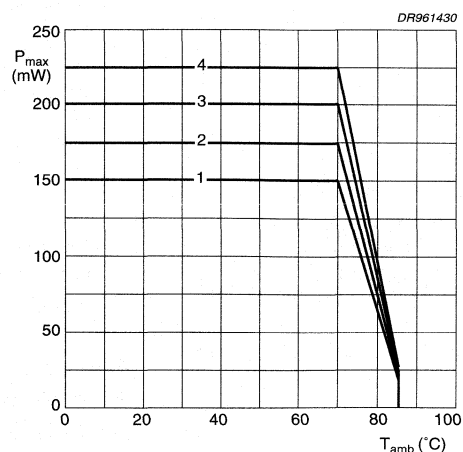


Fig.27 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

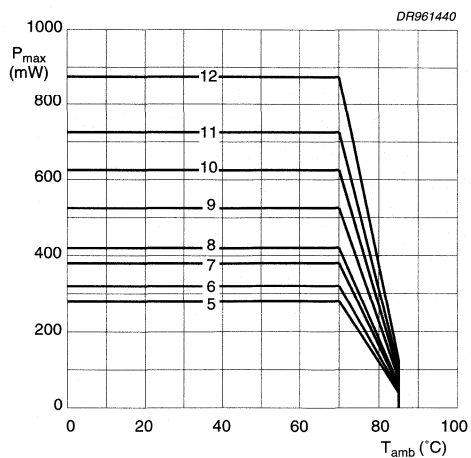


Fig.28 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

# AC and pulse metallized polypropylene film capacitors

## MKP/MKP 378

### Application note<sup>(1)</sup>

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance:

$$I_{p,max} = C \left( \frac{dU}{dt} \right)_{max}$$

Or the voltage pulse slope shall not exceed the rated voltage pulse slope. If the peak-to-peak voltage is lower than the rated voltage, the values (see Table 1 "Rated voltage pulse slope ( $dU/dt$ )R" for more details) may be multiplied by  $U_{Rdc}$  and divided by the applied peak-to-peak voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation as given in Figs 27 and 28.

5. The free air ambient temperature for the capacitor does not exceed the category temperature.
6. Since in circuits used at voltages over 280 V peak-to-peak the risk for an intrinsically active flammability after a capacitor breakdown (short circuit) increases, it is recommended that the power in the capacitor be limited to 10 times the maximum allowed power dissipation ( $P_{max}$ ) during the short circuit failure mode of the capacitor.

Example:  $C = 10 \text{ nF} - 1600 \text{ V}$  used for the voltage signal shown in Fig.29.

This is a pulse with:

$$U_{p-p} = 1200 \text{ V}; U_p = 1100 \text{ V}; \\ T_1 = 12 \mu\text{s}; T_2 = 64 \mu\text{s}; T_3 = 4 \mu\text{s}$$

The ambient temperature is  $50 \text{ }^\circ\text{C}$ .

### Checking the conditions:

1. The peak voltage  $U_p = 1100 \text{ V}$  is lower than  $1600 \text{ V (DC)}$ .
2. The peak-to-peak voltage  $1200 \text{ V}$  is lower than  $2 \times \sqrt{2} \times 500 \text{ V (AC)} = 1414 U_{p-p}$ .
3. The voltage pulse slope  $dU/dt = 1200 \text{ V}/4\mu\text{s} = 300 \text{ V}/\mu\text{s}$ . This is lower than  $1600 \text{ V}/\mu\text{s}$  (see specific reference data for each version).
4. The dissipated power is  $270 \text{ mW}$  as calculated with Fourier terms. This is less than  $320 \text{ mW}$ , allowed for a capacitor with dimensions:  $b_{max} = 7.0 \text{ mm}$  and pitch =  $22.5 \text{ mm}$ .
5. The free air ambient temperature is more than  $50 \text{ }^\circ\text{C}$ , and lower than  $70 \text{ }^\circ\text{C}$ .
6. In case of failure, the power is switched off.

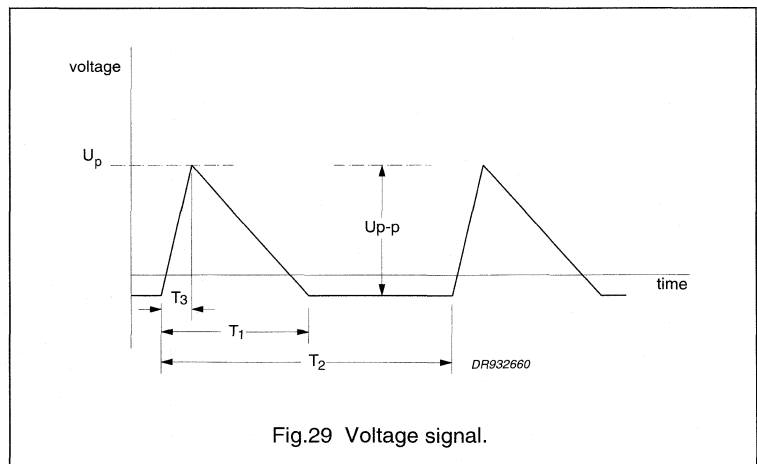


Fig.29 Voltage signal.

(1) Peak-to-peak current tables for S-correction application, are available on request.

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

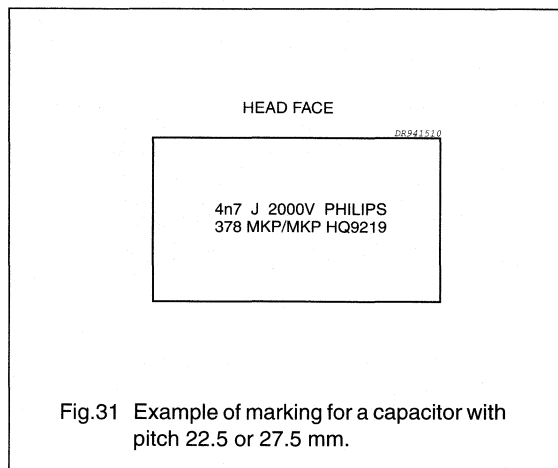
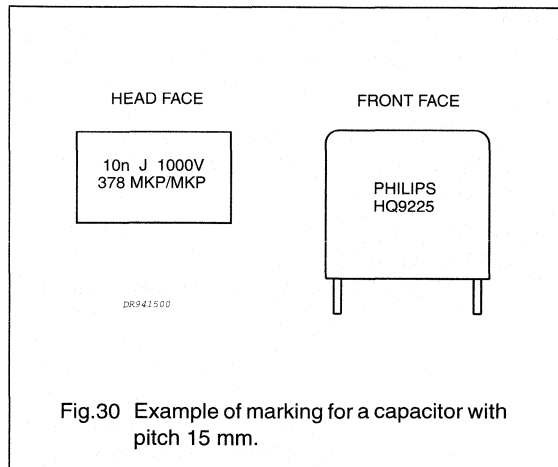
## MARKING

### 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: J =  $\pm 5\%$
3. Rated voltage (DC) (e.g. 1 000 V)
4. Code for dielectric material (MKP/MKP)
5. Code for factory of origin (HQ)
6. Manufacturer's type designation (378)
7. Manufacturer' name (PHILIPS)
8. Year and week of manufacture (e.g. 9225).







# AC and pulse metallized polypropylene film capacitors

## MKP/MKP 378

### Package marking

The package containing the capacitors is marked as shown in Fig.32.

Barcode label marking	
LINE	MARKING EXPLANATION
1.	PHILIPS COMPONENTS
2.	MADE IN BELGIUM
3.	AC/PULSE POLYPROP. FILM CAPACITOR
4.	MKP RADIAL POTTED TYPE
5.	0.68 $\mu$ F $\pm$ 5% 400V= 55/085/56
6.	
7.	 WO: 12345678 ORIG A170 RPC HQ 1234 
8.	TYPE MKP 378
9.	 QTY 100 DATE 9625 
10.	COEEND 2222 378 52684

CCA333

Fig.32 Barcode label.



# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: "IEC 68-2-21" Resistance to soldering heat: "IEC 68-2-20" Component solvent resistance	solder bath: 260 °C; 10 s  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking $ \Delta C/C  \leq 1\%$ $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF)
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"  Shock: "IEC 68-2-27"	10 Hz to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours  half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 1\%$ $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2" Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30" Cold: "IEC 68-2-1" Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"	16 hours; 85 °C    2 hours; -55 °C	$ \Delta C/C  \leq 1\%$ (22.5/27.5 mm pitch) $ \Delta C/C  \leq 2\%$ (15 mm pitch) $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value

# AC and pulse metallized polypropylene film capacitors

MKP/MKP 378

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 1\%$ (22.5/27.5 mm pitch) $ \Delta C/C  \leq 2\%$ (15 mm pitch) $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ (100 nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-17"	1000 h: 85 °C 1.25 × $U_{Rac}$ (RMS); 50 Hz	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ (100 nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-17"	2000 hours; 85 °C	$ \Delta C/C  \leq 1\%$ (22.5/27.5 mm pitch) $ \Delta C/C  \leq 2\%$ (15 mm pitch) $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ (100 nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
Resistance to soldering heat with preheating: "IEC 384-17"	body temperature: 85 °C; bath temperature: 260 °C; dwell time: 10 s	$ \Delta C/C  \leq 1\%$ $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ (100 nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
Passive flammability: "IEC 695-2-2"	class C	no burning
Endurance (DC): "IEC 384-17"	2000 hours; 1.25 × $U_{Rdc}$ ; 85 °C	$ \Delta C/C  \leq 1\%$ (22.5/27.5 mm pitch) $ \Delta C/C  \leq 2\%$ (15 mm pitch) $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ (100 nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value

**Note**

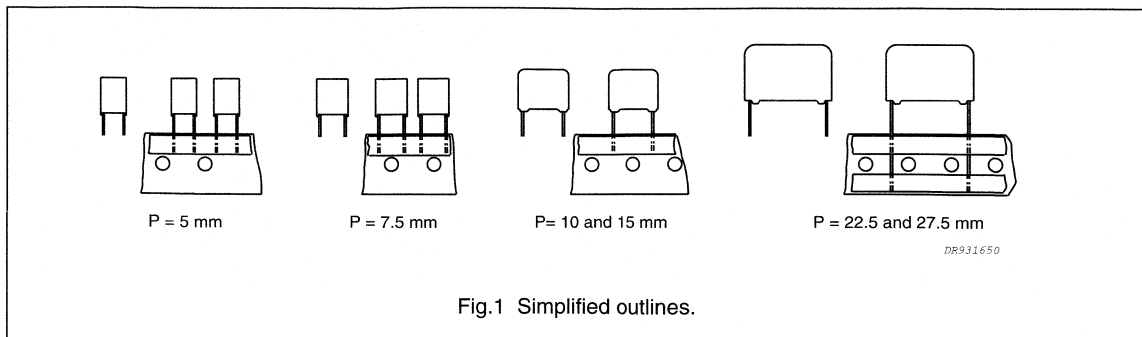
1. For detailed information, see "Type specification".

# AC and pulse metallized polypropylene film capacitors

## MKP 379/380

### MKP RADIAL POTTED CAPACITORS

PITCH 5/10/15/22.5/27.5 mm



### FEATURES

- 5 to 27.5 mm lead pitch
- Supplied loose in box, in ammpack and taped on reel.

### APPLICATIONS

- Low losses due to low contact resistance and low loss dielectric result in applications where high currents at high frequency occur or high stability is preferred
- Their small dimensions make them suitable for circuits with high packaging density.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E24 series)	0.0015 to 6.2 $\mu$ F
Capacitance tolerance	$\pm 5\%$ ; $\pm 10\%$
For pitch $\leq 15$ mm:	
rated voltage (DC)	100 V; 160 V; 250 V; 400 V; 630 V
rated voltage (AC)	63 V; 100 V; 160 V; 200 V; 220 V (see note 1)
rated peak-to-peak voltage	180 V; 280 V; 450 V; 560 V; 620 V (see note 1)
For pitch $> 15$ mm:	
rated voltage (DC)	160 V; 250 V; 400 V; 630 V
rated voltage (AC)	100 V; 160 V; 200 V; 250 V
rated peak-to-peak voltage	280 V; 450 V; 560 V; 700 V
Climatic category	55/085/56
Rated temperature (DC)	85 °C
Rated temperature (AC)	70 °C
Maximum application temperature	85 °C
Reference specification	IEC 384-17
Performance grade	grade 1 (long life)
Stability grade:	
100 V, 160 V versions	grade 2
250 V to 630 V versions pitch 5 to 15 mm	grade 2
250 V to 630 V versions pitch 22.5 and 27.5 mm	grade 1

### Note

1. For pitch = 5.0 mm:  
Rated voltage (AC) = 200 V  
Rated peak-to-peak voltage = 560 V.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 380 GENERAL DATA

PITCH 5 mm

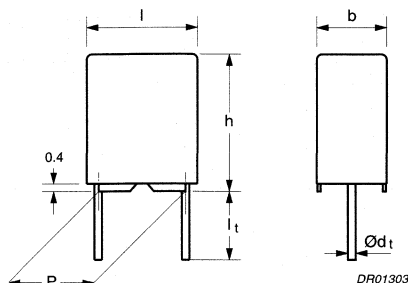


Fig.2 Outline.

## Specific reference data for the 100 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	80 V/ $\mu$ s	
R between leads	$> 100000 \text{ M}\Omega$	

## Available 100 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 380 25...	preferred
		$\pm 5\%$	2222 380 26...	on request
Loose in box	$l_t = 4.0 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 380 21...	on request
		$\pm 5\%$	2222 380 22...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 380

 $U_{Rdc} = 100 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ / $U_{p-p} = 180 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 380 ..... AND PACKAGING		
			AMMOPACK		LOOSE IN BOX
			H = 18.5 mm		$l_t = 4.0 \pm 0.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>					
0.015	2.5 × 6.5 × 7.2	0.25	25153	2000	2000
0.016			25163		
0.018	3.5 × 8.0 × 7.2	0.35	25183	1500	2000
0.02			25203		
0.022			25223		
0.024			25243		
0.027			25273		
0.03			25303		
0.033			25333		
0.036	4.5 × 9.0 × 7.2	0.45	25363	1000	2000
0.039			25393		
0.043			25433		
0.047			25473		
0.051	6.0 × 11.0 × 7.2	0.60	25513	750	2000
0.056			25563		
0.062			25623		
0.068			25683		
0.075			25753		
0.082			25823		
0.091			25913		
0.1			25104		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 380 GENERAL DATA

PITCH 5 mm

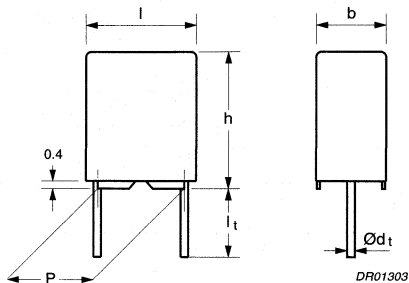


Fig.3 Outline.

## Specific reference data for the 160 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	80 V/ $\mu$ s	
R between leads	$> 100000 \text{ M}\Omega$	

## Available 160 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 380 35...	preferred
		$\pm 5\%$	2222 380 36...	on request
Loose in box	$l_t = 4.0 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 380 31...	on request
		$\pm 5\%$	2222 380 32...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

## MKP 380

 $U_{Rdc} = 160 \text{ V}; U_{Rac} = 100 \text{ V}/U_{p-p} = 280 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 380 ..... AND PACKAGING		
			AMMOPACK		LOOSE IN BOX
			H = 18.5 mm		$l_t = 4.0 \pm 0.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>					
0.01	2.5 × 6.5 × 7.2	0.25	35103	2000	2000
0.011			35113		
0.012			35123		
0.013	3.5 × 8.0 × 7.2	0.35	35133	1500	2000
0.015			35153		
0.016			35163		
0.018			35183		
0.02			35203		
0.022			35223		
0.024	4.5 × 9.0 × 7.2	0.45	35243	1000	2000
0.027			35273		
0.03			35303		
0.033			35333		
0.036	6.0 × 11.0 × 7.2	0.60	35363	750	2000
0.039			35393		
0.043			35433		
0.047			35473		
0.051			35513		
0.056			35563		
0.062			35623		
0.068			35683		

### Note

- The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 380 GENERAL DATA

PITCH 5 mm

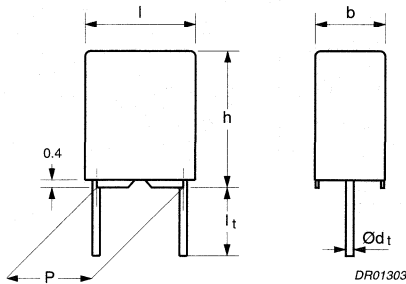


Fig.4 Outline.

## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	90 V/ $\mu$ s	
R between leads	>100 000 M $\Omega$	

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 380 45...	preferred
		$\pm 5\%$	2222 380 46...	on request
Loose in box	$l_t = 4.0 \pm 0.5$ mm	$\pm 10\%$	2222 380 41...	on request
		$\pm 5\%$	2222 380 42...	on request

## Note

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



# AC and pulse metallized polypropylene film capacitors

## MKP 380

 $U_{Rdc} = 250 \text{ V}; U_{Rac} = 160 \text{ V}/U_{p-p} = 450 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 380 ..... AND PACKAGING		
			AMMOPACK		LOOSE IN BOX
			H = 18.5 mm		$l_t = 4.0 \pm 0.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}; d_t = 0.50 \pm 0.05 \text{ mm}</math></b>					
0.0068 0.0075 0.0082	2.5 × 6.5 × 7.2	0.25	45682	2000	2000
			45752		
			45822		
0.0091 0.01 0.011 0.012 0.013 0.015	3.5 × 8.0 × 7.2	0.35	45912	1500	2000
			45103		
			45113		
			45123		
			45133		
			45153		
0.016 0.018 0.02 0.022 0.024	4.5 × 9.0 × 7.2	0.45	45163	1000	2000
			45183		
			45203		
			45223		
			45243		
0.027 0.03 0.033 0.036 0.039 0.043	6.0 × 11.0 × 7.2	0.60	45273	750	2000
			45303		
			45333		
			45363		
			45393		
			45433		

### Note

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 380 GENERAL DATA

PITCH 5 mm

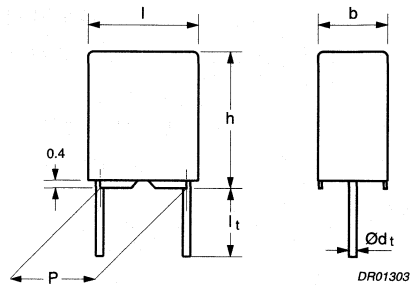


Fig.5 Outline.

## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	100 V/ $\mu$ s	
R between leads	$> 100000 \text{ M}\Omega$	

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 380 55...	preferred
		$\pm 5\%$	2222 380 56...	on request
Loose in box	$l_t = 4.0 \pm 0.5 \text{ mm}$	$\pm 10\%$	2222 380 51...	on request
		$\pm 5\%$	2222 380 52...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 380

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}/U_{p-p} = 560 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 380 ..... AND PACKAGING		
			AMMOPACK		LOOSE IN BOX
			H = 18.5 mm		$l_t = 4.0 \pm 0.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>					
0.0033	2.5 × 6.5 × 7.2	0.25	55332	2000	2000
0.0036			55362		
0.0039			55392		
0.0043	3.5 × 8.0 × 7.2	0.35	55432	1500	2000
0.0047			55472		
0.0051			55512		
0.0056			55562		
0.0062			55622		
0.0068			55682		
0.0075			55752		
0.0082			55822		
0.0091	4.5 × 9.0 × 7.2	0.45	55912	1000	2000
0.01			55103		
0.011			55113		
0.012			55123		
0.013	6.0 × 11.0 × 7.2	0.60	55133	750	2000
0.015			55153		
0.016			55163		
0.018			55183		
0.02			55203		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 380 GENERAL DATA

PITCH 5 mm

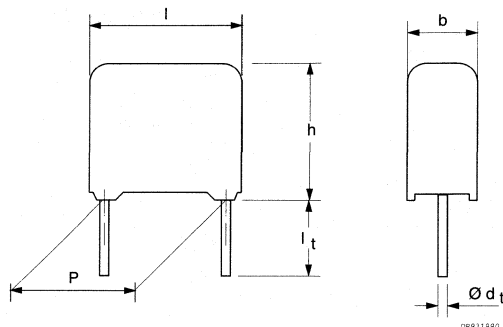


Fig.6 Outline.

## Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	120 V/ $\mu$ s	
R between leads	>100000 M $\Omega$	

## Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Ammopack	H = 18.5 mm; note 1	$\pm 10\%$	2222 380 65...	preferred
		$\pm 5\%$	2222 380 66...	on request
Loose in box	$l_t = 4.0 \pm 0.5$ mm	$\pm 10\%$	2222 380 61...	on request
		$\pm 5\%$	2222 380 62...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 380

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}/U_{p-p} = 560 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 380 ..... AND PACKAGING		
			AMMOPACK		LOOSE IN BOX
			H = 18.5 mm		$l_t = 4.0 \pm 0.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 10\%$		
<b>Pitch = <math>5.0 \pm 0.3 \text{ mm}</math>; <math>d_t = 0.50 \pm 0.05 \text{ mm}</math></b>					
0.0015	$3.5 \times 8.0 \times 7.2$	0.35	65152	1500	2000
0.0016			65162		
0.0018			65182		
0.002			65202		
0.0022			65222		
0.0024			65242		
0.0027			65272		
0.003			65302		
0.0033			65332		
0.0036			65362		
0.0039	65392				
0.0043	$4.5 \times 9.0 \times 7.2$	0.45	65432	1000	2000
0.0047			65472		
0.0051			65512		
0.0056			65562		
0.0062	$6.0 \times 11.0 \times 7.2$	0.60	65622	750	2000
0.0068			65682		
0.0075			65752		
0.0082			65822		
0.0091			65912		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 379 GENERAL DATA

PITCH 10 mm

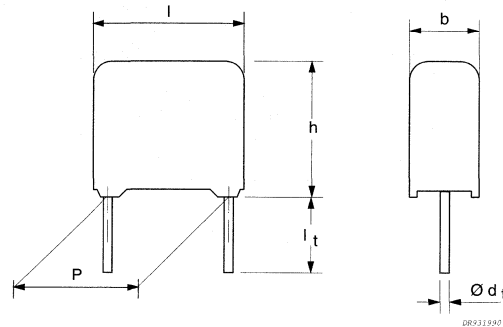


Fig.7 Outline.

## Specific reference data for the 160 V DC capacitors (pitch = 10 mm)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 25 \times 10^{-4}$	$\leq 80 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	60 V/ $\mu$ s	
R between leads	$> 100000 \text{ M}\Omega$	

## Available 160 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 379 34...	preferred
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 379 35...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 379

 $U_{Rdc} = 160 \text{ V}; U_{Rac} = 100 \text{ V}/U_{p-p} = 280 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 379 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}; d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.075	$4.0 \times 10.0 \times 12.5$	0.6	34753	1000	1400
0.082			34823		
0.091			34913		
0.1			34104		
0.11	$5.0 \times 11.0 \times 12.5$	0.85	34114	1000	1100
0.12			34124		
0.13			34134		
0.15			34154		
0.16	$6.0 \times 12.0 \times 12.5$	1.0	34164	1000	900

**Note**

- The shading indicates preferred types.

Available on request

loose and taped

PITCH	$d_t$	CAPACITANCE RANGE ( $\mu\text{F}$ ) <sup>(1)</sup>
$U_{Rdc} = 160 \text{ V}; U_{Rac} = 100 \text{ V}/U_{p-p} = 280 \text{ V}$		
$7.5 \pm 0.4 \text{ mm}$	$0.60 \pm 0.06 \text{ mm}$	0.0022 to 0.012

**Note**

- E24 series.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

MKP 379 GENERAL DATA

PITCH 15/22.5/27.5 mm

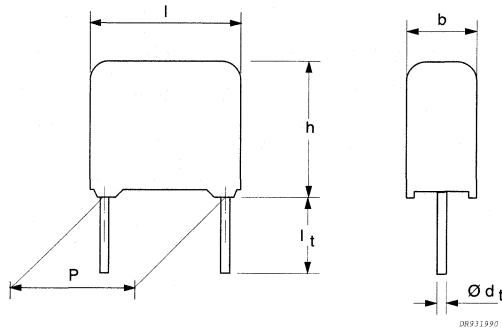


Fig.8 Outline.

### Specific reference data for the 160 V DC capacitors (pitch > 10 mm)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
0.16 $\mu\text{F}$ < C $\leq$ 0.75 $\mu\text{F}$	$\leq 25 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
0.75 $\mu\text{F}$ < C $\leq$ 1.0 $\mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 150 \times 10^{-4}$
C > 1.0 $\mu\text{F}$	$\leq 30 \times 10^{-4}$	—
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> :		
l = 17.5 mm		50 V/ $\mu\text{s}$
l = 26.0 mm		25 V/ $\mu\text{s}$
l = 31.0 mm		15 V/ $\mu\text{s}$ (b < 15 mm)
l = 31.0 mm		7.5 V/ $\mu\text{s}$ (b $\geq$ 15 mm)
R between leads, for C $\leq$ 1 $\mu\text{F}$		>100000 M $\Omega$
RC between leads, for C > 1 $\mu\text{F}$		>100000 s

### Available 160 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 $\pm$ 0.3 mm	$\pm$ 5%	2222 379 34...	preferred
Taped on reel	H = 18.5 mm; note 1	$\pm$ 5%	2222 379 35...	on request

### Note

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



# AC and pulse metallized polypropylene film capacitors

MKP 379

 $U_{Rdc} = 160 \text{ V}$ ;  $U_{Rac} = 100 \text{ V}$ / $U_{p-p} = 280 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 379 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		$H = 18.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.18	5.0 × 11.0 × 17.5	1.2	34184	1000	1100
0.2			34204		
0.22			34224		
0.24			34244		
0.27			34274		
0.3	6.0 × 12.0 × 17.5	1.4	34304	1000	900
0.33			34334		
0.36			34364		
0.39			34394		
0.43	7.0 × 13.5 × 17.5	1.9	34434	1000	800
0.47			34474		
0.51			34514		
0.56	8.5 × 15.0 × 17.5	2.6	34564	1000	650
0.62			34624		
0.68			34684		
0.75			34754		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.82	7.0 × 16.5 × 26.0	3.2	34824	200	550
0.91			34914		
1	8.5 × 18.0 × 26.0	4.4	34105	200	450
1.1			34115		
1.2			34125		
1.3			34135		
1.5	10.0 × 19.5 × 26.0	5.5	34155	200	350
1.6			34165		
1.8			34185		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
2	11.0 × 21.0 × 31.0	7.8	34205	100	300
2.2			34225		
2.4			34245		
2.7	13.0 × 23.0 × 31.0	10.4	34275	100	250
3			34305		
3.3	15.0 × 25.0 × 31.0	12.8	34335	100	200
3.6			34365		
3.9			34395		
4.3			34435		
4.7	18.0 × 28.0 × 31.0	17.2	34475	100	150
5.1			34515		
5.6			34565		
6.2			34625		

**Note**

1. The shading indicates preferred types.

AC and pulse  
metallized polypropylene film capacitors

MKP 379/380

MKP 379 GENERAL DATA

PITCH 10 mm

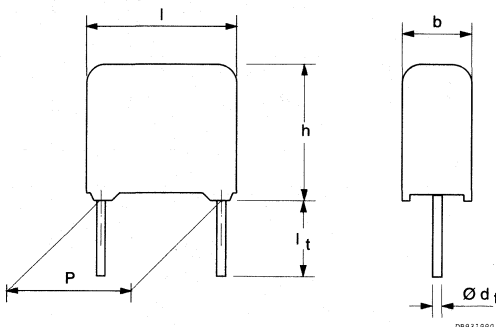


Fig.9 Outline.

Specific reference data for the 250 V DC capacitors (pitch = 10 mm)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 15 \times 10^{-4}$	$\leq 40 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	70 V/ $\mu$ s	
R between leads	$> 100000 \text{ M}\Omega$	

Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 379 44...	preferred
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 379 45...	on request

Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 379

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ / $U_{p-p} = 450 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 379 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		$H = 18.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.047	4.0 × 10.0 × 12.5	0.6	44473	1000	1400
0.051			44513		
0.056			44563		
0.062			44623		
0.068			44683		
0.075	5.0 × 11.0 × 12.5	0.85	44753	1000	1100
0.082			44823		
0.091			44913		

**Note**

- The shading indicates preferred types.

**Available on request**

loose and taped

PITCH	$d_t$	CAPACITANCE RANGE ( $\mu\text{F}$ ) <sup>(1)</sup>
<b><math>U_{Rdc} = 250 \text{ V}</math>; <math>U_{Rac} = 160 \text{ V}</math>/<math>U_{p-p} = 450 \text{ V}</math></b>		
7.5 $\pm$ 0.4 mm	0.60 $\pm$ 0.06 mm	0.012 to 0.082

**Note**

- E24 series.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 379 GENERAL DATA

PITCH 15/22.5/27.5 mm

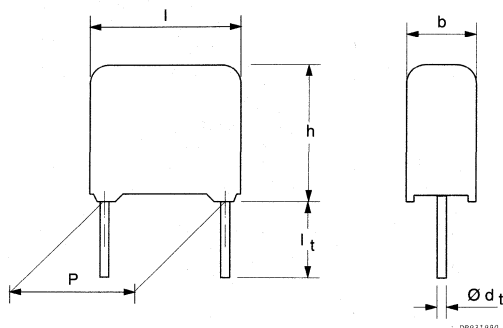


Fig.10 Outline.

## Specific reference data for the 250 V DC capacitors (pitch &gt; 10 mm)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: 0.091 $\mu\text{F} < C \leq 0.47 \mu\text{F}$ 0.47 $\mu\text{F} < C \leq 1.0 \mu\text{F}$ 1.0 $\mu\text{F} < C \leq 3.9 \mu\text{F}$	$\leq 15 \times 10^{-4}$ $\leq 20 \times 10^{-4}$ $\leq 25 \times 10^{-4}$	$\leq 60 \times 10^{-4}$ $\leq 120 \times 10^{-4}$ -
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : l = 17.5 mm l = 26.0 mm l = 31.0 mm l = 31.0 mm	60 V/ $\mu\text{s}$ 30 V/ $\mu\text{s}$ 20 V/ $\mu\text{s}$ (b < 15 mm) 10 V/ $\mu\text{s}$ (b $\geq$ 15 mm)	
R between leads, for $C \leq 1 \mu\text{F}$	>100000 M $\Omega$	
RC between leads, for $C > 1 \mu\text{F}$	>100000 s	

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 379 44...	preferred
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 379 45...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 379

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ / $U_{p-p} = 450 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 379 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.1	5.0 × 11.0 × 17.5	1.2	44104	1000	1100
0.11			44114		
0.12			44124		
0.13			44134		
0.15			44154		
0.16			44164		
0.18	6.0 × 12.0 × 17.5	1.4	44184	1000	900
0.2			44204		
0.22			44224		
0.24			44244		
0.27	7.0 × 13.5 × 17.5	1.9	44274	1000	800
0.3			44304		
0.33			44334		
0.36	8.5 × 15.0 × 17.5	2.6	44364	1000	650
0.39			44394		
0.43			44434		
0.47			44474		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.51	7.0 × 16.5 × 26.0	3.2	44514	200	550
0.56			44564		
0.62			44624		
0.68	8.5 × 18.0 × 26.0	4.4	44684	200	450
0.75			44754		
0.82			44824		
0.91			44914		
1	10.0 × 19.5 × 26.0	5.5	44105	200	350
1.1			44115		
1.2			44125		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
1.3	11.0 × 21.0 × 31.0	7.8	44135	100	300
1.5			44155		
1.6			44165		
1.8	13.0 × 23.0 × 31.0	10.4	44185	100	250
2			44205		
2.2			44225		
2.4	15.0 × 25.0 × 31.0	12.8	44245	100	200
2.7			44275		
3	18.0 × 28.0 × 31.0	17.2	44305	100	150
3.3			44335		
3.6			44365		
3.9			44395		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 379 GENERAL DATA

PITCH 10 mm

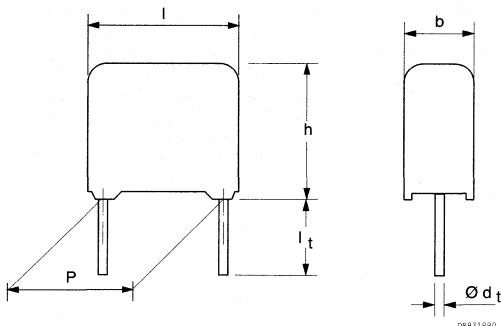


Fig.11 Outline.

## Specific reference data for the 400 V DC capacitors (pitch = 10 mm)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	80 V/ $\mu$ s	
R between leads	>100000 M $\Omega$	

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5$ mm	$\pm 5\%$	2222 379 54...	preferred
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 379 55...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 379

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}/U_{p-p} = 560 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 379 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.022	4.0 × 10.0 × 12.5	0.6	54223	1000	1400
0.024			54243		
0.027			54273		
0.03			54303		
0.033			54333		
0.036	5.0 × 11.0 × 12.5	0.85	54363	1000	1100
0.039			54393		
0.043			54433		

**Note**

- The shading indicates preferred types.

**Available on request**

loose and taped

PITCH	$d_t$	CAPACITANCE RANGE ( $\mu\text{F}$ ) <sup>(1)</sup>
<b><math>U_{Rdc} = 400 \text{ V}</math>; <math>U_{Rac} = 200 \text{ V}/U_{p-p} = 560 \text{ V}</math></b>		
7.5 $\pm 0.4 \text{ mm}$	0.60 $\pm 0.06 \text{ mm}$	0.0075 to 0.039

**Note**

- E24 series.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 379 GENERAL DATA

PITCH 15/22.5/27.5 mm

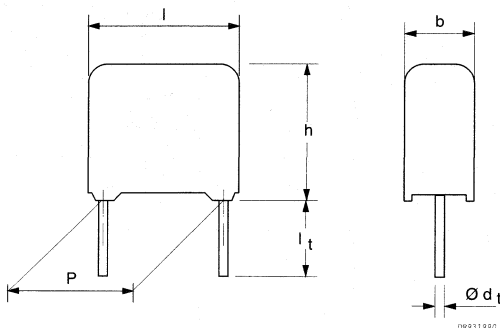


Fig.12 Outline.

## Specific reference data for the 400 V DC capacitors (pitch &gt; 10 mm)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
0.043 $\mu\text{F}$ < C $\leq$ 0.22 $\mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 40 \times 10^{-4}$
0.22 $\mu\text{F}$ < C $\leq$ 0.62 $\mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 60 \times 10^{-4}$
0.62 $\mu\text{F}$ < C $\leq$ 1.0 $\mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 80 \times 10^{-4}$
1.0 $\mu\text{F}$ < C $\leq$ 2.0 $\mu\text{F}$	$\leq 20 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :		
l = 17.5 mm		70 V/ $\mu\text{s}$
l = 26.0 mm		35 V/ $\mu\text{s}$
l = 31.0 mm		25 V/ $\mu\text{s}$ (b < 15 mm)
l = 31.0 mm		13 V/ $\mu\text{s}$ (b $\geq$ 15 mm)
R between leads, for C $\leq$ 1 $\mu\text{F}$		>100000 M $\Omega$
RC between leads, for C > 1 $\mu\text{F}$		>100000 s

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3$ mm	$\pm 5\%$	2222 379 54...	preferred
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 379 55...	on request

## Note

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



# AC and pulse metallized polypropylene film capacitors

MKP 379

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ / $U_{p-p} = 560 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 379 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = 15.0 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.047	5.0 $\times$ 11.0 $\times$ 17.5	1.2	54473	1000	1100
0.051			54513		
0.056			54563		
0.062			54623		
0.068			54683		
0.075			54753		
0.082			54823		
0.091	6.0 $\times$ 12.0 $\times$ 17.5	1.4	54913	1000	900
0.1			54104		
0.11			54114		
0.12			54124		
0.13	7.0 $\times$ 13.5 $\times$ 17.5	1.9	54134	1000	800
0.15			54154		
0.16			54164		
0.18	8.5 $\times$ 15.0 $\times$ 17.5	2.6	54184	1000	650
0.2			54204		
0.22			54224		
<b>Pitch = 22.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.24	7.0 $\times$ 16.5 $\times$ 26.0	3.2	54244	200	550
0.27			54274		
0.3			54304		
0.33	8.5 $\times$ 18.0 $\times$ 26.0	4.4	54334	200	450
0.36			54364		
0.39			54394		
0.43			54434		
0.47			54474		
0.51	10.0 $\times$ 19.5 $\times$ 26.0	5.5	54514	200	350
0.56			54564		
0.62			54624		
<b>Pitch = 27.5 <math>\pm 0.4</math> mm; <math>d_t = 0.80 \pm 0.08</math> mm</b>					
0.68	11.0 $\times$ 21.0 $\times$ 31.0	7.8	54684	100	300
0.75			54754		
0.82			54824		
0.91	13.0 $\times$ 23.0 $\times$ 31.0	10.4	54914	100	250
1			54105		
1.1			54115		
1.2	15.0 $\times$ 25.0 $\times$ 31.0	12.8	54125	100	200
1.3			54135		
1.5			54155		
1.6	18.0 $\times$ 28.0 $\times$ 31.0	17.2	54165	100	150
1.8			54185		
2			54205		

**Note**

1. The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

MKP 379 GENERAL DATA

PITCH 10 mm

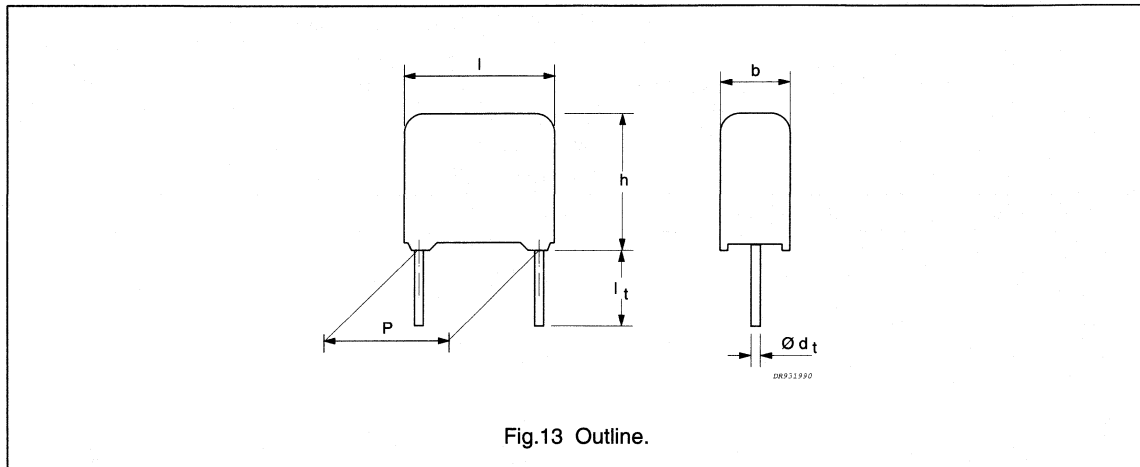


Fig.13 Outline.

### Specific reference data for the 630 V DC capacitors (pitch = 10 mm)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$	100 V/ $\mu$ s	
R between leads	$> 100000 \text{ M}\Omega$	

### Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 379 64...	preferred
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 379 65...	on request

### Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 379

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 220 \text{ V}/U_{p-p} = 620 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 379 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		H = 18.5 mm
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
C-tol = $\pm 5\%$					
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.01	4.0 × 10.0 × 12.5	0.6	64103	1000	1400
0.011			64113		
0.012			64123		
0.013			64133		
0.015			64153		
0.016			64163		
0.018	5.0 × 11.0 × 12.5	0.85	64183	1000	1100
0.02			64203		
0.022			64223		
0.024			64243		

**Note**

- The shading indicates preferred types.

Available on request

loose and taped

PITCH	$d_t$	CAPACITANCE RANGE ( $\mu\text{F}$ ) <sup>(1)</sup>
$U_{Rdc} = 630 \text{ V}$ ; $U_{Rac} = 220 \text{ V}/U_{p-p} = 620 \text{ V}$		
7.5 $\pm$ 0.4 mm	0.60 $\pm$ 0.06 mm	0.0033 to 0.0022

**Note**

- E24 series.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## MKP 379 GENERAL DATA

PITCH 15/22.5/27.5 mm

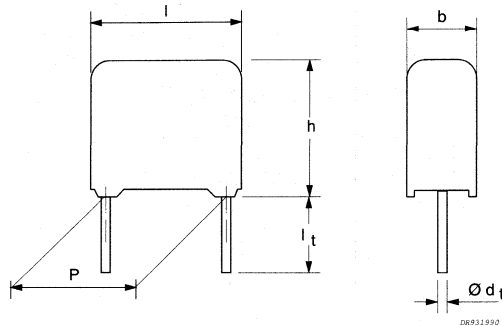


Fig.14 Outline.

## Specific reference data for the 630 V DC capacitors (pitch &gt; 10 mm)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: 0.024 $\mu\text{F} < C \leq 0.11 \mu\text{F}$ 0.11 $\mu\text{F} < C \leq 0.30 \mu\text{F}$ 0.33 $\mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 10 \times 10^{-4}$ $\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$	$\leq 25 \times 10^{-4}$ $\leq 35 \times 10^{-4}$ $\leq 70 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : l = 17.5 mm l = 26.0 mm l = 31.0 mm l = 31.0 mm	90 V/ $\mu\text{s}$ 45 V/ $\mu\text{s}$ 30 V/ $\mu\text{s}$ (b < 15 mm) 15 V/ $\mu\text{s}$ (b $\geq$ 15 mm)	
R between leads	>100000 M $\Omega$	

## Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.3 \text{ mm}$	$\pm 5\%$	2222 379 64...	preferred
Taped on reel	H = 18.5 mm; note 1	$\pm 5\%$	2222 379 65...	on request

## Note

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

# AC and pulse metallized polypropylene film capacitors

MKP 379

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 250 \text{ V}^{(1)}$ / $U_{p-p} = 700 \text{ V}$  (see note 1)

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 379 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$		$H = 18.5 \text{ mm}$
			last 5 digits of catalogue number <sup>(2)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.027 0.03 0.033 0.036 0.039	5.0 × 11.0 × 17.5	1.2	64273	1000	1100
0.043 0.047 0.051 0.056 0.062			64303		
0.068 0.075 0.082			64333		
0.091 0.1 0.11			64363		
			64393		
0.043 0.047 0.051 0.056 0.062	6.0 × 12.0 × 17.5	1.4	64433	1000	900
0.068 0.075 0.082			64473		
0.091 0.1 0.11			64513		
			64563		
			64623		
0.068 0.075 0.082	7.0 × 13.5 × 17.5	1.9	64683	1000	800
0.091 0.1 0.11			64753		
			64823		
			64913		
			64104		
0.091 0.1 0.11	8.5 × 15.0 × 17.5	2.6	64114	1000	650
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.12 0.13 0.15 0.16	7.0 × 16.5 × 26.0	3.2	64124	200	550
0.18 0.2 0.22			64134		
0.24 0.27 0.3			64154		
			64164		
0.18 0.2 0.22	8.5 × 18.0 × 26.0	4.4	64184	200	450
0.24 0.27 0.3			64204		
			64224		
			64244		
0.24 0.27 0.3	10.0 × 19.5 × 26.0	5.5	64274	200	350
			64304		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.33 0.36 0.39 0.43	11.0 × 21.0 × 31.0	7.8	64334	100	300
0.47 0.51 0.56			64364		
0.62 0.68 0.75			64394		
0.82 0.91 1			64434		
0.47 0.51 0.56	13.0 × 23.0 × 31.0	10.4	64474	100	250
0.62 0.68 0.75			64514		
0.82 0.91 1			64564		
			64624		
0.62 0.68 0.75	15.0 × 25.0 × 31.0	12.8	64684	100	200
0.82 0.91 1			64754		
			64824		
			64914		
0.82 0.91 1	18.0 × 28.0 × 31.0	17.2	64105	100	150

**Notes**

- $U_{Rac} = 220 \text{ V}/U_{p-p} = 620 \text{ V}$  for  $C \leq 0.11 \mu\text{F}$ .
- The shading indicates preferred types.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## CONSTRUCTION

### Description

- Low-inductive wound cell of metallized polypropylene (PP) film, potted with epoxy resin in a flame-retardant polypropylene case
- Radial leads, solder-coated
  - Copper clad steel wire (pitch = 2e, 3e, 4e and 6e)
  - Copper wire (pitch = 9e and 11e)
- Solder-plated copper-clad steel wire for pitch  $\leq 15$  mm to ensure good resistance to soldering heat
- Small stand-off pips allow removal of solder flux etc. during cleaning of the printed-circuit board.

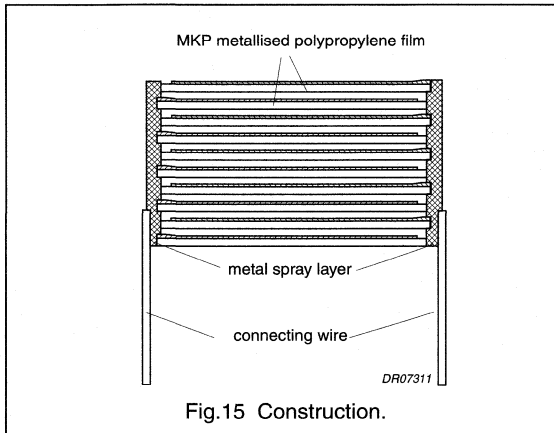


Fig.15 Construction.

### SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD

The maximum length and width of film capacitors is shown in Fig.16:

- Eccentricity as in Fig.16. 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:  $h_{max} \leq h + 0.3$  mm.

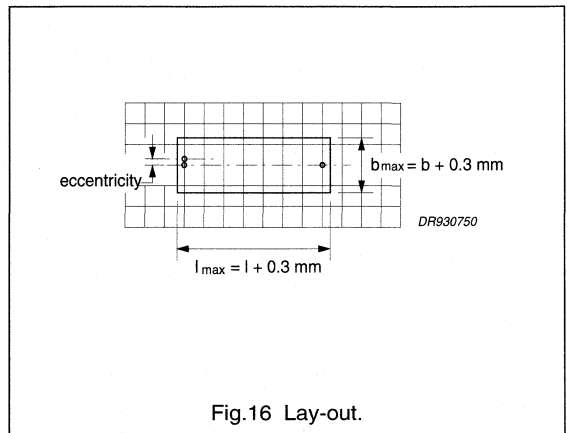


Fig.16 Lay-out.

## Mounting

### NORMAL USE

The capacitors are designed for printed-circuit board applications. The capacitors packed in bandoliers are designed for mounting on printed-circuit boards by means of automatic insertion machines. For detailed specifications refer to this handbook, Chapter "Packaging".

### 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 of  $\leq 15$  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.

## RATINGS AND CHARACTERISTICS

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

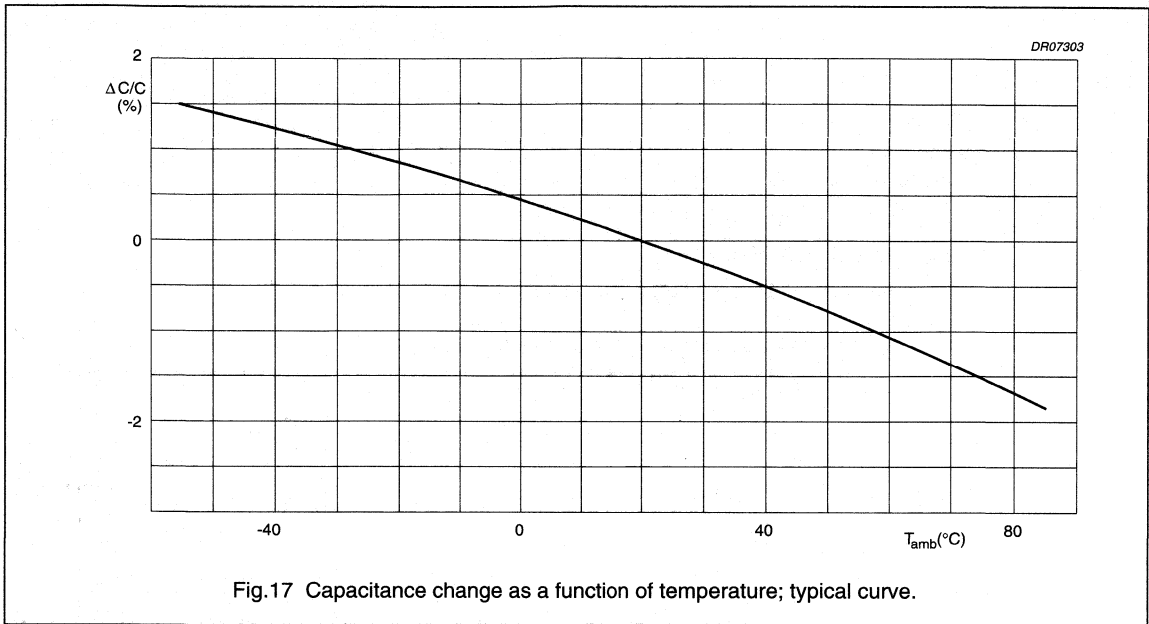
For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

# AC and pulse metallized polypropylene film capacitors

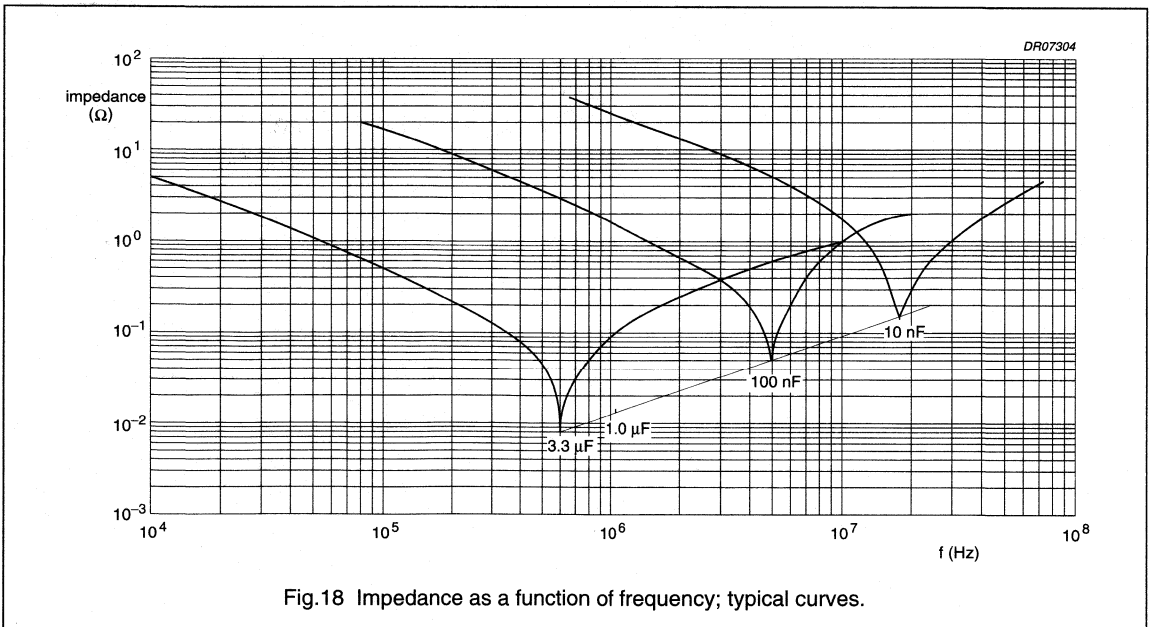
MKP 379

## Capacitance

All capacitance values are specified at 1 kHz.



## Impedance



# AC and pulse metallized polypropylene film capacitors

MKP 379/380

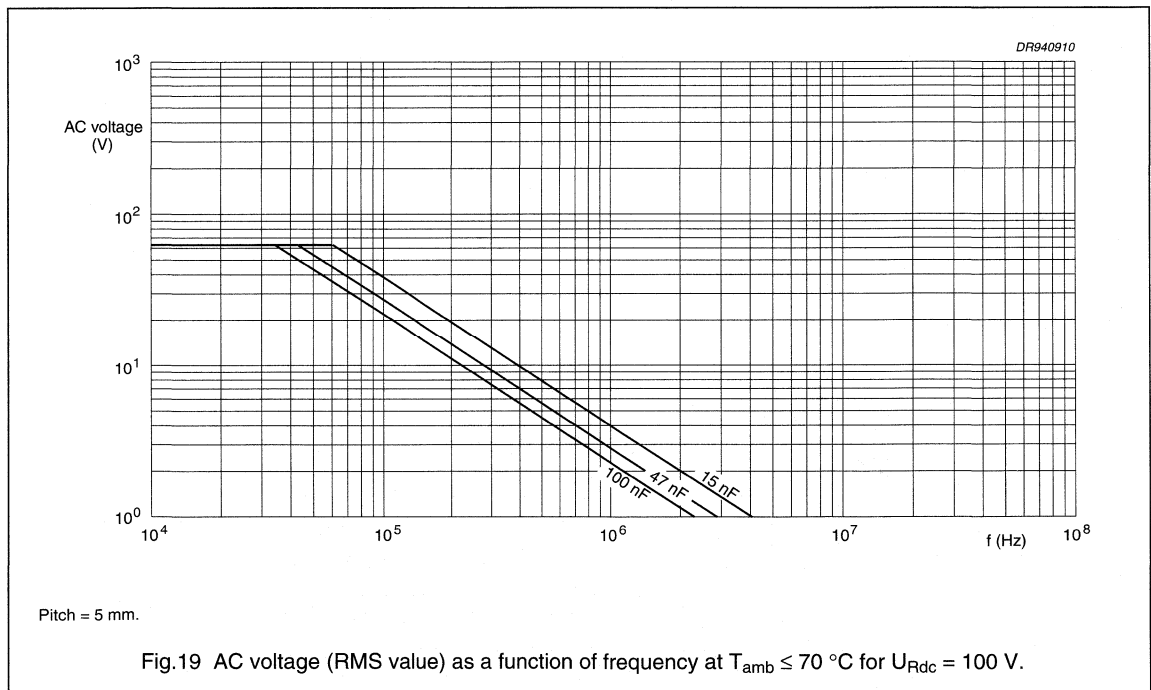
## Temperature

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

## Voltage

- Category voltage:
  - $U_{\text{Cdc}} = U_{\text{Rdc}}$  for  $T = 85$  °C
  - $U_{\text{Cac}} = 0.7 \times U_{\text{Rac}}$  for  $T = 85$  °C
- Test voltage between leads:
  - $1.6 \times U_{\text{Rdc}}$  (for 379 versions)
  - $1.6 \times U_{\text{Rdc}}$  for  $U_{\text{Rdc}} < 630$  V (for 380 versions)
  - $1.4 \times U_{\text{Rdc}}$  for  $U_{\text{Rdc}} = 630$  V (for 380 versions)
- Test voltage between interconnected leads and case (foil method): 2840 V (DC).

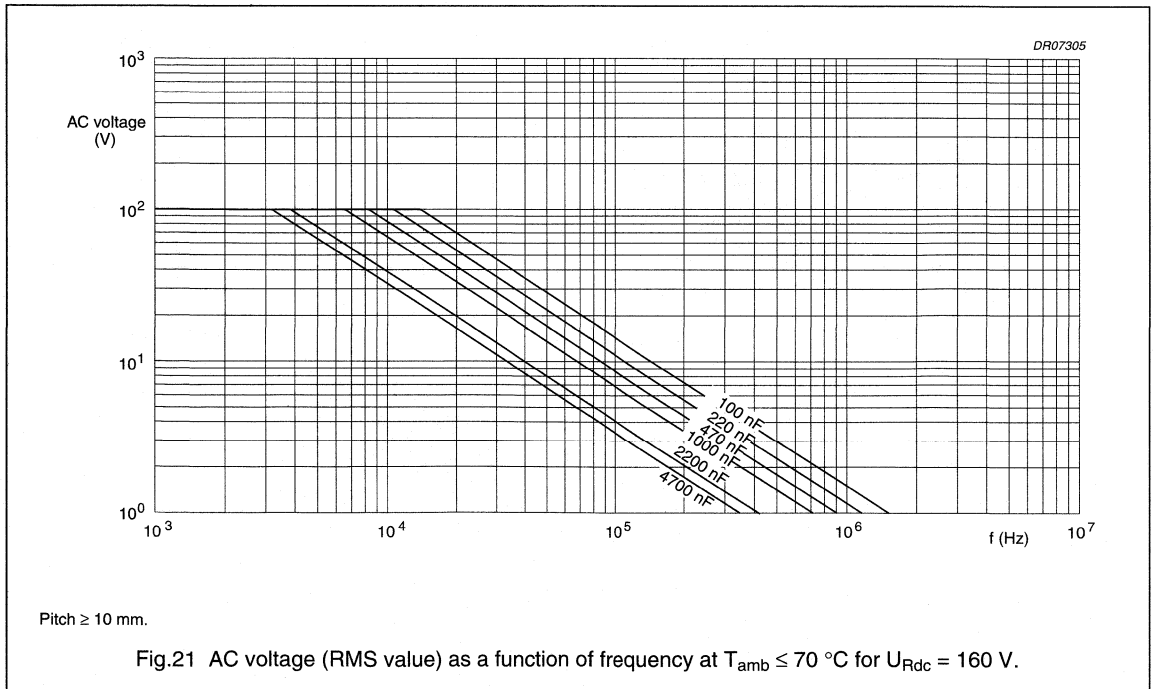
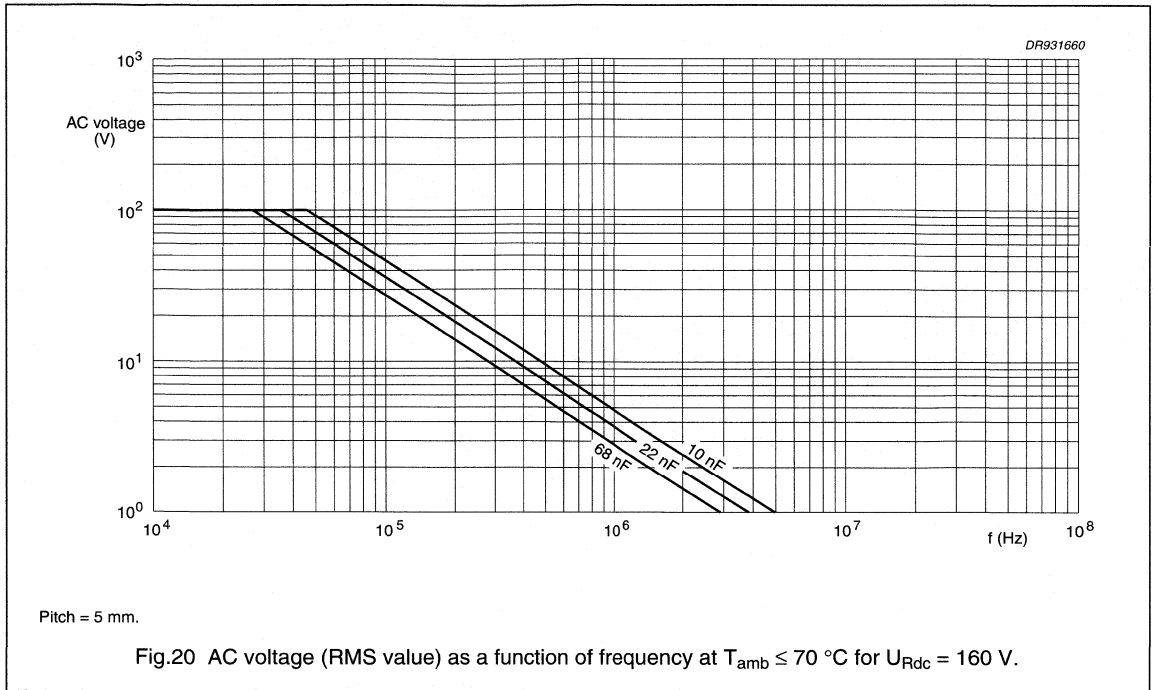
## Maximum RMS voltage (sinewave) as a function of frequency for $T_{\text{amb}} \leq 70$ °C





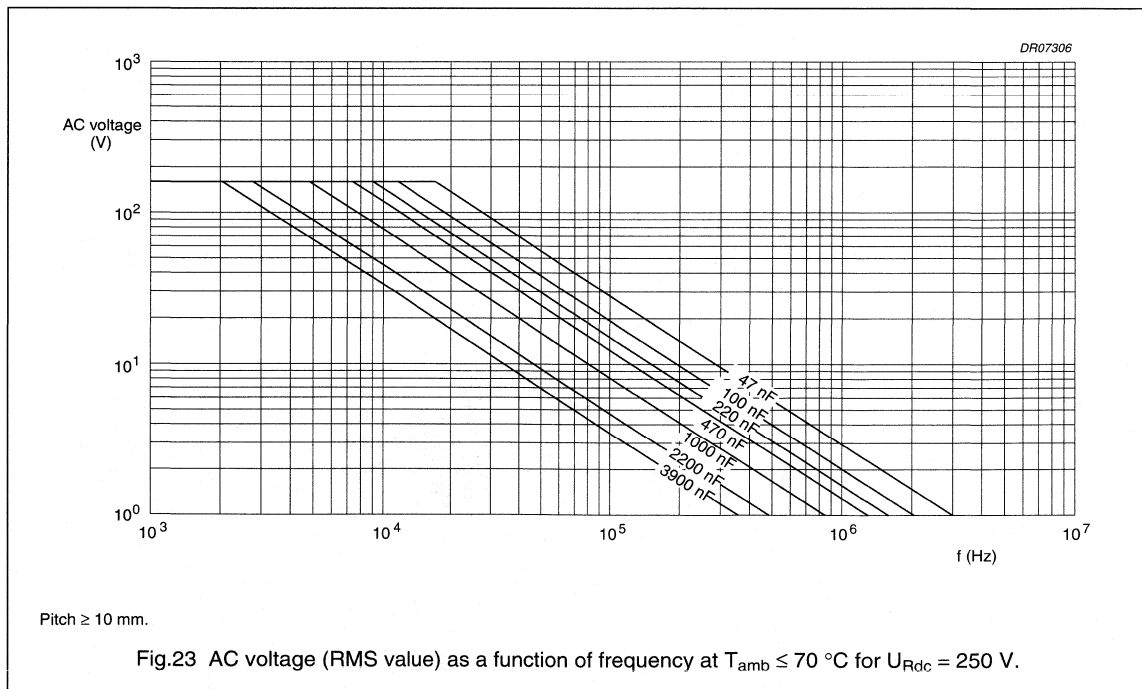
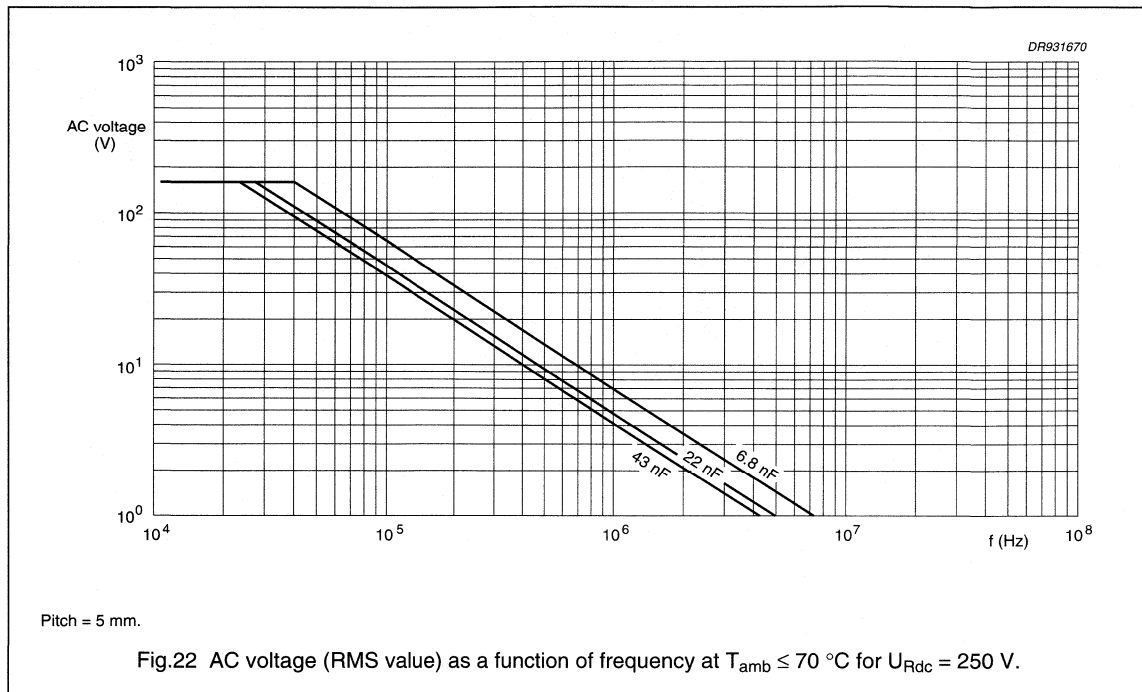
# AC and pulse metallized polypropylene film capacitors

## MKP 379/380



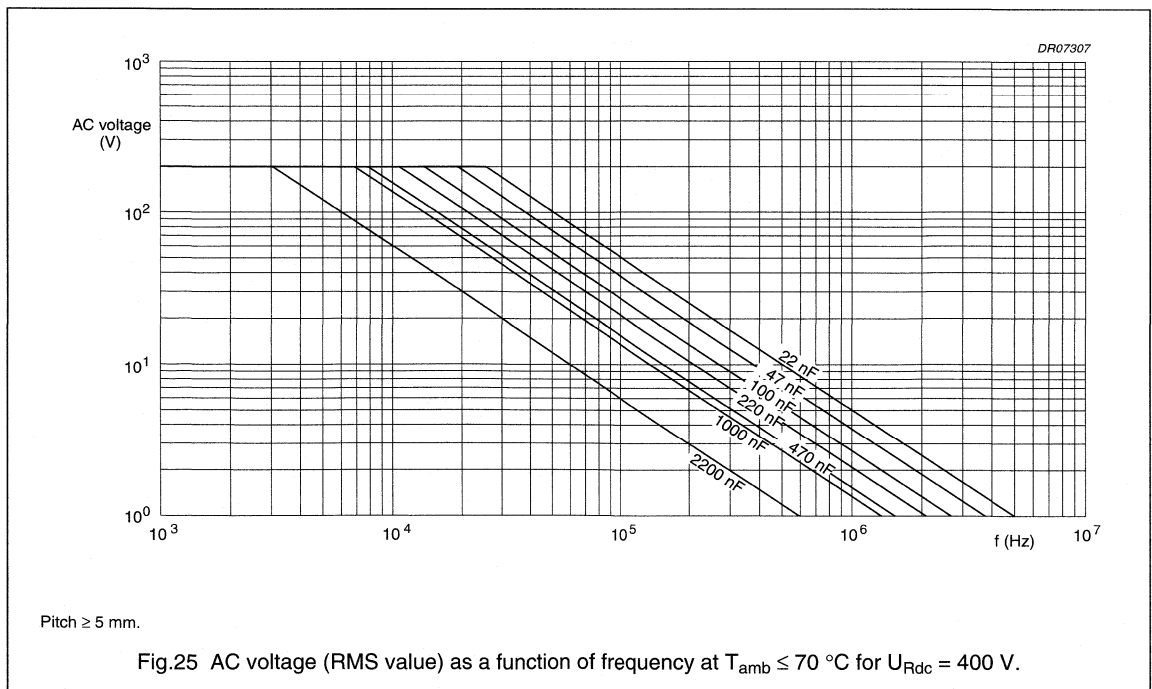
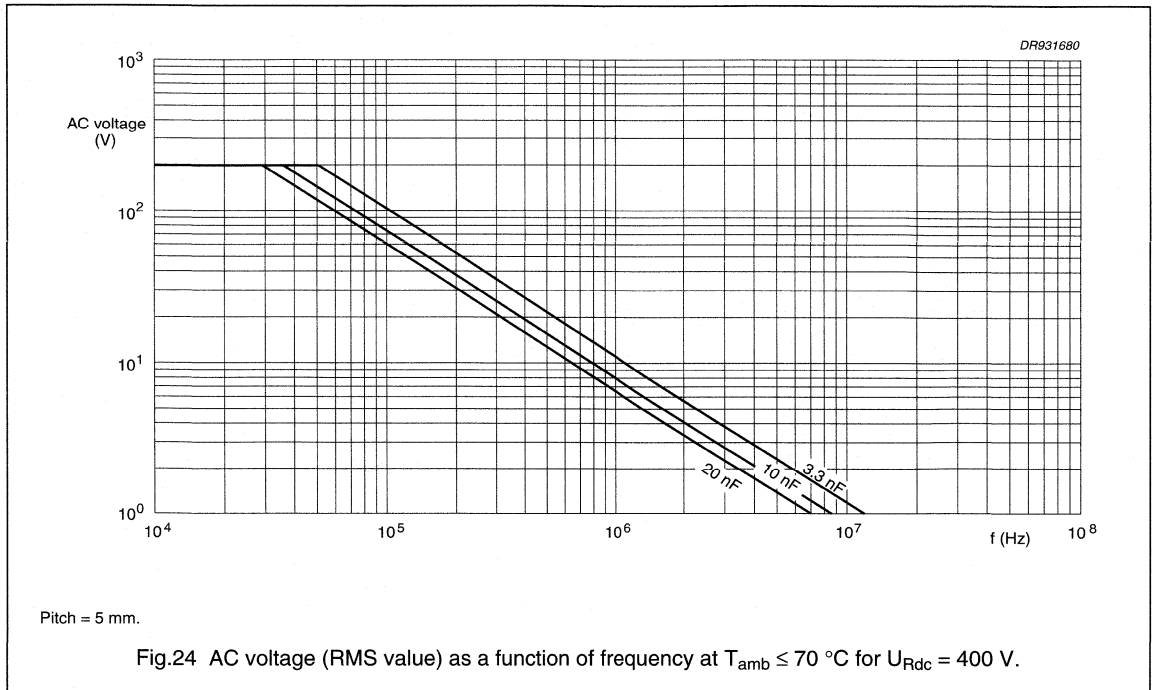
# AC and pulse metallized polypropylene film capacitors

MKP 379/380



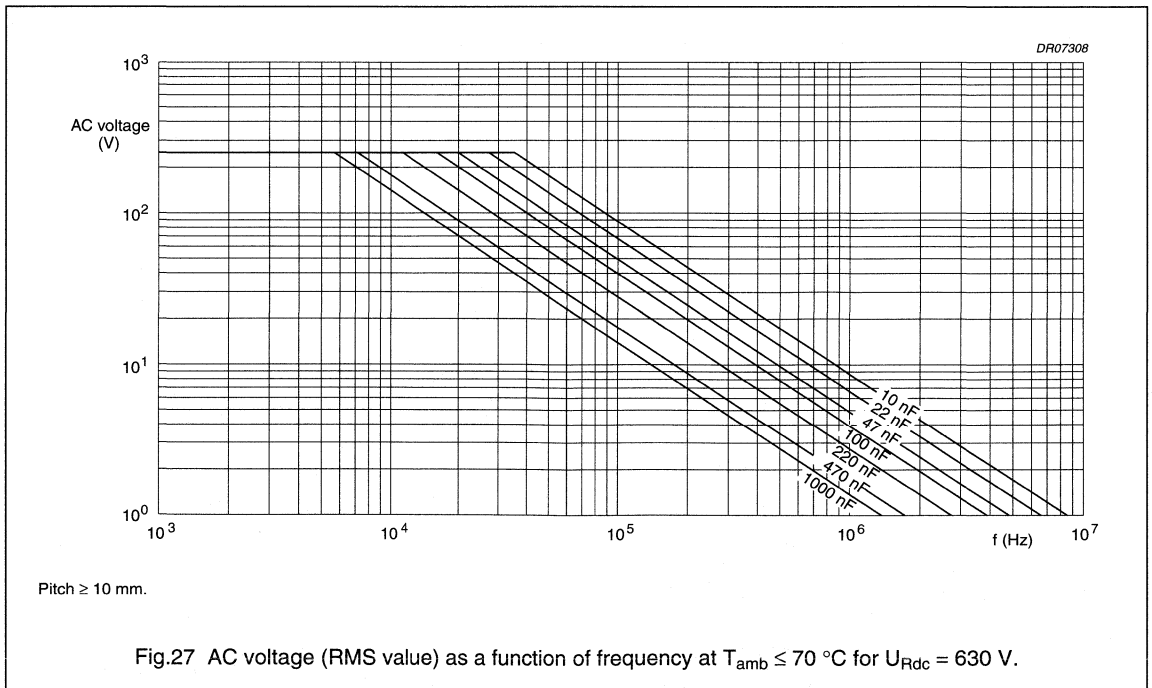
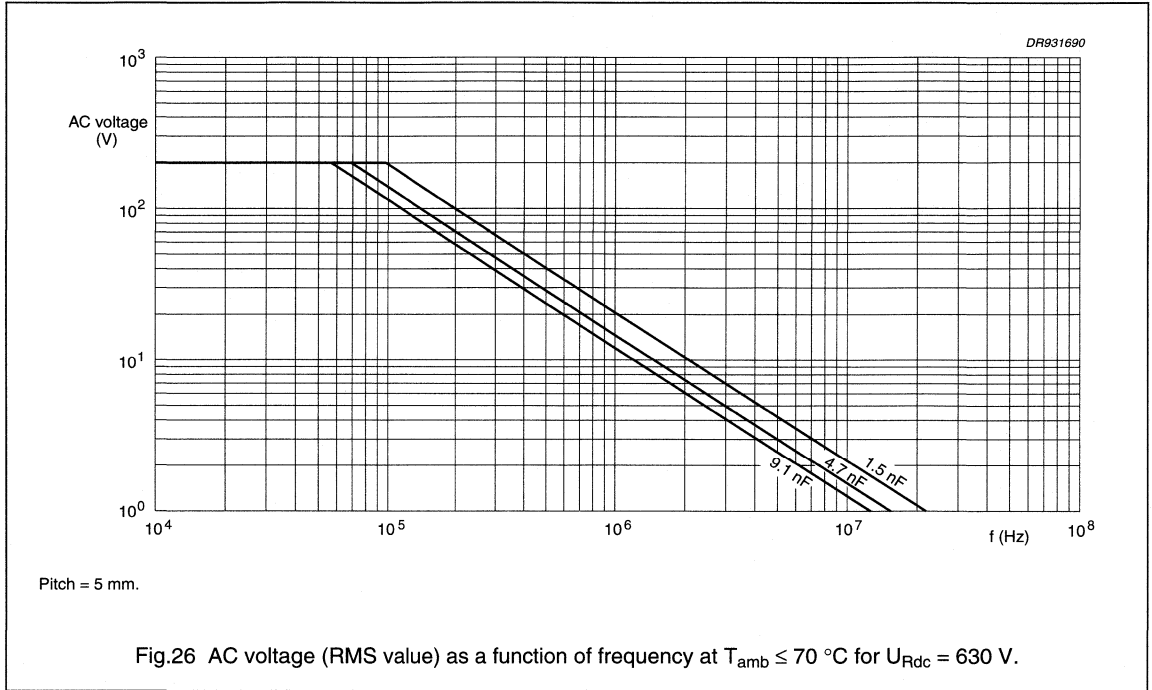
AC and pulse  
metallized polypropylene film capacitors

MKP 379/380



AC and pulse metallized polypropylene film capacitors

MKP 379/380



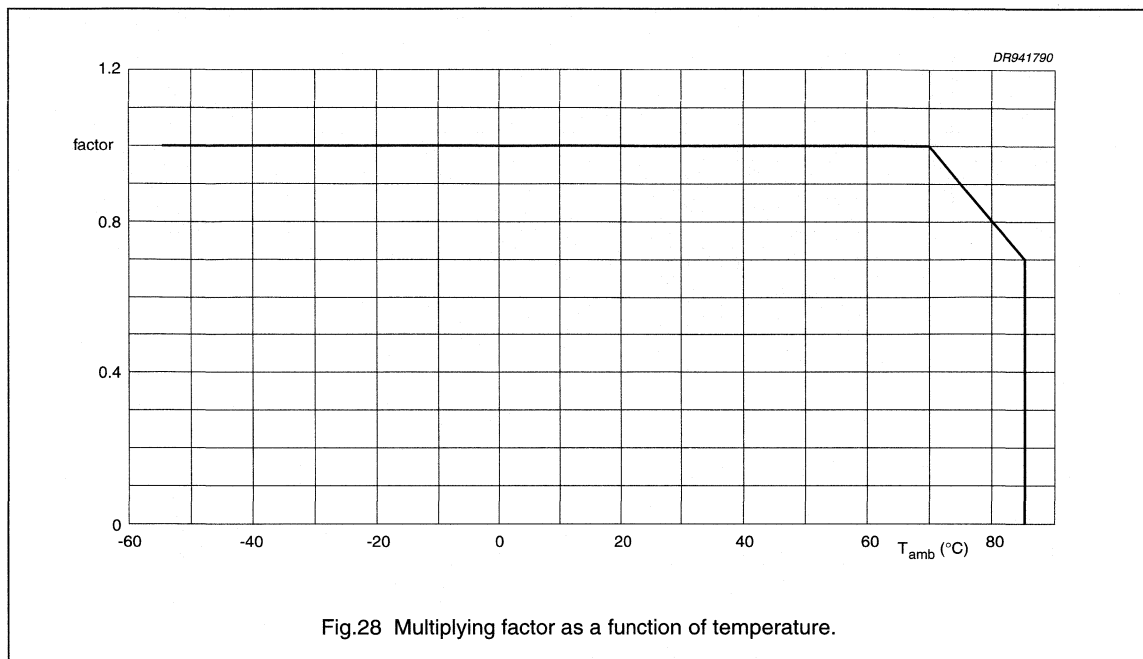
# AC and pulse metallized polypropylene film capacitors

MKP 379

## Maximum RMS voltage (sinewave) as a function of frequency for $T_{amb} > 70\text{ }^{\circ}\text{C}$

The maximum RMS voltage in Figs 19 to 27 has to be multiplied by a factor given in Fig.28.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 31 and 32.



# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## Tangent of loss angle

RATED VOLTAGE $U_R$ (V)	CAPACITANCE	TANGENT OF LOSS ANGLE	
		at 10 kHz	at 100 kHz
100		$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
160	$C \leq 0.068 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
	$0.068 \mu\text{F} < C \leq 0.16 \mu\text{F}$	$\leq 25 \times 10^{-4}$	$\leq 80 \times 10^{-4}$
	$0.16 \mu\text{F} < C \leq 0.75 \mu\text{F}$	$\leq 25 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
	$0.75 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 150 \times 10^{-4}$
	$C > 1 \mu\text{F}$	$\leq 30 \times 10^{-4}$	—
250	$C \leq 0.043 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
	$0.043 \mu\text{F} < C \leq 0.091 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 40 \times 10^{-4}$
	$0.091 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 60 \times 10^{-4}$
	$0.47 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 20 \times 10^{-4}$	$\leq 120 \times 10^{-4}$
	$1.0 \mu\text{F} < C \leq 3.9 \mu\text{F}$	$\leq 25 \times 10^{-4}$	—
400	$C \leq 0.02 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
	$0.02 \mu\text{F} < C \leq 0.043 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
	$0.043 \mu\text{F} < C \leq 0.22 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 40 \times 10^{-4}$
	$0.22 \mu\text{F} < C \leq 0.62 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 60 \times 10^{-4}$
	$0.62 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 80 \times 10^{-4}$
	$1.0 \mu\text{F} < C \leq 2.0 \mu\text{F}$	$\leq 20 \times 10^{-4}$	—
630	$C \leq 0.0091 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
	$0.0091 \mu\text{F} < C \leq 0.024 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
	$0.024 \mu\text{F} < C \leq 0.11 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
	$0.11 \mu\text{F} < C \leq 0.30 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 35 \times 10^{-4}$
	$0.33 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 70 \times 10^{-4}$

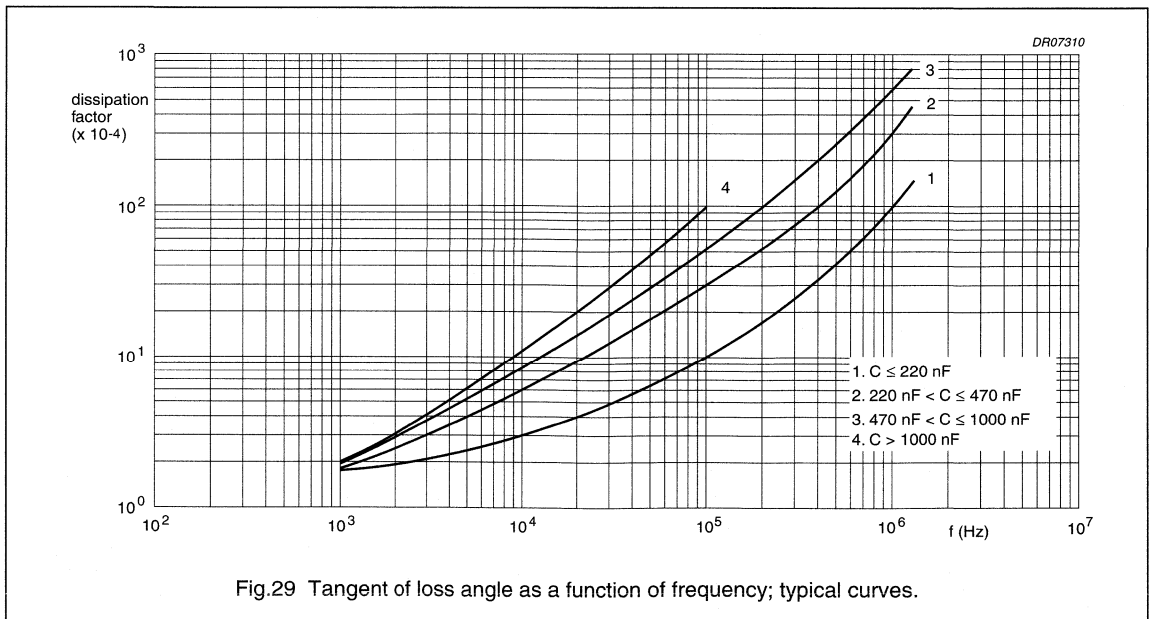


Fig.29 Tangent of loss angle as a function of frequency; typical curves.

# AC and pulse metallized polypropylene film capacitors

MKP 379

## Rated voltage pulse slope

**Table 1** Rated voltage pulse slope  $(dU/dt)_R$

RATED VOLTAGE $U_{Rdc}$ (V)	MAXIMUM RATED PULSE LOAD (V/ $\mu$ s)						
	P = 5 mm	P = 7.5 mm	P = 10 mm	P = 15 mm	P = 22.5 mm	P = 27.5 mm	
						b < 15 mm	b $\geq$ 15 mm
100	80	–	–	–	–	–	–
160	80	70	60	50	25	15	7.5
250	90	80	70	60	30	20	10
400	100	90	80	70	35	25	13
630	120	110	100	90	45	30	15

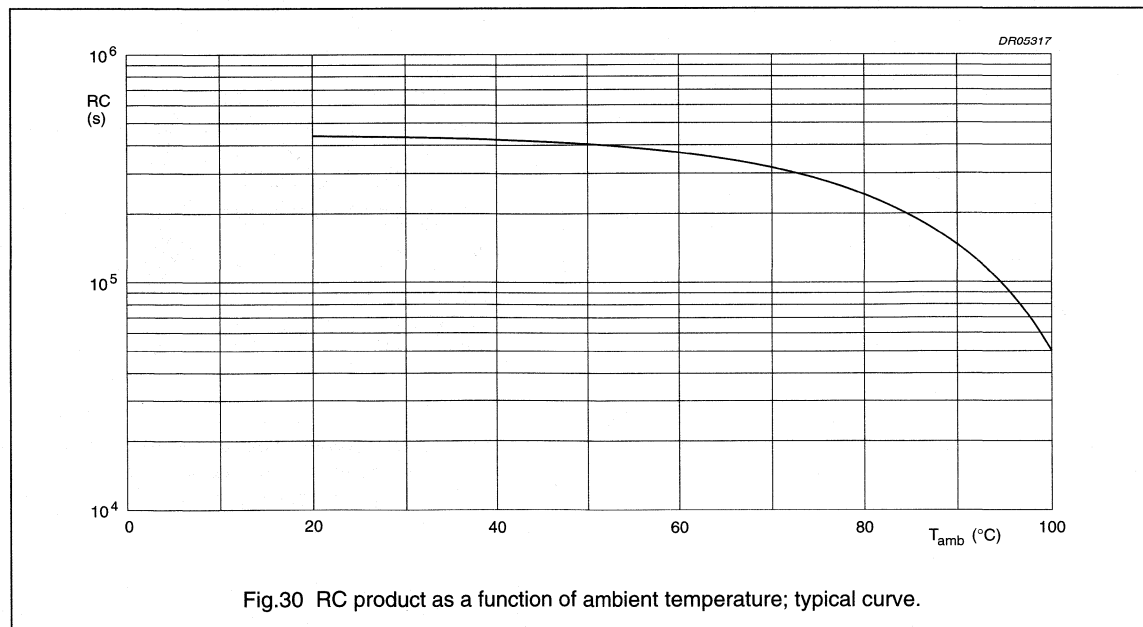
If the pulse voltage is lower than the rated voltage, the values of the specific reference data must be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

The rated voltage pulse slope is valid for ambient temperatures up to 70 °C. For higher temperatures a derating factor of 3% per Kelvin shall be applied.

## Insulation resistance

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm$ 5 seconds, the voltage being 100  $\pm$ 15 V for the 100, 160, 250 and 400 V versions, and 500  $\pm$ 50 V for the 630 V versions:

- R between leads, for  $C \leq 1 \mu$ F: >100000 M $\Omega$
- RC between leads, for  $C > 1 \mu$ F: >100000 s
- R between interconnected leads and case (foil method): >100000 M $\Omega$ .



# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Figs 31 and 32)

$b_{max}$ (mm)	PITCH (mm)					
	5	7.5	10	15	22.5	27.5
2.5	1	2	—	—	—	—
3.0	—	3	—	—	—	—
3.5	2	—	—	—	—	—
4.0	—	4	6	—	—	—
4.5	3	—	—	—	—	—
5.0	—	6	7	9	—	—
6.0	5	—	8	10	—	—
7.0	—	7	—	11	13	—
8.5	—	—	—	12	14	—
9.0	—	—	—	—	—	—
10.0	—	—	—	—	15	—
11.0	—	—	—	—	—	16
13.0	—	—	—	—	—	17
15.0	—	—	—	—	—	18
18.0	—	—	—	—	—	19

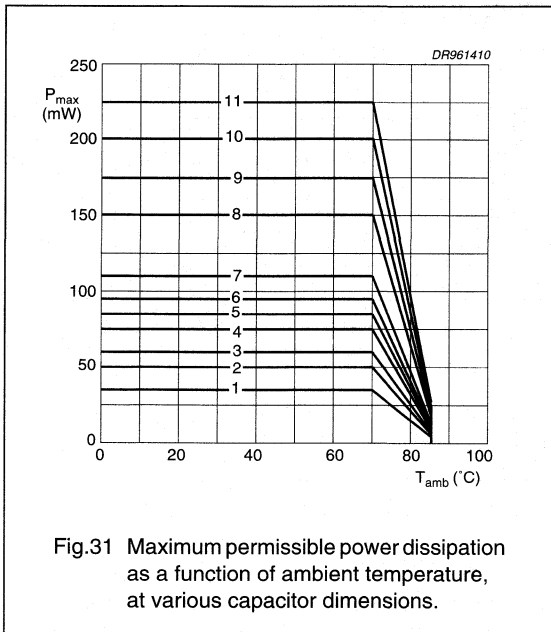


Fig.31 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

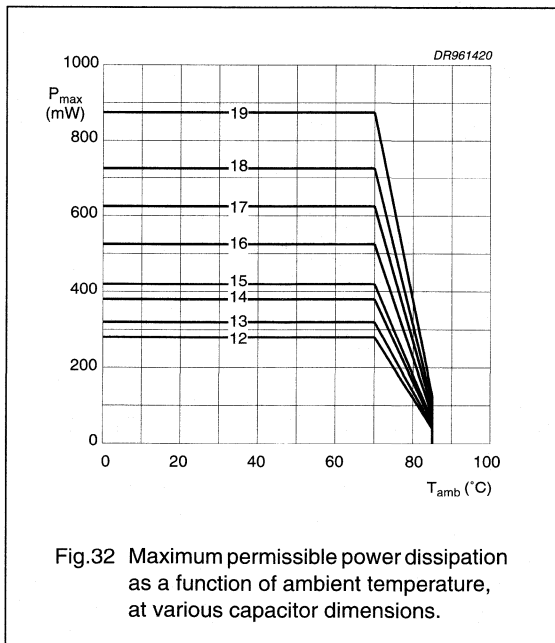


Fig.32 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.



# AC and pulse metallized polypropylene film capacitors

MKP 379/380

## Application note<sup>(1)</sup>

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.

3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance

$$I_{p,max} = C \left( \frac{dU}{dt} \right)_{max}$$

Or the voltage pulse slope shall not exceed the rated voltage pulse slope. If the pulse voltage is lower than the rated voltage, the values (see Table 1 "Rated voltage pulse slope ( $dU/dt$ )R" for more details) may be multiplied by  $U_{Rdc}$  and divided by the applied voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation as given in Figs 31 and 32.

5. The free air ambient temperature for the capacitor does not exceed the category temperature.
6. Since in circuits used at voltages over 280 V peak-to-peak the risk for an intrinsically active flammability after a capacitor breakdown (short circuit) increases, it is recommended that the power to the component is limited to 10 times the maximum allowed power dissipation ( $P_{max}$ ) during the short circuit failure mode of the capacitor.

Example:  $C = 1 \mu F - 250 V$  used for the voltage signal shown in Fig.33.

This is a pulse with:

$$U_{p-p} = 35 V; U_p = 30 V; T_1 = 12 \mu s; T_2 = 64 \mu s; T_3 = 4 \mu s.$$

The ambient temperature is 50 °C.

## Checking the conditions

1. The peak voltage  $U_p = 30 V$  is lower than 250 V (DC).
2. The peak-to-peak voltage 350 V is lower than  $2 \times \sqrt{2} \times 160 V (AC) = 450 U_{p-p}$ .
3. The voltage pulse slope  $dU/dt = 35 V/4 \mu s = 8.7 V/\mu s$ . This is lower than  $30 V/\mu s$  (see specific reference data for each version).
4. The dissipated power is 270 mW as calculated with Fourier terms. This is less than 420 mW, allowed for a capacitor with dimensions:  $b_{max} = 10 mm$  and pitch = 22.5 mm.
5. The free air ambient temperature is more than 50 °C, and lower than 70 °C.
6. In case of failure, the power is switched off.

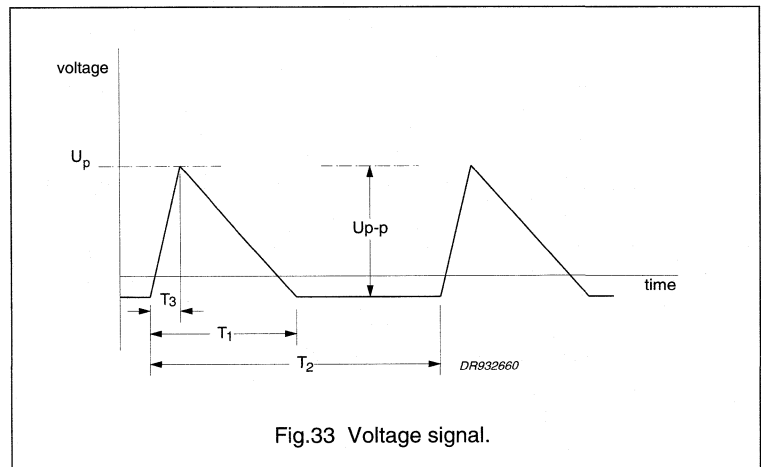


Fig.33 Voltage signal.

(1) Peak-to-peak current tables for S-correction application, are available on request.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

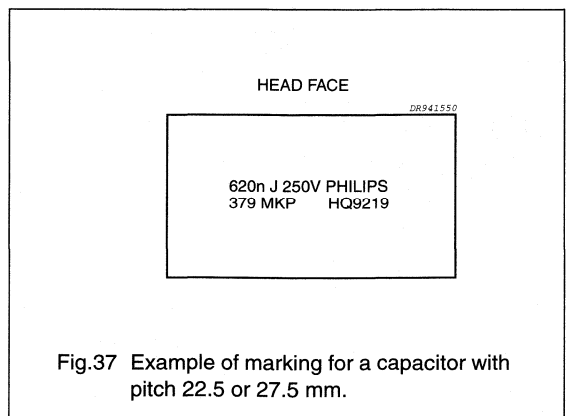
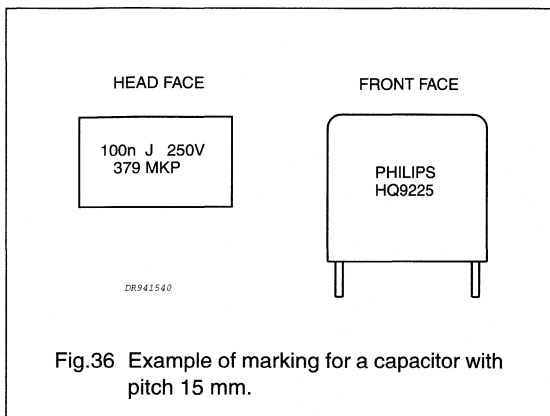
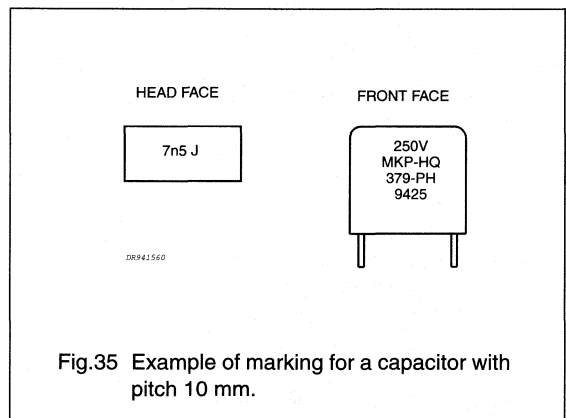
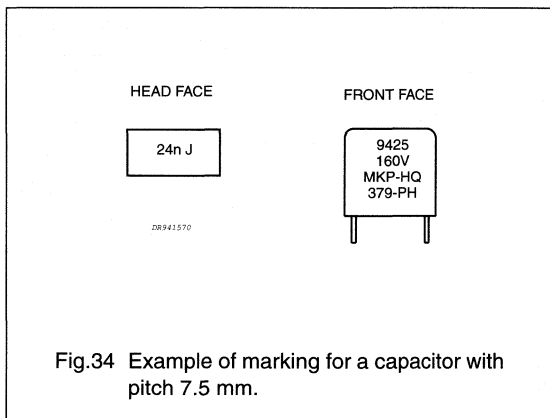
## MARKING

### Product marking

STYLE 2222 379 .....

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

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: J =  $\pm 5\%$
3. Rated voltage (DC) (e.g. 160 V)
4. Code for dielectric material (MKP)
5. Code for factory of origin (HQ)
6. Manufacturer's type designation (379)
7. Manufacturer' name (PHILIPS) for pitches  $\geq 15$  mm or PH for pitch 7.5 or 10 mm
8. Year and week of manufacture (e.g. 9225).



# AC and pulse metallized polypropylene film capacitors

MKP 379/380

STYLE 2222 380 ...

The capacitors are marked by inkjet print on the side with the following information:

1. Capacitance code in accordance with "IEC 62":  
 $n = nF$ ;  $\mu = \mu F$
2. Tolerance on rated capacitance: K =  $\pm 10\%$ ; J =  $\pm 5\%$
3. Rated voltage (DC) (e.g. 160)
4. Code for dielectric material (MKP)
5. Manufacturers type designation (380).

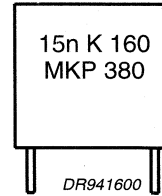


Fig.38 Example of marking for a capacitor with pitch 5 mm.

## Package marking

The package containing the capacitors is marked as shown in Fig.39.

1.	<b>PHILIPS COMPONENTS</b>	<b>Barcode label marking</b>
2.	<b>MADE IN BELGIUM</b>	<b>LINE MARKING EXPLANATION</b>
3.	<b>AC/PULSE POLYPROP. FILM CAPACITOR</b>	1 Manufacturer's name
4.	<b>MKP RADIAL POTTED TYPE</b>	2 Country of origin
5.	<b>0.33<math>\mu</math>F <math>\pm 5\%</math> 250V= 55/085/56</b>	3 Sub-family
6.		4 Type description
		5 Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")
		6 -
		7 Preference origin code: A
		Country of origin in code: 170 (Belgium)
		Responsible production centre: HQ
		Work order: WO
		Wage number of final inspection (only for 2e - 3e - 4e products)
		8 Product type description
		9 Quantity and production period, year and week code
		10 Product code (12NC)
7.	<b>ORIG A170 RPC HQ 1234</b>	
8.	<b>TYPE MKP 379</b>	
9.	<b>QTY 1000 DATE 9625</b>	
10.	<b>CODENO 2222 379 44334</b>	

CCA344

Fig.39 Barcode label.

# AC and pulse metallized polypropylene film capacitors

MKP 379/380

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: <i>"IEC 68-2-21"</i> Resistance to soldering heat <i>"IEC 68-2-20"</i> Component solvent resistance	solder bath: 260 °C; 10 s  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking $ \Delta C/C  \leq 1\%$ 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 2\%$ 100 to 160 V: all pitches 250 to 630 V: 5 to 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
<b>Robustness of component</b>		
Vibration: <i>"IEC 68-2-6"</i> Shock: <i>"IEC 68-2-27"</i>	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 1\%$ 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 2\%$ 100 to 160 V: all pitches 250 to 630 V: 5 to 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
<b>Climatic sequence</b>		
Dry heat: <i>"IEC 68-2-2"</i> Damp heat, cyclic, test Db, first cycle: <i>"IEC 68-2-30"</i> Cold: <i>"IEC 68-2-1"</i> Damp heat, cyclic, test Db, remaining cycles: <i>"IEC 68-2-30"</i>	16 hours; 85 °C   2 hours; -55 °C	$ \Delta C/C  \leq 1\%$ 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 3\%$ 100 to 160 V: all pitches 250 to 630 V: 5 to 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value

# AC and pulse metallized polypropylene film capacitors

MKP 379

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 1\%$ 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 3\%$ 100 to 160 V: all pitches 250 to 630 V: 5 to 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-17"	1000 h; 85 °C 1.25 × U <sub>Rac</sub> (RMS); 50 Hz	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-17"	2000 hours; 85 °C	$ \Delta C/C  \leq 2\%$ 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 3\%$ 100 to 160 V: all pitches 250 to 630 V: 5 to 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)

**Note**

- For detailed information, see "Type specification".

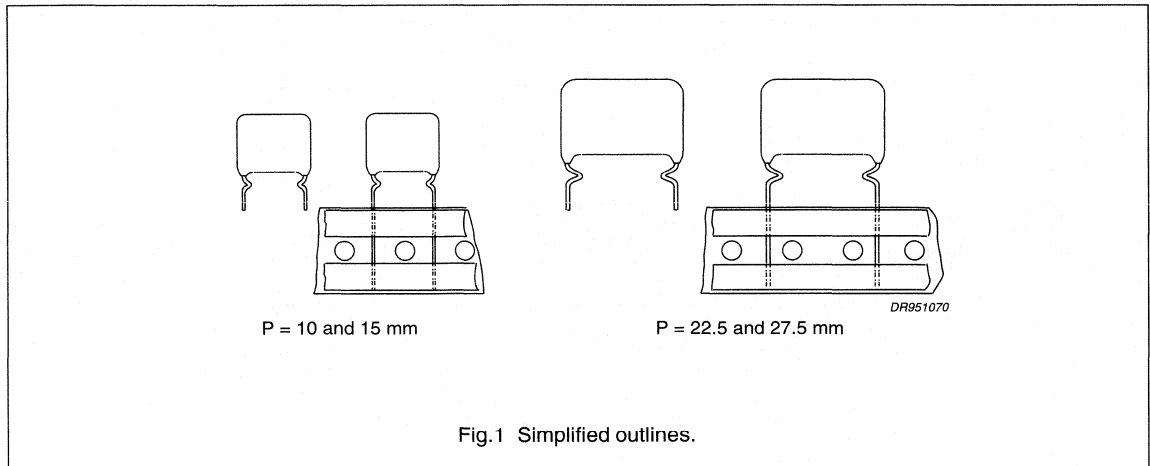


# AC and Pulse metallized polypropylene film

## MKP 479

MKP RADIAL EPOXY LACQUERED CAPACITORS

PITCH 10/15/22.5/27.5 mm



### FEATURES

- 10 to 27.5 mm lead pitch
- Supplied loose in box and taped on reel.

### APPLICATIONS

- Low losses due to low contact resistance and low loss dielectric result in applications where high currents at high frequency occur or high stability is preferred
- Their small dimensions make them suitable for circuits with high packaging density.

### QUICK REFERENCE DATA

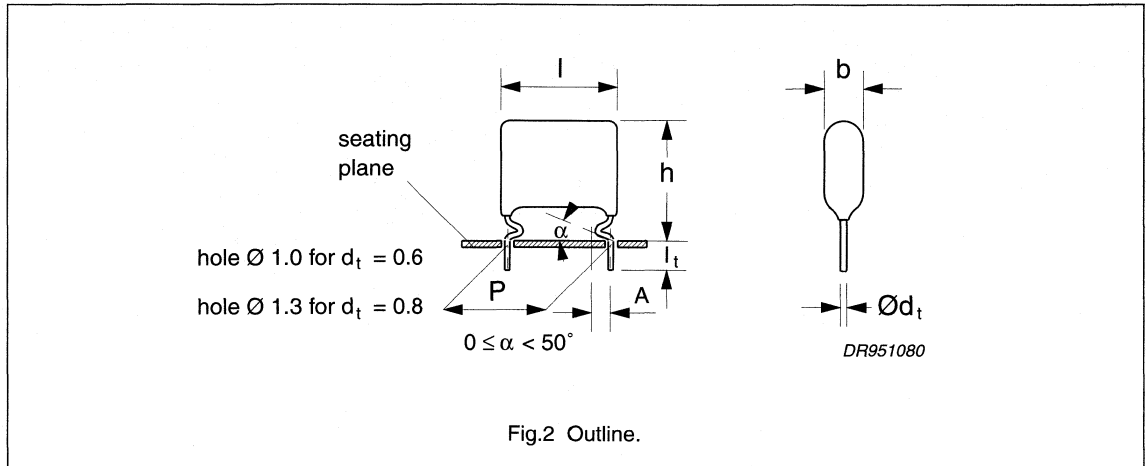
DESCRIPTION	VALUE
Capacitance range (E24 series)	0.0015 to 3.9 $\mu$ F
Capacitance tolerance	$\pm$ 5%
Rated voltage (DC)	160 V; 250 V; 400 V; 630 V
Rated voltage (AC)	100 V; 160 V; 200 V; 200 V
Rated peak-to-peak voltage	280 V; 450 V; 560 V; 560 V
Climatic category	55/100/56
Rated temperature (DC)	85 °C
Rated temperature (AC)	70 °C
Maximum application temperature	100 °C
Reference specification	IEC 384-17
Performance grade	grade 1 (long life)
Stability grade	grade 2

# AC and Pulse metallized polypropylene film capacitors

MKP 479

MKP 479 GENERAL DATA

PITCH 10/15 mm



**Specific reference data for the 160 V DC capacitors**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.1 μF 0.1 μF < C ≤ 0.16 μF 0.16 μF < C ≤ 0.75 μF	≤10 × 10 <sup>-4</sup> ≤10 × 10 <sup>-4</sup> ≤10 × 10 <sup>-4</sup>	≤20 × 10 <sup>-4</sup> ≤25 × 10 <sup>-4</sup> ≤30 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at U <sub>Rdc</sub> : P = 10 mm P = 15 mm	60 V/μs 50 V/μs	
R between leads, for C ≤ 1.0 μF	>100000 MΩ	

**Available 160 V DC versions**

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	l <sub>t</sub> = 3.5 ±0.5 mm	±5%	2222 479 34...	preferred
	l <sub>t</sub> = 5.0 ±1.0 mm	±5%	2222 479 32...	on request
Taped on reel	H = 16.0 mm; note 1	±5%	2222 479 35...	on request

**Note**

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



# AC and Pulse metallized polypropylene film capacitors

MKP 479

 $U_{Rdc} = 160 \text{ V}; U_{Rac} = 100 \text{ V}/U_{p-p} = 280 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 479 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}; d_t = 0.60 \pm 0.06 \text{ mm}; A = 2.0 +1.0/-0.5 \text{ mm}</math></b>					
0.075	6.0 × 15.0 × 12.5	0.9	34753	1000	1000
0.082			34823		
0.091			34913		
0.1			34104		
0.11			34114		
0.12			34124		
0.13	34134				
0.15	6.5 × 15.5 × 12.5	1	34154	1000	900
0.16			34164		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}; A = 2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.18	6.0 × 15.0 × 17.5	1.2	34184	2000	1000
0.20	6.5 × 15.5 × 17.5	1.3	34204	1500	900
0.22			34224		
0.24	7.0 × 16.0 × 17.5	1.4	34244	1250	800
0.27			34274		
0.30			34304		
0.33			34334		
0.36			34364		
0.39			34394		
0.43	7.5 × 16.5 × 17.5	1.5	34434	1250	800
0.47			34474		
0.51	8.0 × 17.0 × 17.5	1.6	34514	1250	700
0.56			34564		
0.62	8.5 × 17.5 × 17.5	1.7	34624	1000	700
0.68	9.0 × 18.0 × 17.5	1.8	34684	1000	600
0.75	9.5 × 18.5 × 17.5	1.9	34754	900	600

**Note**

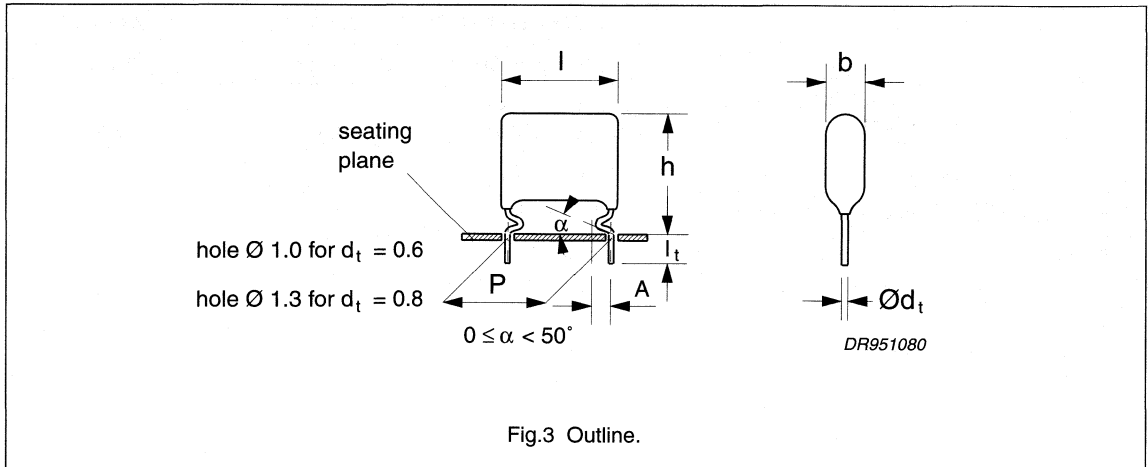
1. The shading indicates preferred types.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

MKP 479 GENERAL DATA

PITCH 22.5/27.5 mm



### Specific reference data for the 160 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
0.82 $\mu\text{F}$ < C $\leq$ 1.0 $\mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 55 \times 10^{-4}$
1.0 $\mu\text{F}$ < C $\leq$ 1.8 $\mu\text{F}$	$\leq 20 \times 10^{-4}$	$\leq 75 \times 10^{-4}$
1.8 $\mu\text{F}$ < C $\leq$ 3.0 $\mu\text{F}$	$\leq 25 \times 10^{-4}$	$\leq 80 \times 10^{-4}$
3.0 $\mu\text{F}$ < C $\leq$ 3.9 $\mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 110 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :		
P = 22.5 mm	25 V/ $\mu\text{s}$	
P = 27.5 mm	15 V/ $\mu\text{s}$	
R between leads, for C $\leq$ 1.0 $\mu\text{F}$	>100000 M $\Omega$	
RC between leads, for C > 1.0 $\mu\text{F}$	>100000 s	

### Available 160 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5$ mm	$\pm 5\%$	2222 479 34...	preferred
	$l_t = 5.0 \pm 1.0$ mm	$\pm 5\%$	2222 479 32...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 479 35...	on request

### Note

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

**AC and Pulse  
metallized polypropylene film capacitors**

**MKP 479**

**$U_{Rdc} = 160\text{ V}$ ;  $U_{Rac} = 100\text{ V}$ / $U_{p-p} = 280\text{ V}$**

**loose and taped**

C ( $\mu\text{F}$ )	DIMENSIONS $b_{max} \times h_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 479 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5\text{ mm}$		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4\text{ mm}</math>; <math>d_t = 0.80 \pm 0.08\text{ mm}</math>; <math>A = 2.5 + 1.4/-0.5\text{ mm}</math></b>					
0.82	$7.0 \times 20.0 \times 26.0$	1.8	34824	650	550
0.91 1	$7.5 \times 20.5 \times 26.0$	1.9	34914 34105	600	500
1.1	$8.0 \times 21.0 \times 26.0$	2	34115	550	500
1.2 1.3	$8.5 \times 21.5 \times 26.0$	2.1	34125 34135	500	450
1.5 1.6	$9.5 \times 22.5 \times 26.0$	2.4	34155 34165	450	400
1.8	$10.0 \times 23.0 \times 26.0$	2.5	34185	400	400
<b>Pitch = <math>27.5 \pm 0.4\text{ mm}</math>; <math>d_t = 0.80 \pm 0.08\text{ mm}</math>; <math>A = 2.5 + 1.4/-0.5\text{ mm}</math></b>					
2	$10.0 \times 23.0 \times 30.0$	5	34205	500	400
2.2	$10.5 \times 23.5 \times 30.0$	5	34225	450	350
2.4	$11.0 \times 24.0 \times 30.0$	5.5	34245	400	350
2.7	$11.5 \times 24.5 \times 30.0$	5.5	34275	400	350
3	$12.0 \times 25.0 \times 30.0$	6	34305	350	350
3.3	$13.0 \times 26.5 \times 30.0$	6.5	34335	300	300
3.6	$13.5 \times 26.5 \times 30.0$	7	34365	300	300
3.9	$14.0 \times 27.0 \times 30.0$	7	34395	300	300

**Note**

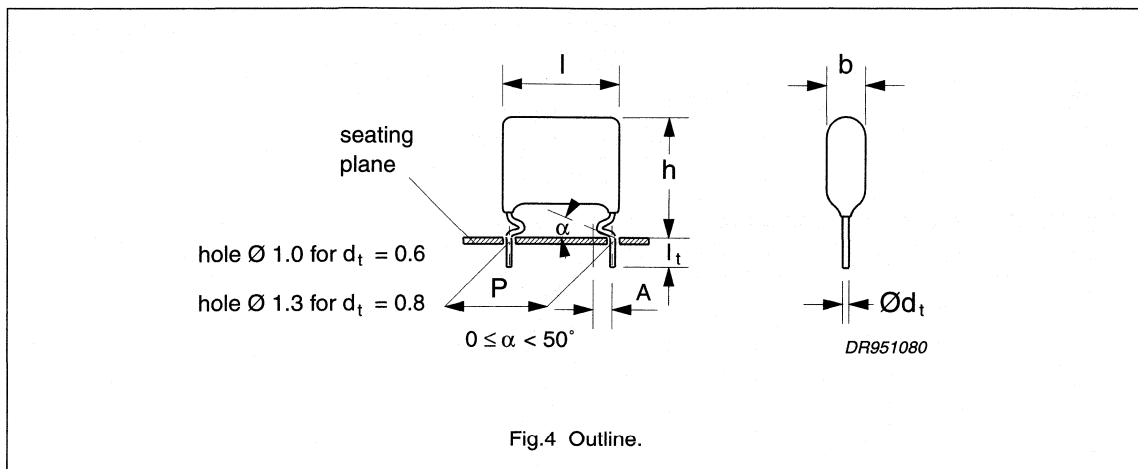
1. The shading indicates preferred types.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

## MKP 479 GENERAL DATA

PITCH 10/15 mm



## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
$C \leq 0.068 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
$0.068 \mu\text{F} < C \leq 0.1 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
$0.1 \mu\text{F} < C \leq 0.22 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
$0.22 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :		
$P = 10.0 \text{ mm}$		70 V/ $\mu\text{s}$
$P = 15.0 \text{ mm}$		60 V/ $\mu\text{s}$
R between leads, for $C \leq 1.0 \mu\text{F}$	>100000 M $\Omega$	

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 479 44...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 479 42...	on request
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 5\%$	2222 479 45...	on request

## Note

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

# AC and Pulse metallized polypropylene film capacitors

MKP 479

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ / $U_{p-p} = 450 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 479 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \text{ } 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>					
0.047	$6.0 \times 15.0 \times 12.5$	0.9	44473	1000	1000
0.051			44513		
0.056			44563		
0.062			44623		
0.068			44683		
0.075			44753		
0.082			44823		
0.091			44913		
0.1	$6.5 \times 15.5 \times 12.5$	1	44104	1000	900
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.11	$6.5 \times 15.5 \times 17.5$	1.3	44114	1500	900
0.12			44124		
0.13			44134		
0.15			44154		
0.16			44164		
0.18			44184		
0.20			44204		
0.22			44224		
0.24	$7.0 \times 16.0 \times 17.5$	1.4	44244	1250	800
0.27	$7.5 \times 16.5 \times 17.5$	1.5	44274	1250	800
0.30			44304		
0.33	$8.0 \times 17.0 \times 17.5$	1.6	44334	1250	700
0.36	$8.5 \times 17.5 \times 17.5$	1.7	44364	1000	700
0.39			44394		
0.43	$9.0 \times 18.0 \times 17.5$	1.8	44434	1000	600
0.47	$9.5 \times 18.5 \times 17.5$	1.9	44474	900	600

**Note**

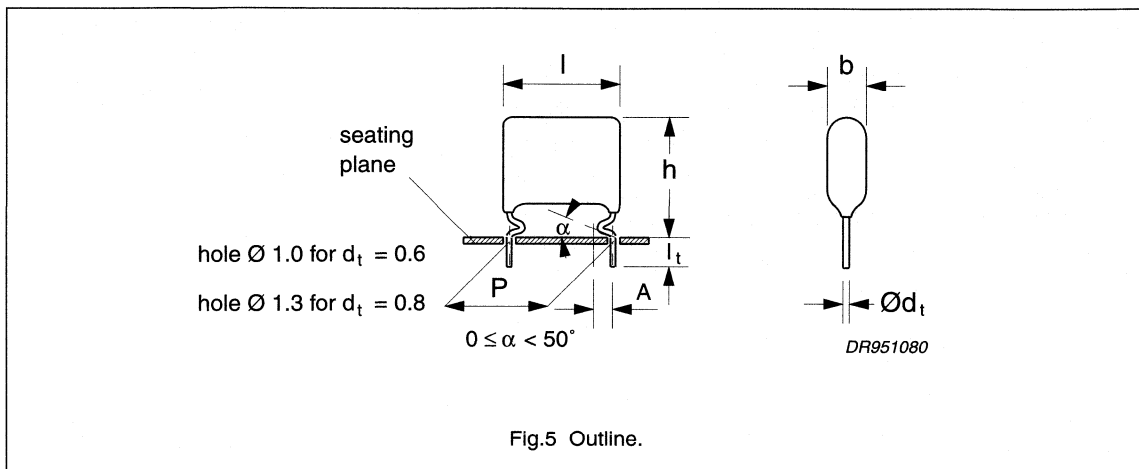
1. The shading indicates preferred types.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

## MKP 479 GENERAL DATA

PITCH 22.5/27.5 mm



## Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
$0.47 \mu\text{F} < C \leq 0.68 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 50 \times 10^{-4}$
$0.68 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$
$1.0 \mu\text{F} < C \leq 2.0 \mu\text{F}$	$\leq 25 \times 10^{-4}$	$\leq 90 \times 10^{-4}$
$2.0 \mu\text{F} < C \leq 2.7 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :		
$P = 22.5 \text{ mm}$	30 V/ $\mu\text{s}$	
$P = 27.5 \text{ mm}$	20 V/ $\mu\text{s}$	
R between leads, for $C \leq 1.0 \mu\text{F}$	$> 100000 \text{ M}\Omega$	
RC between leads, for $C > 1.0 \mu\text{F}$	$> 100000 \text{ s}$	

## Available 250 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 479 44...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 479 42...	on request
Taped on reel	$H = 16.0 \text{ mm}$ ; note 1	$\pm 5\%$	2222 479 45...	on request

## Note

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

# AC and Pulse metallized polypropylene film capacitors

MKP 479

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ / $U_{p-p} = 450 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 479 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 + 1.4/-0.5 \text{ mm}</math></b>					
0.51	7.0 × 20.0 × 26.0	1.8	44514	650	550
0.56			44564		
0.62	7.5 × 20.5 × 26.0	1.9	44624	600	500
0.68			44684		
0.75	8.0 × 21.0 × 26.0	2	44754	550	500
0.82	8.5 × 21.5 × 26.0	2.1	44824	500	450
0.91	9.0 × 22.0 × 26.0	2.4	44914	450	450
1.0	9.5 × 22.5 × 26.0	2.5	44105	450	400
1.1	10.0 × 23.0 × 26.0	2.6	44115	400	400
1.2	10.5 × 23.5 × 26.0	2.7	44125	350	350
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 + 1.4/-0.5 \text{ mm}</math></b>					
1.3	10.0 × 23.0 × 30.0	5	44135	500	400
1.5	10.5 × 23.5 × 30.0	5	44155	450	350
1.6	11.0 × 24.0 × 30.0	5.5	44165	400	350
1.8	11.5 × 24.5 × 30.0	5.5	44185	400	350
2.0	12.5 × 25.5 × 30.0	6.5	44205	350	300
2.2	13.0 × 26.5 × 30.0	6.5	44225	300	300
2.4	13.5 × 26.5 × 30.0	7	44245	300	300
2.7	14.0 × 27.0 × 30.0	7	44275	300	300
3.0	15.0 × 28.0 × 30.0	7.5	44305	250	250

**Note**

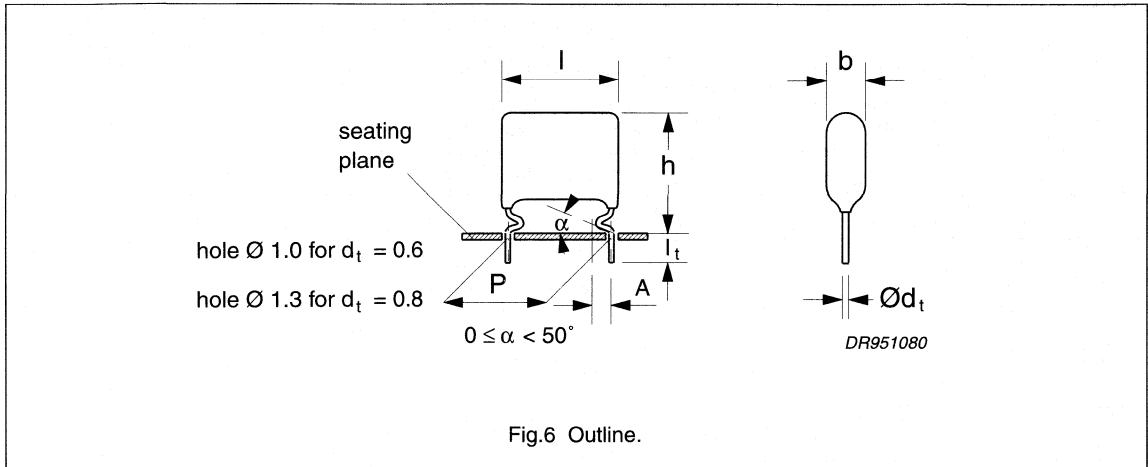
1. The shading indicates preferred types.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

## MKP 479 GENERAL DATA

PITCH 10/15 mm



## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.047 \mu\text{F}$ $0.047 \mu\text{F} < C \leq 0.1 \mu\text{F}$ $0.1 \mu\text{F} < C \leq 0.22 \mu\text{F}$	$\leq 10 \times 10^{-4}$ $\leq 10 \times 10^{-4}$ $\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$ $\leq 20 \times 10^{-4}$ $\leq 25 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : $P = 10.0 \text{ mm}$ $P = 15.0 \text{ mm}$	80 V/ $\mu\text{s}$ 70 V/ $\mu\text{s}$	
R between leads, for $C \leq 1.0 \mu\text{F}$	>100000 M $\Omega$	

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 479 54...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 479 52...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 479 55...	on request

## Note

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



# AC and Pulse metallized polypropylene film capacitors

MKP 479

 $U_{Rdc} = 400 \text{ V}; U_{Rac} = 200 \text{ V}/U_{p-p} = 560 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 479 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \text{ } 0.06 \text{ mm}</math>; <math>A = 2.0 + 1.0/-0.5 \text{ mm}</math></b>					
0.022	6.0 × 15.0 × 12.5	0.9	54223	1000	1000
0.024			54243		
0.027			54273		
0.03			54303		
0.033			54333		
0.036			54363		
0.039			54393		
0.043			54433		
0.047			54473		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 + 1.4/-0.5 \text{ mm}</math></b>					
0.051	6.5 × 15.5 × 17.5	1.3	54513	1500	900
0.056			54563		
0.062			54623		
0.068			54683		
0.075			54753		
0.082			54823		
0.091	7.0 × 16.0 × 17.5	1.4	54913	1250	800
0.1			54104		
0.11			54114		
0.12			54124		
0.13	7.5 × 16.5 × 17.5	1.5	54134	1250	800
0.15			54154		
0.16	8.0 × 17.0 × 17.5	1.6	54164	1250	700
0.18	8.5 × 17.5 × 17.5	1.7	54184	1000	700
0.2			54204		
0.22			9.0 × 18.0 × 17.5		

**Note**

1. The shading indicates preferred types.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

## MKP 479 GENERAL DATA

PITCH 22.5/27.5 mm

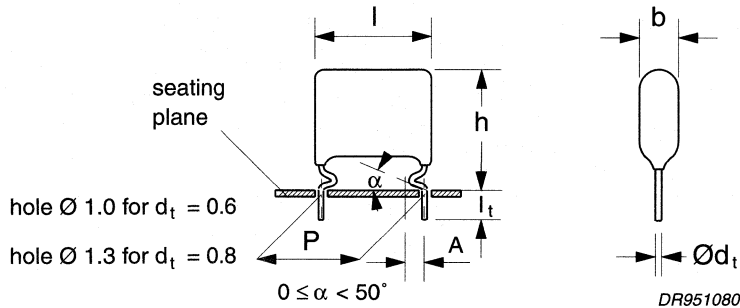


Fig.7 Outline.

## Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
0.22 $\mu$ F < C $\leq$ 0.33 $\mu$ F	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
0.33 $\mu$ F < C $\leq$ 0.47 $\mu$ F	$\leq 10 \times 10^{-4}$	$\leq 35 \times 10^{-4}$
0.47 $\mu$ F < C $\leq$ 0.68 $\mu$ F	$\leq 15 \times 10^{-4}$	$\leq 45 \times 10^{-4}$
0.68 $\mu$ F < C $\leq$ 1.0 $\mu$ F	$\leq 15 \times 10^{-4}$	$\leq 50 \times 10^{-4}$
1.0 $\mu$ F < C $\leq$ 1.2 $\mu$ F	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :		
P = 22.5 mm		35 V/ $\mu$ s
P = 27.5 mm		25 V/ $\mu$ s
R between leads, for C $\leq$ 1.0 $\mu$ F		>100000 M $\Omega$
RC between leads, for C > 1.0 $\mu$ F		>100000 s

## Available 400 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5$ mm	$\pm 5\%$	2222 479 54...	preferred
	$l_t = 5.0 \pm 1.0$ mm	$\pm 5\%$	2222 479 52...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 479 55...	on request

## Note

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

# AC and Pulse metallized polypropylene film capacitors

MKP 479

 $U_{Rdc} = 400 \text{ V}; U_{Rac} = 200 \text{ V}/U_{p-p} = 560 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $d_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 479 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.24	$6.5 \times 19.5 \times 26.0$	1.7	54244	750	600
0.27	$7.0 \times 20.0 \times 26.0$	1.8	54274	650	550
0.3	$7.5 \times 20.5 \times 26.0$	1.9	54304	600	500
0.33			54334		
0.36	$8.0 \times 21.0 \times 26.0$	2	54364	550	500
0.39	$8.5 \times 21.5 \times 26.0$	2.1	54394	500	450
0.43			54434		
0.47	$9.0 \times 22.0 \times 26.0$	2.4	54474	450	450
0.51	$9.5 \times 22.5 \times 26.0$	2.5	54514	450	400
0.56	$10.0 \times 23.0 \times 26.0$	2.6	54564	400	400
0.62	$10.5 \times 23.5 \times 26.0$	2.7	54624	350	350
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.68	$10.0 \times 24.0 \times 30.0$	5	54684	450	400
0.75	$10.5 \times 23.5 \times 30.0$	5	54754	450	350
0.82	$11.0 \times 24.0 \times 30.0$	5.5	54824	400	350
0.91	$11.5 \times 24.5 \times 30.0$	5.5	54914	400	350
1.0	$12.0 \times 25.0 \times 30.0$	6	54105	350	350
1.1	$12.5 \times 25.5 \times 30.0$	6.5	54115	350	300
1.2	$13.0 \times 26.5 \times 30.0$	6.5	54125	300	300

**Note**

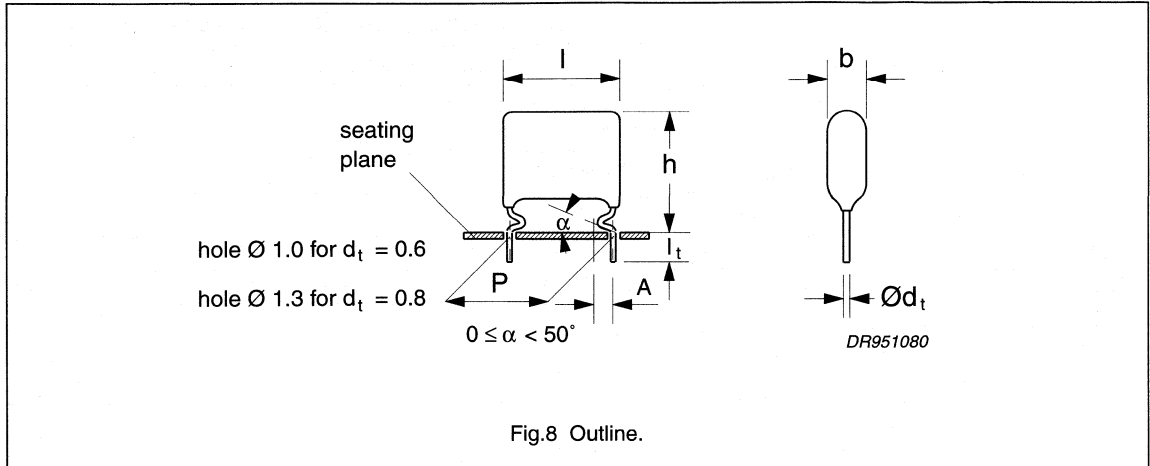
1. The shading indicates preferred types.

AC and Pulse  
metallized polypropylene film capacitors

MKP 479

MKP 479 GENERAL DATA

PITCH 10/15 mm



Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.027 \mu\text{F}$ $0.027 \mu\text{F} < C \leq 0.047 \mu\text{F}$ $0.047 \mu\text{F} < C \leq 0.11 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$ $\leq 20 \times 10^{-4}$ $\leq 25 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ : $P = 10.0 \text{ mm}$ $P = 15.0 \text{ mm}$	100 V/ $\mu\text{s}$ 90 V/ $\mu\text{s}$	
R between leads, for $C \leq 1.0 \mu\text{F}$	>100000 M $\Omega$	

Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 479 64...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 479 62...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 479 65...	on request

Note

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

# AC and Pulse metallized polypropylene film capacitors

MKP 479

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ / $U_{p-p} = 560 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\text{max}} \times h_{\text{max}} \times l_{\text{max}}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 479 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>10.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.60 \text{ } 0.06 \text{ mm}</math>; <math>A = 2.0 +1.0/-0.5 \text{ mm}</math></b>					
0.01	$6.0 \times 15.0 \times 12.5$	0.9	64103	1000	1000
0.011			64113		
0.012			64123		
0.013			64133		
0.015			64153		
0.016			64163		
0.018			64183		
0.02			64203		
0.022			64223		
0.024			64243		
0.027	$6.5 \times 15.5 \times 12.5$	1	64273	1000	900
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.03	$6.5 \times 15.5 \times 17.5$	1.3	64303	1500	900
0.033			64333		
0.036			64363		
0.039			64393		
0.043			64433		
0.047			64473		
0.051			64513		
0.056			64563		
0.062	$7.0 \times 16.0 \times 17.5$	1.4	64623	1250	800
0.068	$7.5 \times 16.5 \times 17.5$	1.5	64683	1250	800
0.075	$8.0 \times 17.0 \times 17.5$	1.6	64753	1250	700
0.082			64823		
0.091	$8.5 \times 17.5 \times 17.5$	1.7	64913	1000	700
0.1	$9.0 \times 18.0 \times 17.5$	1.8	64104	1000	600
0.11	$9.5 \times 18.5 \times 17.5$	1.9	64114	900	600

**Note**

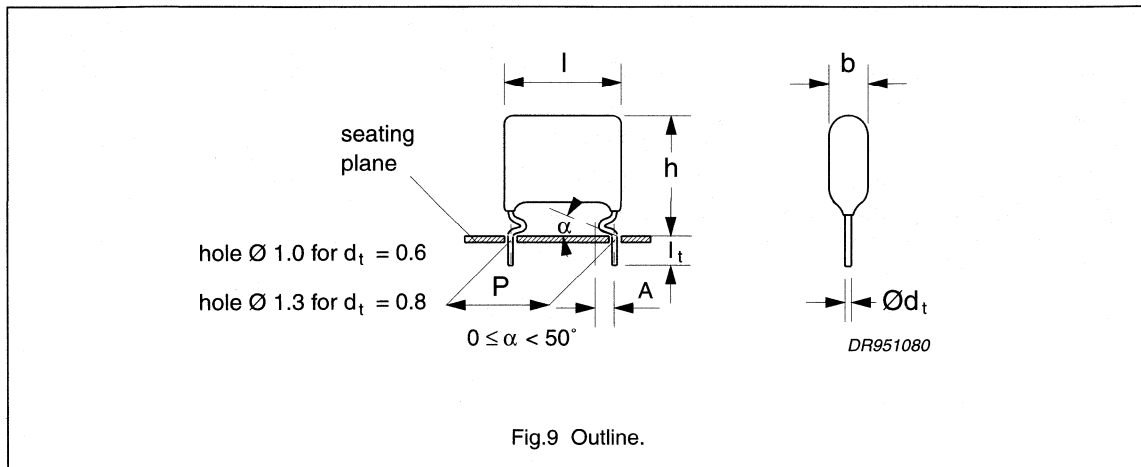
- The shading indicates preferred types.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

## MKP 479 GENERAL DATA

PITCH 22.5/27.5 mm



## Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
0.11 $\mu\text{F} < C \leq 0.22 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
0.22 $\mu\text{F} < C \leq 0.3 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 35 \times 10^{-4}$
0.3 $\mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 45 \times 10^{-4}$
0.47 $\mu\text{F} < C \leq 0.68 \mu\text{F}$	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at $U_{Rdc}$ :		
P = 22.5 mm	45 V/ $\mu\text{s}$	
P = 27.5 mm	30 V/ $\mu\text{s}$	
R between leads, for $C \leq 1.0 \mu\text{F}$	$> 100000 \text{ M}\Omega$	

## Available 630 V DC versions

PACKAGING	DIMENSIONS	C-tol	FIRST 9 DIGITS OF CATALOGUE NUMBER	ORDERING
Loose in box	$l_t = 3.5 \pm 0.5 \text{ mm}$	$\pm 5\%$	2222 479 64...	preferred
	$l_t = 5.0 \pm 1.0 \text{ mm}$	$\pm 5\%$	2222 479 62...	on request
Taped on reel	H = 16.0 mm; note 1	$\pm 5\%$	2222 479 65...	on request

## Note

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

# AC and Pulse metallized polypropylene film capacitors

MKP 479

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ / $U_{p-p} = 560 \text{ V}$ 

loose and taped

C ( $\mu\text{F}$ )	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 479 ..... AND PACKAGING		
			LOOSE IN BOX; $l_t = 3.5 \pm 0.5 \text{ mm}$		REEL
			last 5 digits of catalogue number <sup>(1)</sup>	SPQ	SPQ
			C-tol = $\pm 5\%$		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.12	$6.5 \times 19.5 \times 26.0$	1.7	64124	750	600
0.13	$7.0 \times 20.0 \times 26.0$	1.8	64134	650	550
0.15	$7.5 \times 20.5 \times 26.0$	1.9	64154	600	500
0.16			64164		
0.18	$8.0 \times 21.0 \times 26.0$	2	64184	550	500
0.20	$8.5 \times 21.5 \times 26.0$	2.1	64204	500	450
0.22	$9.0 \times 22.0 \times 26.0$	2.4	64224	450	450
0.24			64244		
0.27	$9.5 \times 22.5 \times 26.0$	2.5	64274	450	400
0.30	$10.0 \times 23.0 \times 26.0$	2.7	64304	400	400
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math>; <math>A = 2.5 +1.4/-0.5 \text{ mm}</math></b>					
0.33	$9.5 \times 22.5 \times 30.0$	5	64334	550	400
0.36	$10.0 \times 22.5 \times 30.0$	5	64364	500	400
0.39	$10.5 \times 23.0 \times 30.0$	5	64394	450	350
0.43	$11.0 \times 23.0 \times 30.0$	5.5	64434	450	350
0.47	$11.5 \times 24.5 \times 30.0$	5.5	64474	400	350
0.51	$12.0 \times 25.0 \times 30.0$	6	64514	350	350
0.56	$13.0 \times 26.5 \times 30.0$	6.5	64564	300	300
0.62	$13.5 \times 26.5 \times 30.0$	6.5	64624	300	300
0.68	$14.0 \times 27.0 \times 30.0$	7	64684	300	300

**Note**

1. The shading indicates preferred types.

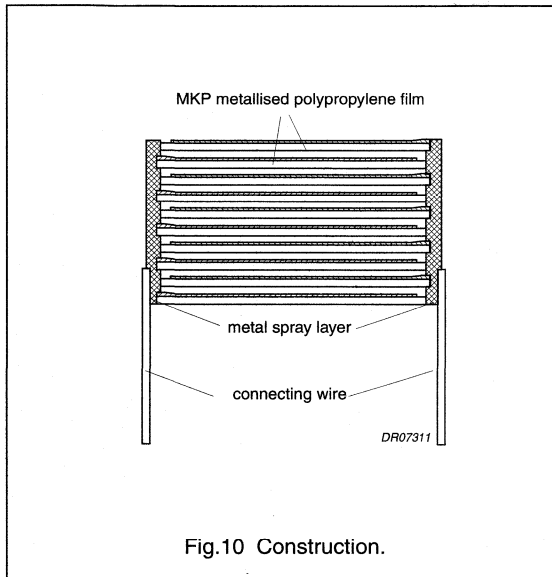
# AC and Pulse metallized polypropylene film capacitors

MKP 479

## CONSTRUCTION

### Description

- Low-inductive wound cell of metallized polypropylene (PP) film, epoxy lacquered.
- Radial leads, solder-coated wire:
  - Copper clad steel wire (pitch = 4e and 6e)
  - Copper wire (pitch = 9e and 11e).



## 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

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 of  $\leq 15$  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  $23 \pm 1$  °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%.

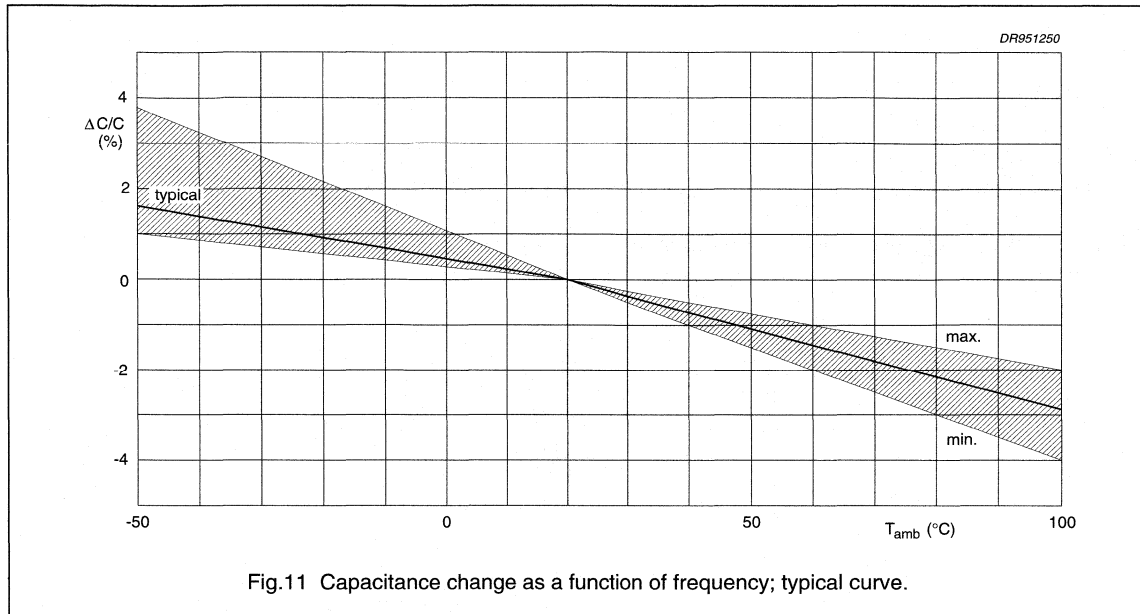


# AC and Pulse metallized polypropylene film capacitors

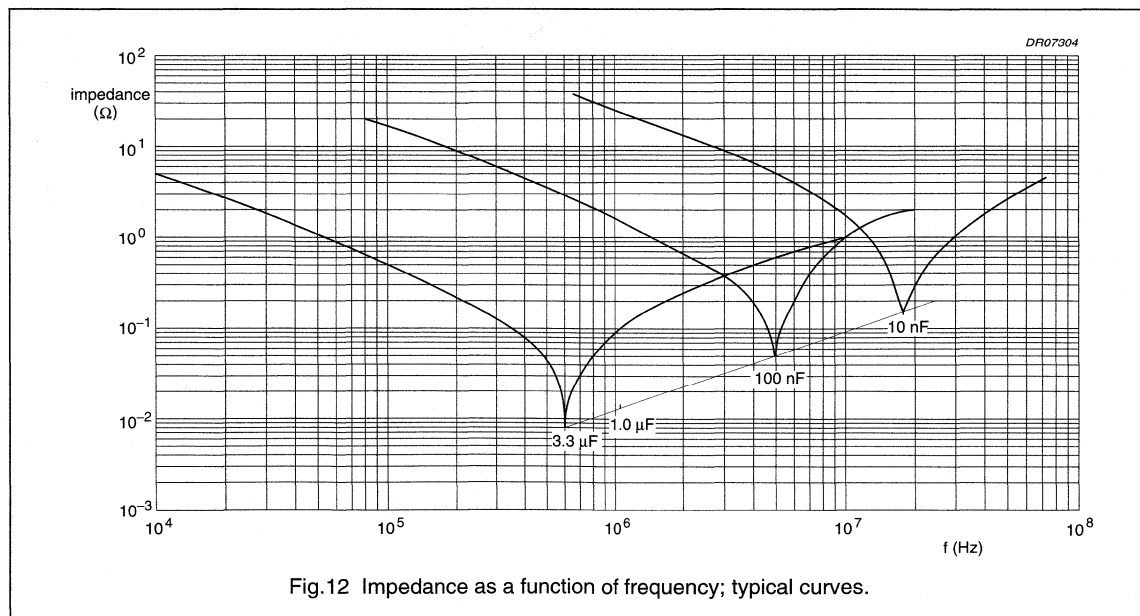
MKP 479

## Capacitance

All capacitance values are specified at 1 kHz.



## Impedance



# AC and Pulse metallized polypropylene film capacitors

MKP 479

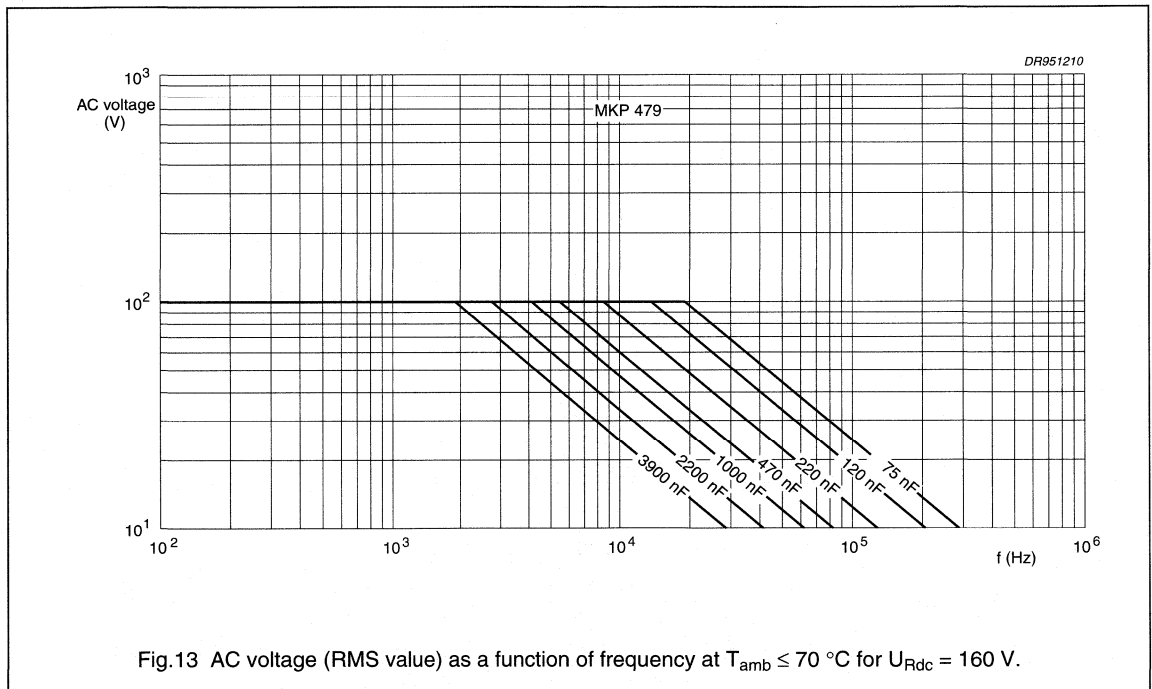
## Temperature

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

## Voltage

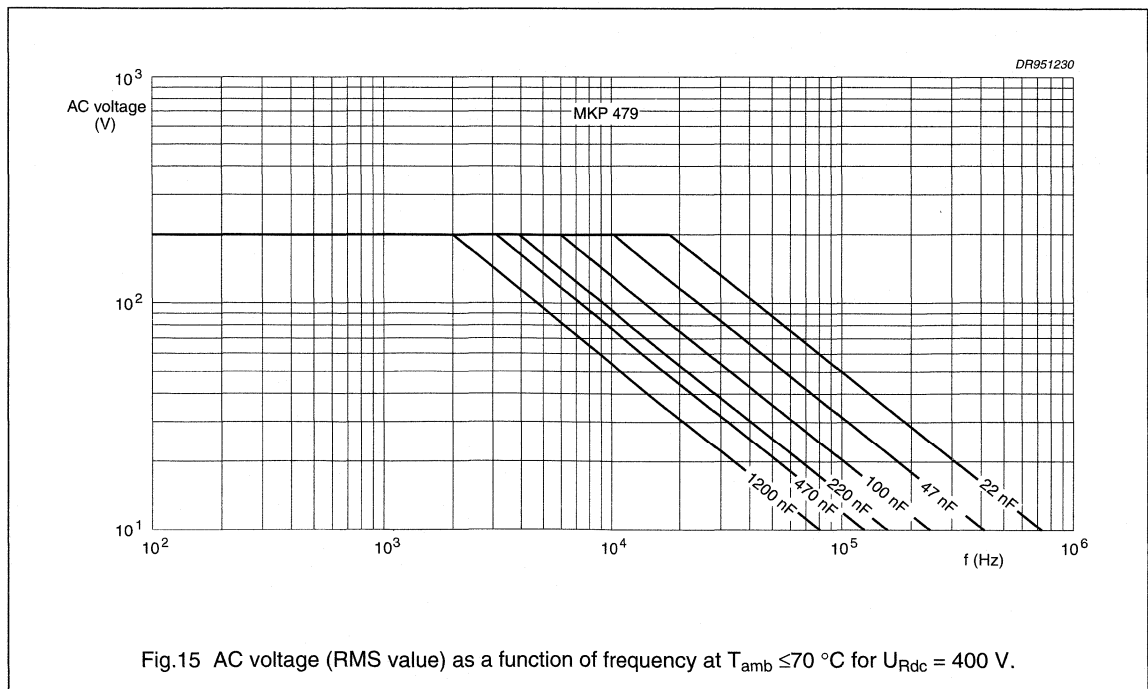
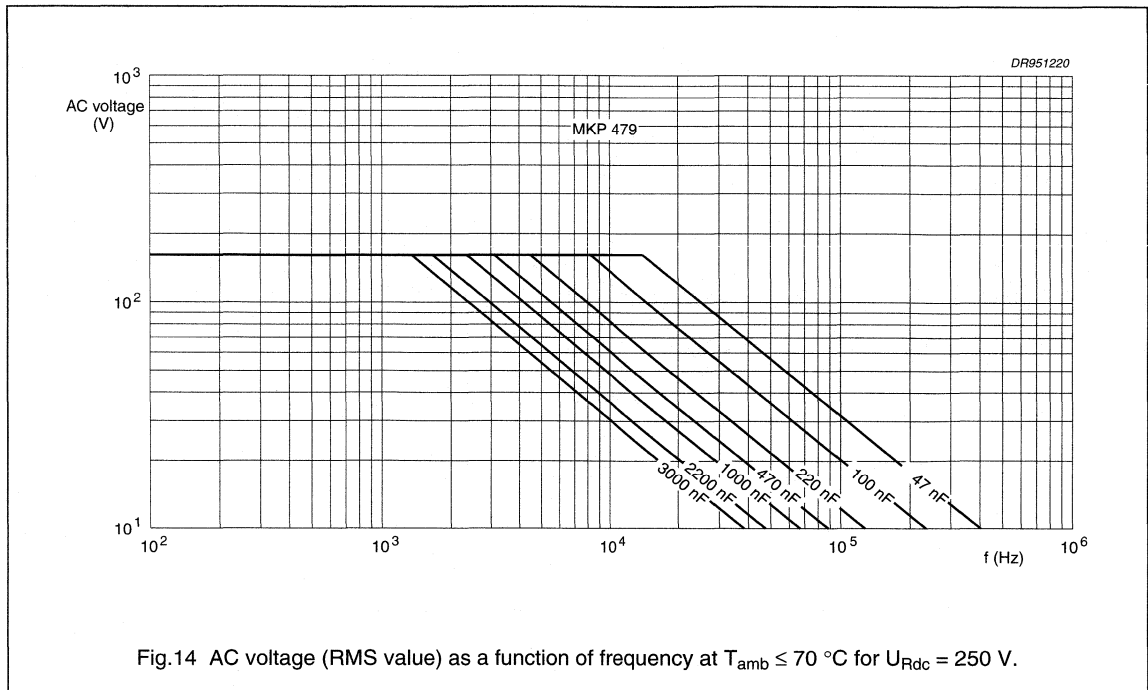
- Category voltage:
  - $U_{\text{Cdc}} = U_{\text{Rdc}}$  for  $T = 85\text{ °C}$ ;  $U_{\text{Cdc}} = 0.7 U_{\text{Rdc}}$  for  $T = 100\text{ °C}$
  - $U_{\text{Cac}} = U_{\text{Rac}}$  for  $T = 70\text{ °C}$ ;  $U_{\text{Cac}} = 0.7 U_{\text{Rac}}$  for  $T = 85\text{ °C}$
- Test voltage between leads:  $1.6 \times U_{\text{Rdc}}$
- Test voltage between interconnected leads and case (foil method): 2840 V (DC).

## Maximum RMS voltage (sinewave) as a function of frequency for $T_{\text{amb}} \leq 70\text{ °C}$



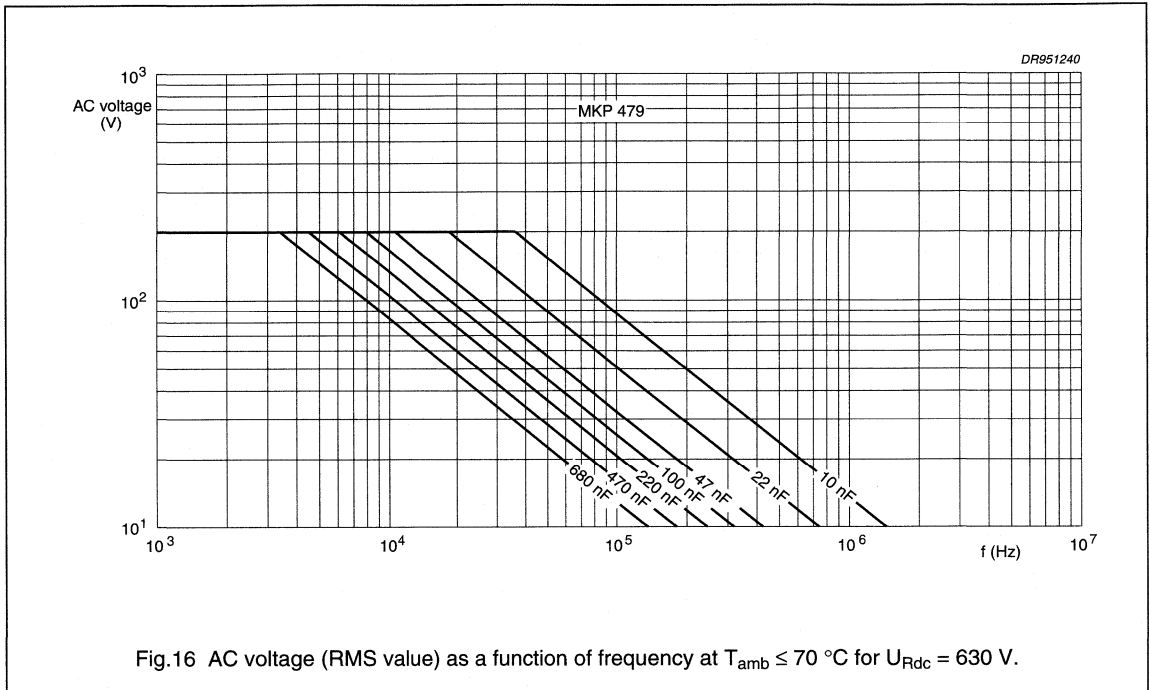
# AC and Pulse metallized polypropylene film capacitors

MKP 479



# AC and Pulse metallized polypropylene film capacitors

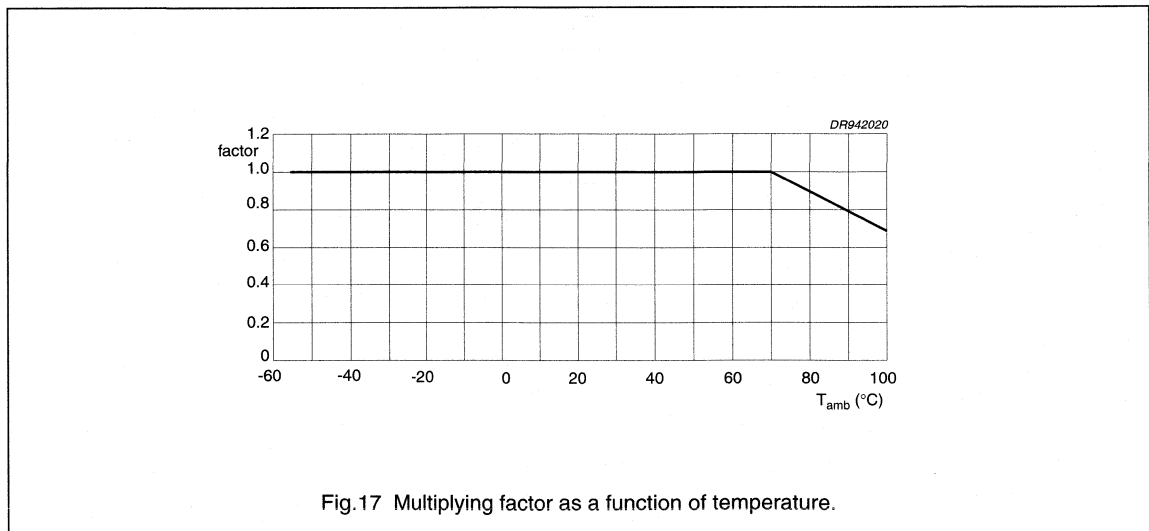
MKP 479



### Maximum RMS voltage (sinewave) as a function of frequency for $T_{amb} > 70\text{ °C}$ .

The maximum RMS voltage in Figs 13 to 16 has to be multiplied by a factor given in Fig.17.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Figs 20 and 21.



# AC and Pulse metallized polypropylene film capacitors

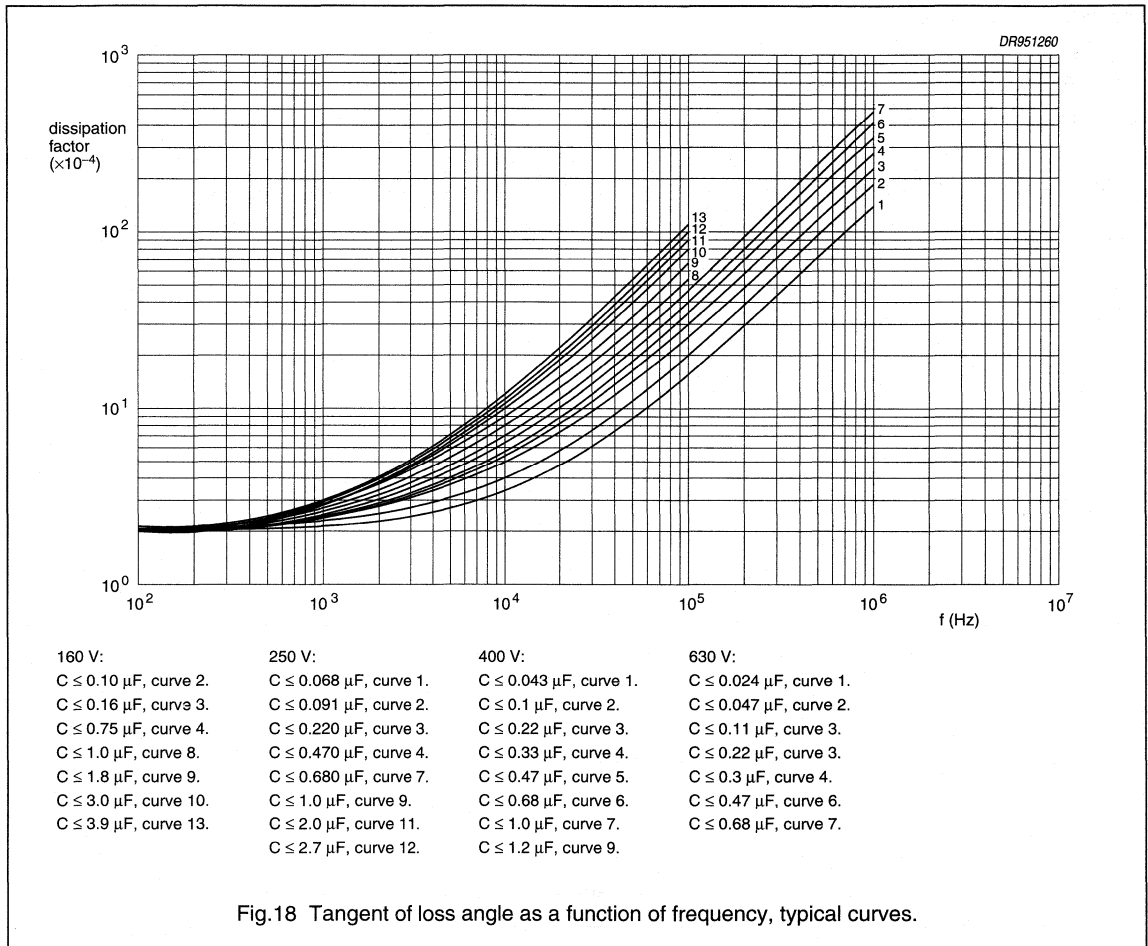
MKP 479

## Tangent of Loss Angle

RATED VOLTAGE $U_R$ (V)	CAPACITANCE	TANGENT OF LOSS ANGLE	
		at 10 kHz	at 100 kHz
160	$C \leq 0.1 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
	$0.1 \mu\text{F} < C \leq 0.16 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
	$0.16 \mu\text{F} < C \leq 0.75 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
	$0.75 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 55 \times 10^{-4}$
	$1.0 \mu\text{F} < C \leq 1.8 \mu\text{F}$	$\leq 20 \times 10^{-4}$	$\leq 75 \times 10^{-4}$
	$1.8 \mu\text{F} < C \leq 3.0 \mu\text{F}$	$\leq 25 \times 10^{-4}$	$\leq 80 \times 10^{-4}$
250	$3.0 \mu\text{F} < C \leq 3.9 \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 110 \times 10^{-4}$
	$C \leq 0.068 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
	$0.068 \mu\text{F} < C \leq 0.100 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
	$0.100 \mu\text{F} < C \leq 0.220 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
	$0.220 \mu\text{F} < C \leq 0.470 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
	$0.470 \mu\text{F} < C \leq 0.680 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 50 \times 10^{-4}$
	$0.680 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$
400	$1.0 \mu\text{F} < C \leq 2.0 \mu\text{F}$	$\leq 25 \times 10^{-4}$	$\leq 90 \times 10^{-4}$
	$2.0 \mu\text{F} < C \mu\text{F}$	$\leq 30 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
	$C \leq 0.047 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
	$0.047 \mu\text{F} < C \leq 0.1 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
	$0.1 \mu\text{F} < C \leq 0.22 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
	$0.22 \mu\text{F} < C \leq 0.33 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
	$0.33 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 35 \times 10^{-4}$
	$0.47 \mu\text{F} < C \leq 0.68 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 45 \times 10^{-4}$
630	$0.68 \mu\text{F} < C \leq 1.0 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 50 \times 10^{-4}$
	$1.0 \mu\text{F} < C \leq 1.2 \mu\text{F}$	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$
	$C \leq 0.027 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
	$0.027 \mu\text{F} < C \leq 0.047 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
	$0.11 \mu\text{F} < C \leq 0.22 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
	$0.22 \mu\text{F} < C \leq 0.3 \mu\text{F}$	$\leq 10 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
630	$0.3 \mu\text{F} < C \leq 0.47 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 45 \times 10^{-4}$
	$0.47 \mu\text{F} < C \leq 0.68 \mu\text{F}$	$\leq 15 \times 10^{-4}$	$\leq 50 \times 10^{-4}$

# AC and Pulse metallized polypropylene film capacitors

MKP 479



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

RATED VOLTAGE U <sub>R</sub> (V)	MAXIMUM RATED PULSE LOAD (V/μs) <sup>(1)(2)</sup>			
	P = 10.0 mm	P = 15.0 mm	P = 22.5 mm	P = 27.5 mm
160	60	50	25	15
250	70	60	30	20
400	80	70	35	25
630	100	90	45	30

### Notes

1. If the pulse voltage is lower than the rated voltage, the values may be multiplied by U<sub>Rdc</sub> and divided by the applied voltage.
2. The rated voltage pulse slope is valid for ambient temperatures up to 70 °C. For higher temperatures a derating factor of 3% per Kelvin shall be applied.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

## Insulation Resistance

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $100 \pm 15$  V for the 100, 160, 250 and 400 V versions, and  $500 \pm 50$  V for the 630 V versions:

- Resistance between leads, for  $C \leq 1 \mu\text{F}$ :  $>100000 \text{ M}\Omega$
- RC between leads, for  $C > 1 \mu\text{F}$ :  $>100000 \text{ s}$
- Resistance between interconnected leads and case (foil method):  $>100000 \text{ M}\Omega$ .

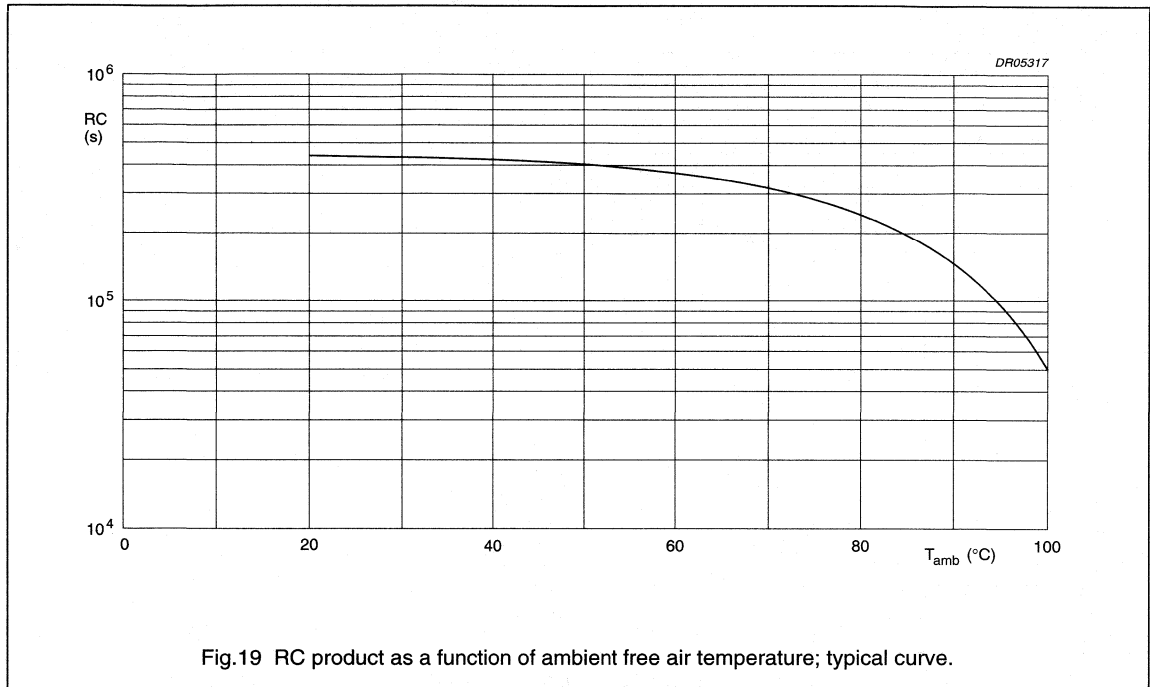


Fig.19 RC product as a function of ambient free air temperature; typical curve.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

## Maximum dissipation

Power dissipation curves as a function of pitch and capacitor thickness (see Figs 20 and 21)

$b_{max}$ (mm)	PITCH (mm)			
	10	15	22.5	27.5
4.0	1	3	–	–
4.5	2	4	–	–
5.0	3	4	9	10
5.5	4	5	10	11
6.0	4	5	10	11
6.5	5	6	11	12
7.0	–	6	11	12
7.5	–	7	12	13
8.0	–	7	12	14
8.5	–	8	13	14
9.0	–	8	13	15
9.5	–	9	14	15
10.0	–	9	14	16
10.5	–	–	14	17
11.0	–	–	–	17
11.5	–	–	–	18
12.0	–	–	–	18
12.5	–	–	–	19
13.0	–	–	–	19
13.5	–	–	–	19
14.0	–	–	–	19
14.5	–	–	–	20
15.0	–	–	–	20
15.5	–	–	–	21
16.0	–	–	–	21

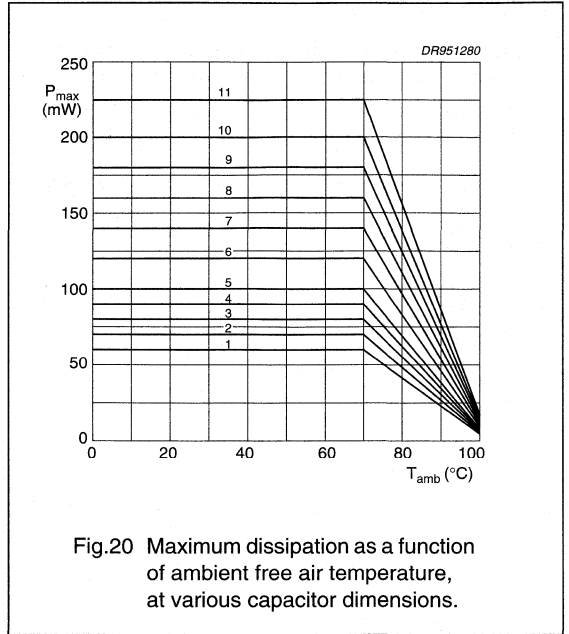


Fig.20 Maximum dissipation as a function of ambient free air temperature, at various capacitor dimensions.

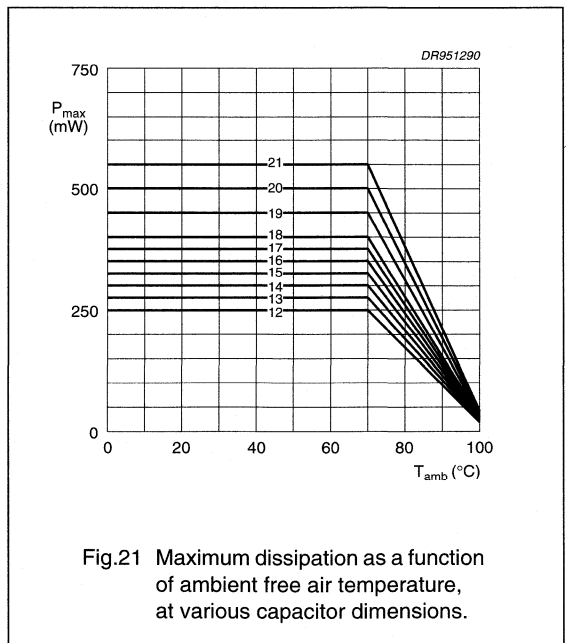


Fig.21 Maximum dissipation as a function of ambient free air temperature, at various capacitor dimensions.



# AC and Pulse metallized polypropylene film capacitors

MKP 479

## Application note<sup>(1)</sup>

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ )
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{rac}$ ) to avoid the ionisation inception level.
3. The peak current ( $I_p$ ) shall not exceed the maximum peak current, defined as maximum voltage pulse slope ( $dU/dt$ ) multiplied by the capacitance:

$$I_{p\max} = C \left( \frac{dU}{dt} \right)_{\max}$$

Or the voltage slope shall not exceed the rated voltage pulse slope. If the pulse voltage is lower than the rated voltage, the values (see Section "Rated voltage pulse slope ( $dU/dt$ )R" for more details) may be multiplied by  $U_{Rdc}$  and divided by applied voltage.

4. The dissipated power shall not be greater than the maximum permissible power dissipation stated in the Figs. 20 and 21.
5. The free air ambient temperature for the capacitor does not exceed the category temperature.

(1) Peak-to-peak current tables for S-correction application, are available on request.

6. Since in circuits used at voltages over 280 V peak-to-peak the risk for an intrinsically active flammability after a capacitor breakdown (short circuit) increases, it is recommended that the power to the component is limited to 10 times the maximum allowed power dissipation ( $P_{\max}$ ) during the short circuit failure mode of the capacitor.

Example:  $C = 470 \text{ nF} - 250 \text{ V}$  used for S-correction:

In this application the following pulse criteria apply:

$U_{p-p} = 108 \text{ V}$ ;  $U_p = 170 \text{ V}$ ;  $T_1 = 12 \mu\text{s}$ ;  
 $T_2 = 64 \mu\text{s}$ ;  $I_{p-p} = 5 \text{ A}$ .

The ambient temperature is  $50 \text{ }^\circ\text{C}$ .

## Checking the conditions

1. The peak voltage  $U_p = 170 \text{ V}$  is lower than  $250 \text{ V}$  (DC).
2. The peak-to-peak voltage  $108 \text{ V}$  is lower than  $2 \times \sqrt{2} \times 160 \text{ V}$  (AC) =  $450 U_{p-p}$ .
3.  $I_p = 2.5 \text{ A}$  is lower than  $0.47 \mu\text{F} \times 60 \text{ V} / \mu\text{s} = 28 \text{ A}$ .
4. The dissipated power is about  $40 \text{ mW}$  as calculated with Fourier terms and  $\text{tg}\delta$  maximum values. This is less than  $160 \text{ mW}$ , allowed for a capacitor with dimensions:  $b_{\max} = 9.5$  and pitch =  $15 \text{ mm}$  at  $50 \text{ }^\circ\text{C}$ .
5. The free air ambient temperature is more than  $50 \text{ }^\circ\text{C}$ , and lower than  $100 \text{ }^\circ\text{C}$ .
6. Depends on actual application.

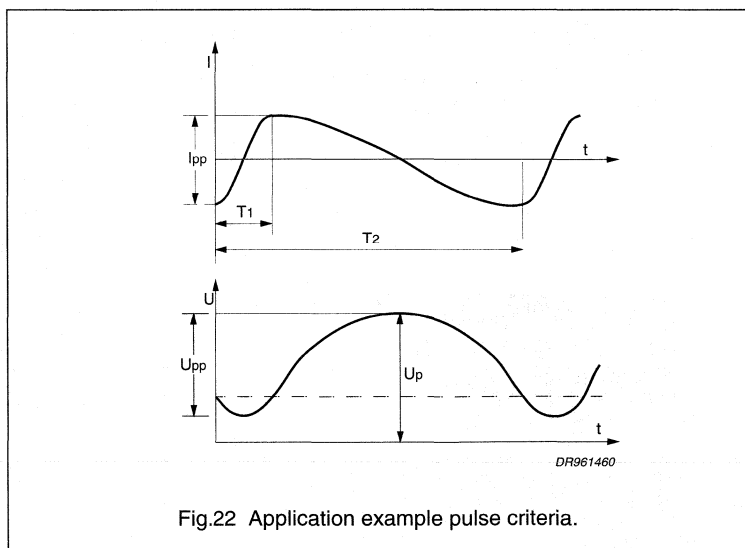


Fig.22 Application example pulse criteria.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

## MARKING

### Product marking

Capacitors are marked on top in black ink with the following information:

1. Manufacturer's logo (only for pitches > 10 mm)
2. Manufacturer's type designation with code for dielectric material (MKP 479))
3. Rated capacitance code in accordance with "IEC 62"
4. Rated (DC) voltage (e.g. 400 V)
5. Tolerance on rated capacitance  $J = \pm 5\%$
6. Year and month of manufacture in code(e.g. H1).

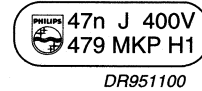


Fig.23 Example of marking.

### Package marking

The package containing the capacitors is marked as shown in Fig.24.

LINE	MARKING EXPLANATION
1.	Manufacturer's name
2.	Country of origin
3.	Sub-family
4.	Type description
5.	Capacitance value in $\mu\text{F}$ , tolerance, voltage and climatic category ("IEC 68-1")
6.	-
7.	Preference origin code: A
8.	Product type description
9.	Quantity and production period, year and week code
10.	Product code (12NC)

CCA325

Fig.24 Barcode label.

# AC and Pulse metallized polypropylene film capacitors

MKP 479

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

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Robustness of leads</b>		
Tensile and bending: <i>"IEC 68-2-21"</i> Resistance to soldering heat: <i>"IEC 68-2-20"</i> Component solvent resistance	solder bath: 260 °C; 10 s  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking $ \Delta C/C  \leq 1\%$ for 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 2\%$ for 160 V all pitches 250 V to 630 V: 10 and 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
<b>Robustness of component</b>		
Vibration: <i>"IEC 68-2-6"</i>  Shock: <i>"IEC 68-2-27"</i>	10 Hz to 55 kHz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours  half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$ \Delta C/C  \leq 1\%$ for 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 2\%$ for 160 V all pitches 250 V to 630 V: 10 and 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
<b>Climatic sequence</b>		
Dry heat: <i>"IEC 68-2-2"</i> Damp heat, cyclic, test Db, first cycle: <i>"IEC 68-2-30"</i> Cold: <i>"IEC 68-2-1"</i> Damp heat, cyclic, test Db, remaining cycles: <i>"IEC 68-2-30"</i>	16 hours; 85 °C   2 hours; -55 °C	$ \Delta C/C  \leq 1\%$ for 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 3\%$ for 160 V all pitches 250 V to 630 V: 10 and 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)  $R_{ins} \geq 50\%$ of specified value

# AC and Pulse metallized polypropylene film capacitors

MKP 479

TEST	PROCEDURE (quick reference)	REQUIREMENTS
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 1\%$ for 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 3\%$ for 160 V all pitches 250 V to 630 V: 10 and 15 mm pitch $R_{ins} \geq 50\%$ of specified value
Endurance (AC): "IEC 384-17"	2000 hours; 85 °C $1.25 \times U_{Rac}$ (RMS); 50 Hz	$ \Delta C/C  \leq 5\%$ $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value
Heat storage: "IEC 384-17"	2000 hours; 85 °C	$ \Delta C/C  \leq 1\%$ for 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 3\%$ for 160 V all pitches 250 V to 630 V: 10 and 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
Resistance to soldering heat with preheating: "IEC 384-17"	body temperature: 100 °C; bath temperature: 260 °C; dwell time: 10 s	$ \Delta C/C  \leq 1\%$ for 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 2\%$ for 160 V all pitches 250 V to 630 V: 10 and 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF)
Passive flammability: "IEC 695-2-2"	class C	no burning
Endurance (DC): "IEC 384-17"	2000 h: $1.25 \times U_{Rdc}$ ; 85 °C	$ \Delta C/C  \leq 1\%$ for 250 to 630 V: 22.5/27.5 mm pitch $ \Delta C/C  \leq 3\%$ for 160 V all pitches 250 V to 630 V: 10 and 15 mm pitch $\Delta \tan \delta \leq 5 \times 10^{-4}$ ( $C \leq 100$ nF) $\Delta \tan \delta \leq 10 \times 10^{-4}$ ( $100$ nF < $C \leq 470$ nF) $\Delta \tan \delta \leq 15 \times 10^{-4}$ ( $C > 470$ nF) $R_{ins} \geq 50\%$ of specified value

**Note**

1. For detailed information, see "Type specification".

## PRECISION CAPACITORS





## Polystyrene film foil capacitors

KS 424 to 431

## KS AXIAL CAPACITORS

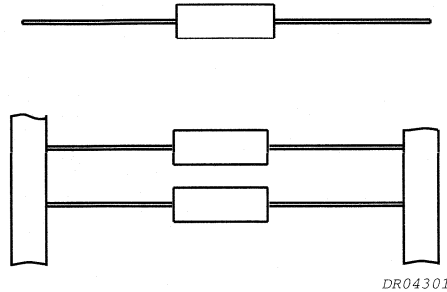


Fig.1 Simplified outlines.

## FEATURES

- Supplied loose in box and taped on reel.

## APPLICATIONS

In circuits where close tolerance, reliability and low losses are of prime importance, for example: tuned circuits, filter and timing networks.

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range	47 to 39000 pF
Capacitance tolerance	$\pm 5\%$ ; $\pm 2\%$ ; $\pm 1\%$
Rated voltage (DC)	63 V; 160 V; 250 V; 630 V
Climatic category	40/085/21
Rated temperature	85 °C
Reference specification	IEC 384-7
Stability class	Class 3

Polystyrene film foil capacitors

KS 424/428

KS 424/428 GENERAL DATA

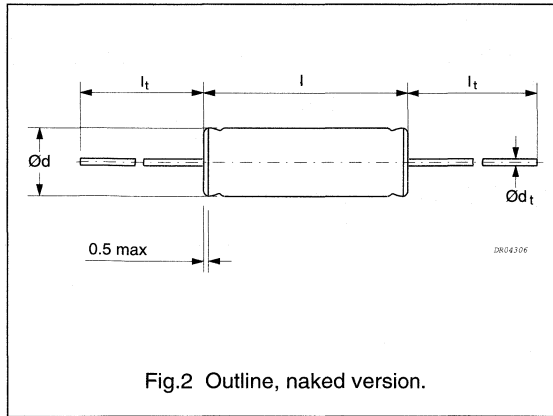


Fig.2 Outline, naked version.

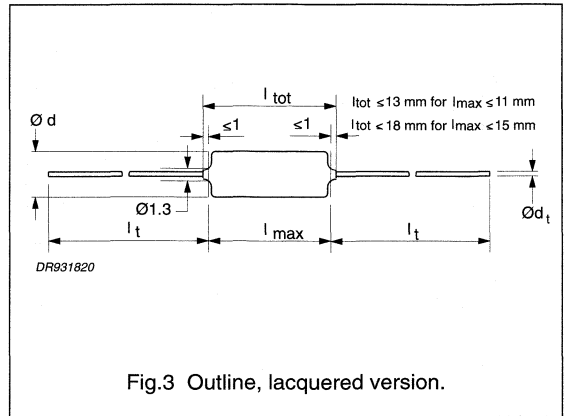


Fig.3 Outline, lacquered version.

Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle:		
1000 pF < C ≤ 10000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>
10000 pF < C ≤ 20000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 15 × 10 <sup>-4</sup>
C > 20000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 25 × 10 <sup>-4</sup>
R between leads	> 100000 MΩ	

Available 63 V DC versions

PACKAGING	VERSION	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	naked	±1%	2222 428 8....	on request
		±2%	2222 428 7....	on request
		±5%	2222 428 6....	on request
Loose in box		±1%	2222 424 4....	on request
		±2%	2222 424 3....	on request
		±5%	2222 424 2....	on request
Taped on reel; note 1	lacquered	±1%	2222 428 4....	on request
		±2%	2222 428 3....	on request
		±5%	2222 428 2....	on request
Loose in box		±1%	2222 424 8....	on request
		±2%	2222 424 7....	on request
		±5%	2222 424 6....	on request

Note

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



## Polystyrene film foil capacitors

KS 424 to 431

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 25 \text{ V}$ 

loose and taped

C <sup>(1)</sup> (E-24) (pF)	DIMENSIONS <sup>(2)</sup> $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER AND PACKAGING			
			2222 428 .....		2222 424 .....	
			naked version taped on reel		loose in box	
			last 5 digits of catalogue number		SPQ <sup>(3)</sup>	SPQ <sup>(3)</sup>
C-tol = $\pm 2\%$	C-tol = $\pm 1\%$					
<b><math>l_t = 30.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
2000	3.8 × 11.0	0.3	72002	82002	3000 (2500)	400 (300)
2200		0.3	72202	82202		
2400		0.4	72402	82402		
2700	4.0 × 11.0	0.4	72702	82702	2500	400 (300)
3000		0.4	73002	83002		
3300		0.4	73302	83302		
3600		0.4	73602	83602		
3900		0.4	73902	83902		
4300	4.5 × 11.0	0.5	74302	84302	2500	300 (250)
4700		0.5	74702	84702		
5100		0.5	75102	85102		
5600		0.5	75602	85602		
6200	5.0 × 11.0	0.6	76202	86202	1500	250 (200)
6800		0.6	76802	86802		
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
7500	5.0 × 15.0	0.6	77502	87502	1500	300 (250)
8200		0.6	78202	88202		
9100		0.7	79102	89102		
10000		0.7	71003	81003		
11000	5.5 × 15.0	0.8	71103	81103	1500	250 (200)
12000		0.8	71203	81203		
13000		0.9	71303	81303		
15000		0.9	71503	81503		
16000	6.0 × 15.0	1.1	71603	81603	1500	250 (200)
18000		1.1	71803	81803		
20000		1.3	72003	82003		
22000	6.5 × 15.0	1.3	72203	82203	1000	200 (150)
24000		1.4	72403	82403		
27000	7.0 × 15.0	1.5	72703	82703	1000	150 (100)
30000		1.7	73003	83003		
33000	7.5 × 15.0	1.9	73303	83303	1000	150 (100)
36000		1.9	73603	83603		
39000	8.0 × 15.0	2.0	73903	83903	1000	150 (100)

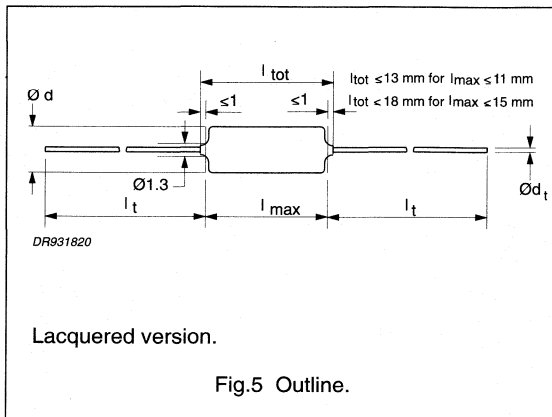
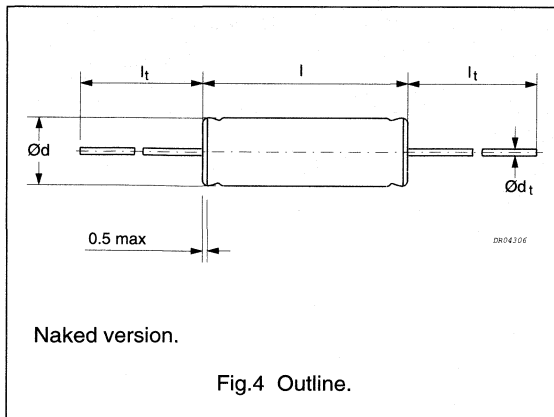
## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and of the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- Diameter  $d_{max} + 0.7 \text{ mm}$  for lacquered versions.
- SPQ in brackets for lacquered version.

# Polystyrene film foil capacitors

KS 425/429

## KS 425/429 GENERAL DATA



### Specific reference data for the 160 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle: 1 000 pF < C ≤ 10 000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>
10 000 pF < C ≤ 20 000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 15 × 10 <sup>-4</sup>
R between leads	> 100 000 MΩ	

### Available 160 V DC versions

PACKAGING	VERSION	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	naked	±1%	2222 429 8...	on request
		±2%	2222 429 7...	on request
		±5%	2222 429 6...	on request
Loose in box		±1%	2222 425 4...	on request
		±2%	2222 425 3...	on request
		±5%	2222 425 2...	on request
Taped on reel; note 1	lacquered	±1%	2222 429 4...	on request
		±2%	2222 429 3...	on request
		±5%	2222 429 2...	on request
Loose in box		±1%	2222 425 8...	on request
		±2%	2222 425 7...	on request
		±5%	2222 425 6...	on request

### Note

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

## Polystyrene film foil capacitors

KS 424 to 431

 $U_{Rdc} = 160 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose and taped

C <sup>(1)</sup> (E-24) (pF)	DIMENSIONS <sup>(2)</sup> $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER AND PACKAGING			
			2222 429 .....		2222 425 .....	
			naked version taped on reel		loose in box	
			last 5 digits of catalogue number		SPQ <sup>(3)</sup>	SPQ <sup>(3)</sup>
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$		
<b><math>l_t = 30.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
1100	3.8 × 11.0	0.3	71102	81102	3000 (2500)	400 (300)
1200		0.3	71202	81202		
1300		0.3	71302	81302		
1500	4.0 × 11.0	0.4	71502	81502	2500	400 (300)
1600		0.4	71602	81602		
1800		0.4	71802	81802		
2000	4.5 × 11.0	0.4	72002	82002	2500	300 (250)
2200		0.4	72202	82202		
2400		0.5	72402	82402		
2700		0.5	72702	82702		
3000	5.0 × 11.0	0.5	73002	83002	1500	250 (200)
3300		0.5	73302	83302		
3600		0.6	73602	83602		
3900		0.6	73902	83902		
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
4300	5.0 × 15.0	0.6	74302	84302	1500	300 (250)
4700		0.6	74702	84702		
5100		0.6	75102	85102		
5600		0.7	75602	85602		
6200		0.7	76202	86202		
6800	5.5 × 15.0	0.8	76802	86802	1500	250 (200)
7500		0.8	77502	87502		
8200	6.0 × 15.0	0.9	78202	88202	1500	250 (200)
9100		0.9	79102	89102		
10000		1.1	71003	81003		
11000	6.5 × 15.0	1.1	71103	81103	1000	200 (150)
12000		1.2	71203	81203		
13000		1.3	71303	81303		
15000	7.0 × 15.0	1.4	71503	81503	1000	150 (100)
16000		1.5	71603	81603		

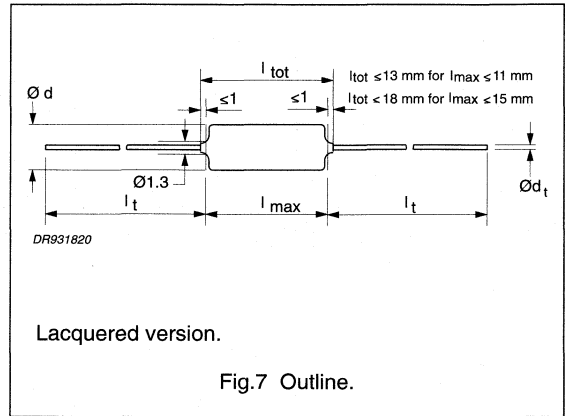
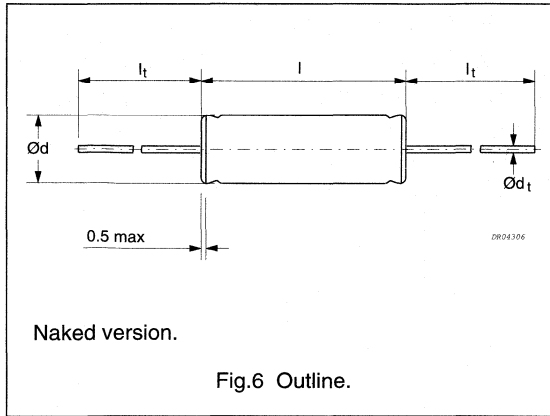
## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and of the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- Diameter  $d_{max} + 0.7 \text{ mm}$  for lacquered versions.
- SPQ in brackets for lacquered version.

Polystyrene film foil capacitors

KS 426/430

KS 426/430 GENERAL DATA



Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1 MHz
Tangent of loss angle:			
$C \leq 1000 \text{ pF}$	$\leq 5 \times 10^{-4}$	-	$\leq 10 \times 10^{-4}$
$1000 \text{ pF} < C \leq 10000 \text{ pF}$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	-
$10000 \text{ pF} < C \leq 20000 \text{ pF}$	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$	-
R between leads	$> 100000 \text{ M}\Omega$		

Available 250 V DC versions

PACKAGING	VERSION	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	naked	$\pm 1\%$	2222 430 8...	on request
		$\pm 2\%$	2222 430 7...	on request
		$\pm 5\%$	2222 430 6...	on request
Loose in box		$\pm 1\%$	2222 426 4...	on request
		$\pm 2\%$	2222 426 3...	on request
		$\pm 5\%$	2222 426 2...	on request
Taped on reel; note 1	lacquered	$\pm 1\%$	2222 430 4...	on request
		$\pm 2\%$	2222 430 3...	on request
		$\pm 5\%$	2222 430 2...	on request
Loose in box		$\pm 1\%$	2222 426 8...	on request
		$\pm 2\%$	2222 426 7...	on request
		$\pm 5\%$	2222 426 6...	on request

Note

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

## Polystyrene film foil capacitors

KS 424 to 431

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 125 \text{ V}$ 

loose and taped

C <sup>(1)</sup> (E-24) (pF)	DIMENSIONS <sup>(2)</sup> $d_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER AND PACKAGING			
			2222 430 .....		2222 426 .....	
			naked version taped on reel		loose in box	
			last 5 digits of catalogue number		SPQ <sup>(3)</sup>	SPQ <sup>(3)</sup>
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$		
<b><math>l_t = 30.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
560	3.8 × 11.0	0.3	75601	85601	3000 (2500)	400 (300)
620		0.3	76201	86201		
680		0.3	76801	86801		
750	4.0 × 11.0	0.3	77501	87501	2500	400 (300)
820		0.4	78201	88201		
910		0.4	79101	89101		
1000		0.4	71002	81002		
1100	4.5 × 11.0	0.4	71102	81102	2500	300 (250)
1200		0.5	71202	81202		
1300		0.5	71302	81302		
1500		0.5	71502	81502		
1600	5.0 × 11.0	0.5	71602	81602	1500	250 (200)
1800		0.5	71802	81802		
2000		0.6	72002	82002		
2200		0.6	72202	82202		
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>						
2400	5.0 × 15.0	0.6	72402	82402	1500	300 (250)
2700		0.6	72702	82702		
3000		0.6	73002	83002		
3300		0.6	73302	83302		
3600		0.7	73602	83602		
3900		0.7	73902	83902		
4300		0.7	74302	84302		
4700	5.5 × 15.0	0.8	74702	84702	1500	250 (200)
5100		0.8	75102	85102		
5600	6.0 × 15.0	0.9	75602	85602	1500	250 (200)
6200		0.9	76202	86202		
6800	6.5 × 15.0	1.1	76802	86802	1000	200 (150)
7500		1.1	77502	87502		
8200	7.0 × 15.0	1.3	78202	88202	1000	150 (100)
9100		1.3	79102	89102		
10000	7.5 × 15.0	1.5	71003	81003	1000	150 (100)
11000		1.6	71103	81103		

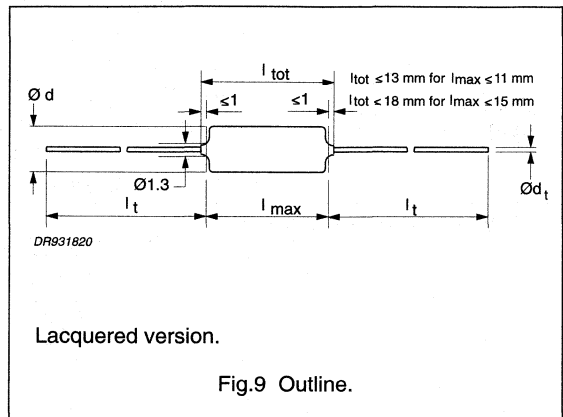
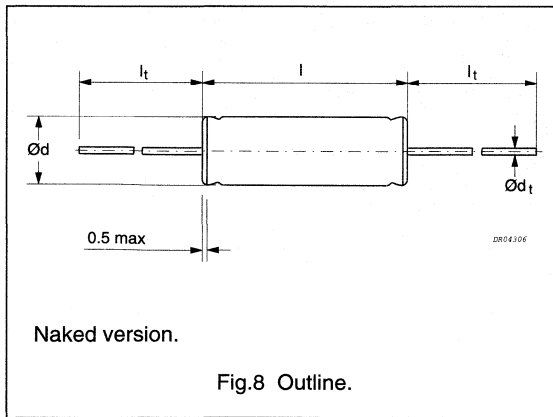
## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and of the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- Diameter  $d_{\max} + 0.7 \text{ mm}$  for lacquered versions.
- SPQ in brackets for lacquered version.

# Polystyrene film foil capacitors

KS 427/431

## KS 427/431 GENERAL DATA



### Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 1 MHz
Tangent of loss angle: C ≤ 1000 pF	≤5 × 10 <sup>-4</sup>	-	≤10 × 10 <sup>-4</sup>
1000 pF < C ≤ 10000 pF	≤5 × 10 <sup>-4</sup>	≤10 × 10 <sup>-4</sup>	-
R between leads	>100000 MΩ		

### Available 630 V DC versions

PACKAGING	VERSION	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	naked	±1%	2222 431 8...	on request
		±2%	2222 431 7...	on request
		±5%	2222 431 6...	on request
Loose in box		±1%	2222 427 4...	on request
		±2%	2222 427 3...	on request
		±5%	2222 427 2...	on request
Taped on reel; note 1	lacquered	±1%	2222 431 4...	on request
		±2%	2222 431 3...	on request
		±5%	2222 431 2...	on request
Loose in box		±1%	2222 427 8...	on request
		±2%	2222 427 7...	on request
		±5%	2222 427 6...	on request

### Note

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

## Polystyrene film foil capacitors

KS 424 to 431

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 250 \text{ V}$ 

loose and taped

C <sup>(1)</sup> (E-24) (pF)	DIMENSIONS <sup>(2)</sup> $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER AND PACKAGING			
			2222 431 .....		2222 427 .....	
			naked version taped on reel		loose in box	
			last 5 digits of catalogue number		SPQ <sup>(3)</sup>	SPQ <sup>(3)</sup>
C-tol = $\pm 2\%$	C-tol = $\pm 1\%$					
$l_t = 30.0 \text{ mm}$ ; $d_t = 0.60 \pm 0.06 \text{ mm}$						
47	3.8 × 11.0	0.2	74709	84709	3000 (2500)	400 (300)
51			75109	85109		
56			75609	85609		
62			76209	86209		
68			76809	86809		
75			77509	87509		
82			78209	88209		
91			79109	89109		
100			71001	81001		
110			71101	81101		
120			71201	81201		
130			71301	81301		
150			71501	81501		
160			71601	81601		
180			71801	81801		
200			72001	82001		
220			72201	82201		
240	0.3	0.3	72401	82401	2500	400 (300)
270			72701	82701		
300			73001	83001		
330			73301	83301		
360	4.0 × 11.0	0.3	73601	83601	2500	400 (300)
390			73901	83901		
430			74301	84301		
470			74701	84701		
510	4.5 × 11.0	0.3	75101	85101	2500	300 (250)
560			75601	85601		
620			76201	86201		
680			76801	86801		
750			77501	87501		
820	5.0 × 11.0	0.4	78201	88201	1500	250 (200)
910			79101	89101		
1000			71002	81002		
1100			71102	81102		
1200			71202	81202		

## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and of the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- Diameter  $d_{max} + 0.7 \text{ mm}$  for lacquered versions with  $l_{max} = 11.0 \text{ mm}$ .
- SPQ in brackets for lacquered version.

## Polystyrene film foil capacitors

KS 427/431

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 250 \text{ V}$ 

loose and taped

C <sup>(1)</sup> (E-24) (pF)	DIMENSIONS <sup>(2)</sup> $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER AND PACKAGING				
			2222 431 .....		2222 427 .....		
			naked version taped on reel			loose in box	
			last 5 digits of catalogue number		SPQ <sup>(3)</sup>	SPQ <sup>(3)</sup>	
C-tol = $\pm 2\%$	C-tol = $\pm 1\%$						
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>							
1300	5.0 × 15.0	0.6	71302	81302	1500	300 (250)	
1500		0.6	71502	81502			
1600		0.7	71602	81602			
1800	5.5 × 15.0	0.8	71802	81802	1500	250 (200)	
2000		0.8	72002	82002			
2200		0.9	72202	82202			
2400		0.9	72402	82402			
2700	6.0 × 15.0	1.1	72702	82702	1500	250 (200)	
3000	6.5 × 15.0	1.1	73002	83002	1000	200 (150)	
3300		1.4	73302	83302			
3600	7.0 × 15.0	1.4	73602	83602	1000	150 (100)	
3900		1.4	73902	83902			
4300	7.5 × 15.0	1.7	74302	84302	1000	150 (100)	
4700		1.7	74702	84702			
5100	8.0 × 15.0	1.7	75102	85102	1000	150 (100)	
5600		2.0	75602	85602			

**Notes**

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and of the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- Diameter  $d_{max} + 1.0 \text{ mm}$  for lacquered versions with  $l_{max} = 15.0 \text{ mm}$ .
- SPQ in brackets for lacquered version.



## Polystyrene film foil capacitors

KS 424 to 431

**MARKING****MARKING EXAMPLE****Product marking**

8n2

The capacitors are marked with black ink with the following information:

G 63

KS D2.

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: F =  $\pm 1\%$ ; G 2%; J =  $\pm 5\%$
3. Rated voltage (DC) (e.g. 63 V)
4. Code for dielectric material (KS)
5. Production date code in accordance with "IEC 62, clause 5".

**Package marking**

The package containing the capacitors is marked as shown in Fig.10.

Barcode label marking	
LINE	MARKING EXPLANATION
1.	Manufacturer's name
2.	Country of origin
3.	Sub-family
4.	Type description
5.	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")
6.	-
7.	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO
8.	Product type description
9.	Quantity and production period, year and week code
10.	Product code (12NC)

The barcode label marking example consists of a rectangular box containing the following information:

1. PHILIPS COMPONENTS
2. MADE IN BELGIUM
3. POLYSTYRENE FILM-FOIL CAPACITOR
4. KS AXIAL TYPE
5. 2000pF  $\pm 1\%$  63V= 40/085/21
6. (Empty line)
7. ORIG **A170** RPC HQ 1234
8. TYPE **KS 424**
9. QTY **400** DATE **9625**
10. CODENO **2222 424 42002**

CC4345

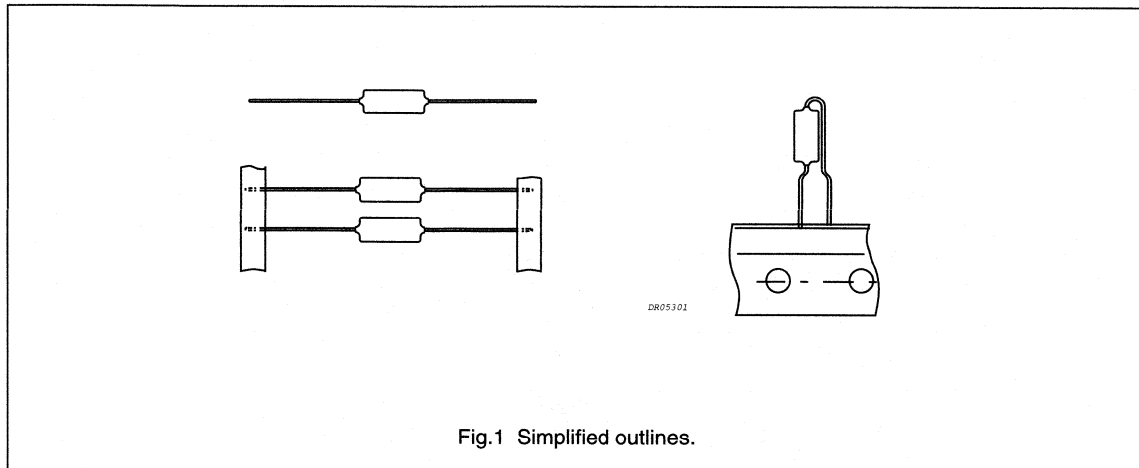
Fig.10 Barcode label.



# Polypropylene film foil capacitors

KP 460 to 464

## KP AXIAL EPOXY LACQUERED TYPES



### FEATURES

- Supplied loose in box, taped on reel or unidirectional.

### APPLICATIONS

- In circuits where close tolerance, reliability and low losses are of prime importance, for example: tuned circuits, filter and timing networks.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series)	47 to 62000 pF
Capacitance tolerance	±5% (E24 series); ±2% (E24, E48 series); ±1% (E24, E48, E96 series)
Rated voltage (DC)	63 V; 160 V; 250 V; 400 V; 630 V
Climatic category	40/100/56
Rated temperature	85 °C
Maximum application temperature	100 °C
Reference specification	IEC 384-13
Stability class for:	
63, 160, 250 V versions	Class 1
400, 630 V versions	Class 2

Polypropylene film foil capacitors

KP 460

KP 460 GENERAL DATA

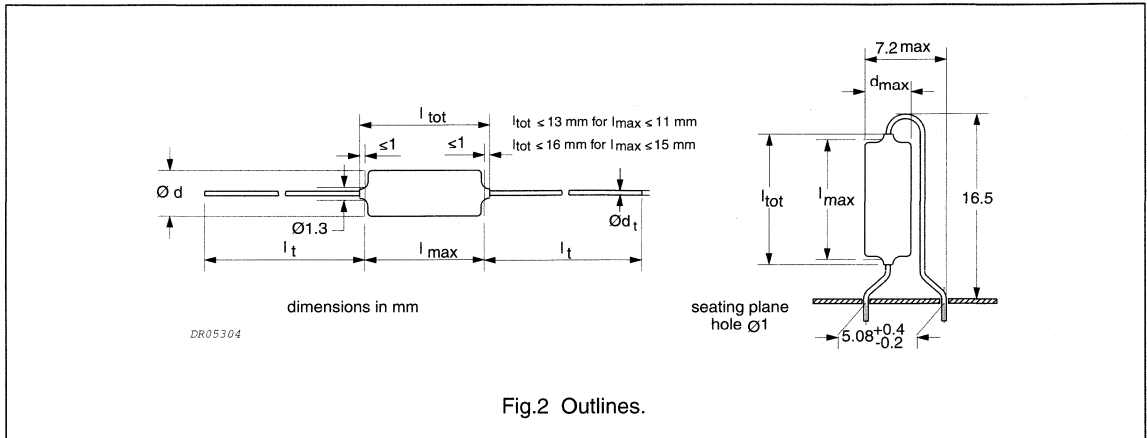


Fig.2 Outlines.

Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle:		
5000 pF < C ≤ 20000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 15 × 10 <sup>-4</sup>
20000 pF < C ≤ 47000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 25 × 10 <sup>-4</sup>
C > 47000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 40 × 10 <sup>-4</sup>
R between leads	> 100000 MΩ	
R between interconnected leads and case	> 100000 MΩ	

Available 63 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	±1%	2222 460 8...	preferred
	±2%	2222 460 7...	preferred
	±5%	2222 460 6...	on request
Loose in box	±1%	2222 460 4...	on request
	±2%	2222 460 3...	on request
	±5%	2222 460 2...	on request
Unidirectional; note 1	±1%	2222 460 1...	on request
	±2%	2222 460 0...	on request

Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammpack	52.5; note 1

Note

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

## Polypropylene film foil capacitors

KP 460 to 464

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 40 \text{ V}$ 

loose, taped and unidirectional

C <sup>(1)</sup> (E 24) (pF)	DIMENSIONS $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 460 ..... AND PACKAGING							
			TAPED ON REEL			LOOSE IN BOX	UNIDIRECTIONAL			
			TAPE DISTANCE 63.5 mm				SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$
			last 5 digits of catalogue number <sup>(2)</sup>		SPQ					
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$						
<b><math>l_t = 30.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>										
6800	5.0 × 11.0	0.5	76802	86802	2500	250	06802	16802	1000	
7500		0.5	77502	87502			07502	17502		
8200		0.6	78202	88202			08202	18202		
9100		0.6	79102	89102			09102	19102		
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>										
10000	5.5 × 15.0	0.6	71003	81003	1500	250	-	-	-	
11000		0.6	71103	81103						
12000		0.7	71203	81203						
13000		0.8	71303	81303						
15000		0.7	71503	81503						
16000		0.7	71603	81603						
18000		0.8	71803	81803						
20000		0.8	72003	82003						
22000		0.9	72203	82203						
24000	6.0 × 15.0	0.9	72403	82403	1500	250	-	-	-	
27000		1.0	72703	82703						
30000	6.5 × 15.0	1.1	73003	83003	1000	200	-	-	-	
33000		1.2	73303	83303						
36000		1.2	73603	83603						
39000	7.0 × 15.0	1.3	73903	83903	1000	150	-	-	-	
43000		1.4	74303	84303						
47000	7.5 × 15.0	1.5	74703	84703	1000	150	-	-	-	
51000		1.6	75103	85103						
56000	8.0 × 15.0	1.7	75603	85603	1000	150	-	-	-	
62000		1.8	76203	86203						

## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- The shading indicates preferred types.

## Polypropylene film foil capacitors

KP 461

## KP 461 GENERAL DATA

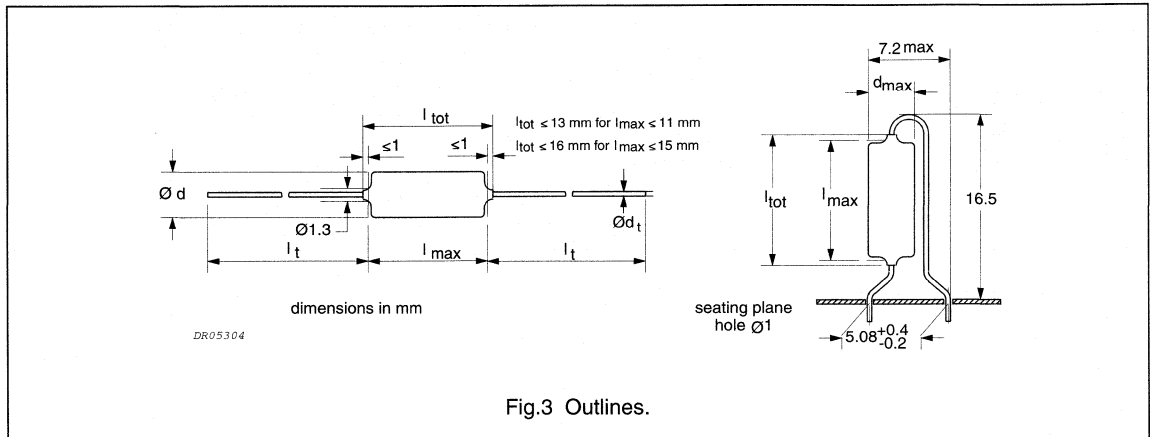


Fig.3 Outlines.

## Specific reference data for the 160 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle:		
1 000 pF < C ≤ 5 000 pF	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
5 000 pF < C ≤ 20 000 pF	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
20 000 pF < C ≤ 39 000 pF	$\leq 5 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
R between leads	>100 000 MΩ	
R between interconnected leads and case	>100 000 MΩ	

## Available 160 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	±1%	2222 461 8....	preferred
	±2%	2222 461 7....	preferred
	±5%	2222 461 6....	on request
Loose in box	±1%	2222 461 4....	on request
	±2%	2222 461 3....	on request
	±5%	2222 461 2....	on request
Unidirectional; note 1	±1%	2222 461 1....	on request
	±2%	2222 461 0....	on request

## Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammpack	52.5; note 1

## Note

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

## Polypropylene film foil capacitors

KP 460 to 464

 $U_{Rdc} = 160 \text{ V}$ ;  $U_{Rac} = 63 \text{ V}$ 

loose, taped and unidirectional

C <sup>(1)</sup> (E 24) (pF)	DIMENSIONS $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 461 ..... AND PACKAGING						
			TAPED ON REEL			LOOSE IN BOX	UNIDIRECTIONAL		
			TAPE DISTANCE 63.5 mm						
			last 5 digits of catalogue number <sup>(2)</sup>		SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$					
<b><math>l_t = 30.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>									
3600	5.0 × 11.0	0.5	73602	83602	2500	250	03602	13602	1000
3900		0.5	73902	83902			03902	13902	
4300		0.5	74302	84302			04302	14302	
4700		0.5	74702	84702			04702	14702	
5100		0.5	75102	85102			05102	15102	
5600		0.5	75602	85602			05602	15602	
6200		0.6	76202	86202			06202	16202	
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>									
6800	5.5 × 15.0	0.4	76802	86802	1500	250	-	-	-
7500		0.7	77502	87502					
8200		0.6	78202	88202					
9100		0.6	79102	89102					
10000		0.7	71003	81003					
11000		0.7	71103	81103					
12000		0.7	71203	81203					
13000	0.8	71303	81303						
15000	0.8	71503	81503						
16000	6.0 × 15.0	0.9	71603	81603	1500	250	-	-	-
18000		0.9	71803	81803					
20000		1.0	72003	82003					
22000	6.5 × 15.0	1.1	72203	82203	1000	200	-	-	-
24000		1.1	72403	82403					
27000	7.0 × 15.0	1.2	72703	82703	1000	150	-	-	-
30000	7.5 × 15.0	1.3	73003	83003	1000	150	-	-	-
33000		1.4	73303	83303					
36000	8.0 × 15.0	1.5	73603	83603	1000	150	-	-	-
39000		1.6	73903	83903					

## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- The shading indicates preferred types.

Polypropylene film foil capacitors

KP 462

KP 462 GENERAL DATA

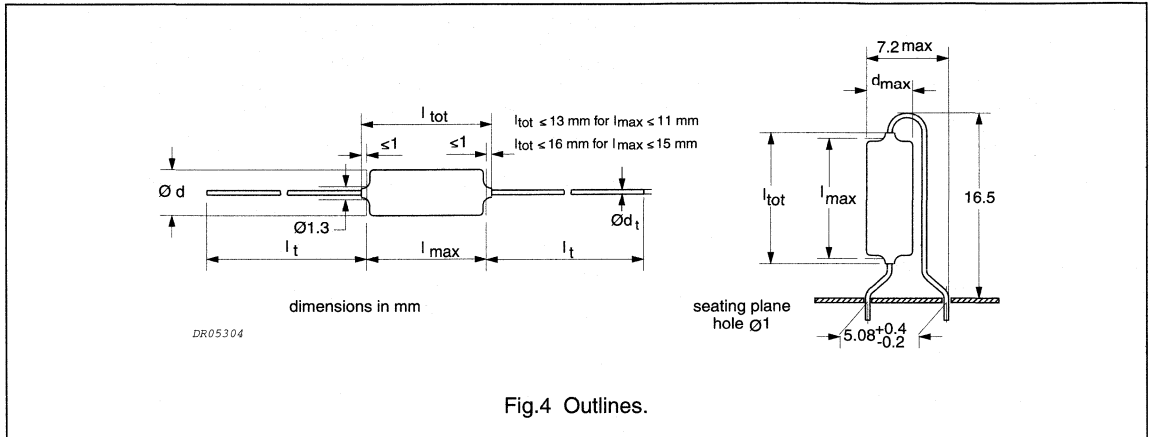


Fig.4 Outlines.

Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle:		
1 000 pF < C ≤ 5 000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>
5 000 pF < C ≤ 20 000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 15 × 10 <sup>-4</sup>
20 000 pF < C ≤ 22 000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 25 × 10 <sup>-4</sup>
R between leads	> 100 000 MΩ	
R between interconnected leads and case	> 100 000 MΩ	

Available 250 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	±1%	2222 462 8....	preferred
	±2%	2222 462 7....	preferred
	±5%	2222 462 6....	on request
Loose in box	±1%	2222 462 4....	on request
	±2%	2222 462 3....	on request
	±5%	2222 462 2....	on request
Unidirectional; note 1	±1%	2222 462 1....	on request
	±2%	2222 462 0....	on request

Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammpack	52.5; note 1

Note

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



## Polypropylene film foil capacitors

KP 460 to 464

 $U_{Rdc} = 250 \text{ V}$ ;  $U_{Rac} = 125 \text{ V}$ 

loose, taped and unidirectional

C <sup>(1)</sup> (E 24) (pF)	DIMENSIONS $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 462 ..... AND PACKAGING						
			TAPED ON REEL			LOOSE IN BOX	UNIDIRECTIONAL		
			TAPE DISTANCE 63.5 mm		SPQ		SPQ	C-tol = ±2%	C-tol = ±1%
			last 5 digits of catalogue number <sup>(2)</sup>						
C-tol = ±2%		C-tol = ±1%							
<b><math>l_t = 30.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>									
1200	5.0 × 11.0	0.5	71202	81202	2500	250	01202	11202	1000
1300		0.5	71302	81302			01302	11302	
1500		0.4	71502	81502			01502	11502	
1600		0.5	71602	81602			01602	11602	
1800		0.6	71802	81802			01802	11802	
2000		0.6	72002	82002			02002	12002	
2200		0.5	72202	82202			02202	12202	
2400		0.5	72402	82402			02402	12402	
2700		0.5	72702	82702			02702	12702	
3000		0.5	73002	83002			03002	13002	
3300		0.5	73302	83302			03302	13302	
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>									
3600	5.5 × 15.0	0.5	73602	83602	1500	250	-	-	-
3900		0.5	73902	83902					
4300		0.6	74302	84302					
4700		0.6	74702	84702					
5100		0.6	75102	85102					
5600		0.6	75602	85602					
6200		0.7	76202	86202					
6800		0.7	76802	86802					
7500	0.7	77502	87502						
8200	6.0 × 15.0	0.8	78202	88202	1500	250	-	-	-
9100		0.8	79102	89102					
10000		0.9	71003	81003					
11000	6.5 × 15.0	0.9	71103	81103	1000	200	-	-	-
12000		1.0	71203	81203					
13000		1.0	71303	81303					
15000	7.0 × 15.0	1.1	71503	81503	1000	150	-	-	-
16000		1.2	71603	81603					
18000	7.5 × 15.0	1.3	71803	81803	1000	150	-	-	-
20000	8.0 × 15.0	1.4	72003	82003	1000	150	-	-	-
22000		1.5	72203	82203					

## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of ±2% or ±1%) and the E96 series (with a tolerance of ±1%). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- The shading indicates preferred types.

# Polypropylene film foil capacitors

KP 463

## KP463 GENERAL DATA

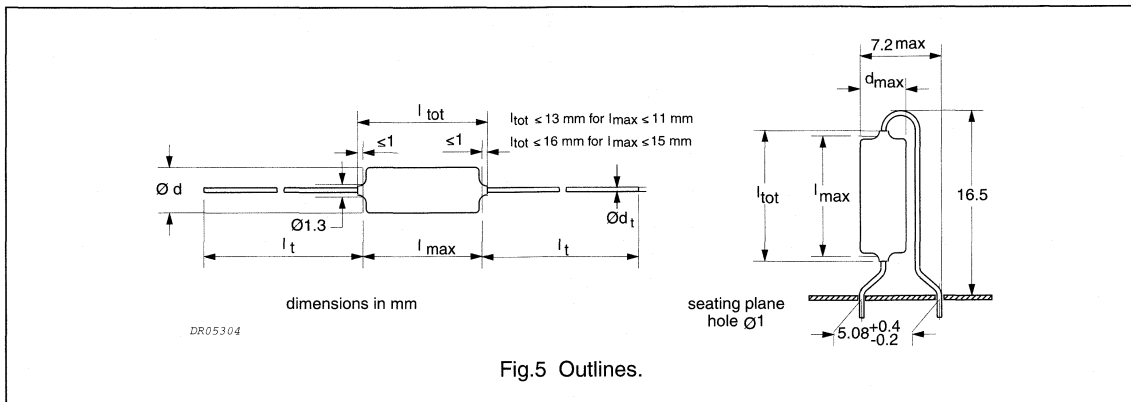


Fig.5 Outlines.

### Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1 MHz <sup>(1)</sup>
Tangent of loss angle: C ≤ 1000 pF 1 000 pF < C ≤ 5000 pF	≤ 5 × 10 <sup>-4</sup> ≤ 5 × 10 <sup>-4</sup>	- ≤ 10 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup> -
R between leads	> 100000 MΩ		
R between interconnected leads and case	> 100000 MΩ		

### Note

- For unidirectional capacitors ≤ 13 × 10<sup>-4</sup>.

### Available 400 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	±1%	2222 463 8....	preferred
	±2%	2222 463 7....	preferred
	±5%	2222 463 6....	on request
Loose in box	±1%	2222 463 4....	on request
	±2%	2222 463 3....	on request
	±5%	2222 463 2....	on request
Unidirectional; note 1	±1%	2222 463 1....	on request
	±2%	2222 463 0....	on request

### Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammpack	52.5; note 1

### Note

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

## Polypropylene film foil capacitors

KP 460 to 464

 $U_{Rdc} = 400 \text{ V}$ ;  $U_{Rac} = 160 \text{ V}$ 

loose, taped and unidirectional

C <sup>(1)</sup> (E 24) (pF)	DIMENSIONS $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 463 ..... AND PACKAGING							
			TAPED ON REEL			LOOSE IN BOX	UNIDIRECTIONAL			
			TAPE DISTANCE 63.5 mm				SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$
			last 5 digits of catalogue number <sup>(2)</sup>		SPQ					
C-tol = $\pm 2\%$	C-tol = $\pm 1\%$									
<b><math>l_t = 30.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>										
620	5.0 × 11.0	0.5	76201	86201	2500	250	06201	16201	1000	
680		0.5	76801	86801			06801	16801		
750		0.5	77501	87501			07501	17501		
820		0.5	78201	88201			08201	18201		
910		0.5	79101	89101			09101	19101		
1000		0.5	71002	81002			01002	11002		
1100		0.5	71102	81102			01102	11102		
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>										
1200	5.5 × 15.0	0.5	71202	81202	1500	250	-	-	-	
1300		0.5	71302	81302						
1500		0.6	71502	81502						
1600		0.6	71602	81602						
1800		0.6	71802	81802						
2000		0.7	72002	82002						
2200	6.0 × 15.0	0.7	72202	82202	1500	250	-	-	-	
2400		0.8	72402	82402						
2700		0.8	72702	82702						
3000		0.9	73002	83002						
3300	6.5 × 15.0	0.9	73302	83302	1000	200	-	-	-	
3600		1.0	73602	83602						
3900		1.0	73902	83902						
4300	7.0 × 15.0	1.1	74302	84302	1000	150	-	-	-	
4700		1.1	74702	84702						
5100		1.2	75102	85102						
5600	7.5 × 15.0	1.3	75602	85602	1000	150	-	-	-	
6200		1.3	76202	86202						
6800	8.0 × 15.0	1.4	76802	86802	1000	150	-	-	-	
7500		1.5	77502	87502						
8200		1.5	78202	88202						

## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- The shading indicates preferred types.

# Polypropylene film foil capacitors

KP 464

## KP 464 GENERAL DATA

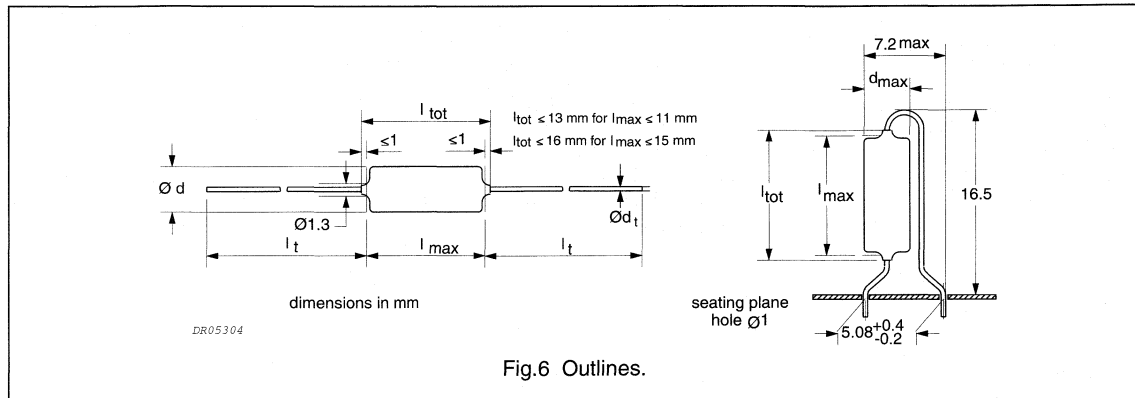


Fig.6 Outlines.

### Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1 MHz <sup>(1)</sup>
Tangent of loss angle: C ≤ 1000 pF	≤ 5 × 10 <sup>-4</sup>	–	≤ 10 × 10 <sup>-4</sup>
1000 pF < C ≤ 5000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>	–
R between leads	> 100000 MΩ		
R between interconnected leads and case	> 100000 MΩ		

**Note**

- For unidirectional capacitors  $\leq 13 \times 10^{-4}$ .

### Available 630 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	±1%	2222 464 8....	preferred
	±2%	2222 464 7....	preferred
	±5%	2222 464 6....	on request
Loose in box	±1%	2222 464 4....	on request
	±2%	2222 464 3....	on request
	±5%	2222 464 2....	on request
Unidirectional; note 1	±1%	2222 464 1....	on request
	±2%	2222 464 0....	on request

### Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammpack	52.5; note 1

**Note**

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

## Polypropylene film foil capacitors

KP 460 to 464

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ 

loose, taped and unidirectional

C <sup>(1)</sup> (E 24) (pF)	DIMENSIONS $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 464 ....x AND PACKAGING							
			TAPED ON REEL			LOOSE IN BOX	UNIDIRECTIONAL			
			TAPE DISTANCE 63.5 mm				SPQ	SPQ	C-tol = ±2%	C-tol = ±1%
			last 5 digits of catalogue number <sup>(2)</sup>		C-tol = ±2%	C-tol = ±1%				
$l_t = 30.0 \text{ mm}$ ; $d_t = 0.60 \pm 0.06 \text{ mm}$										
47	5.0 × 11.0	0.4	74709	84709	2500	250	04709	14709	1000	
51		0.4	75109	85109			05109	15109		
56		0.4	75609	85609			05609	15609		
62		0.4	76209	86209			06209	16209		
68		0.4	76809	86809			06809	16809		
75		0.4	77509	87509			07509	17509		
82		0.4	78209	88209			08209	18209		
91		0.4	79109	89109			09109	19109		
100		0.4	71001	81001			01001	11001		
110		0.4	71101	81101			01101	11101		
120		0.4	71201	81201			01201	11201		
130		0.5	71301	81301			01301	11301		
150		0.4	71501	81501			01501	11501		
160		0.4	71601	81601			01601	11601		
180		0.5	71801	81801			01801	11801		
200		0.5	72001	82001			02001	12001		
220		0.6	72201	82201			02201	12201		
240		0.6	72401	82401			02401	12401		
270		0.6	72701	82701			02701	12701		
300		0.7	73001	83001			03001	13001		
330		0.4	73301	83301			03301	13301		
360		0.4	73601	83601			03601	13601		
390		0.5	73901	83901			03901	13901		
430		0.5	74301	84301			04301	14301		
470		0.5	74701	84701			04701	14701		
510		0.5	75101	85101			05101	15101		
560		0.5	75601	85601			05601	15601		

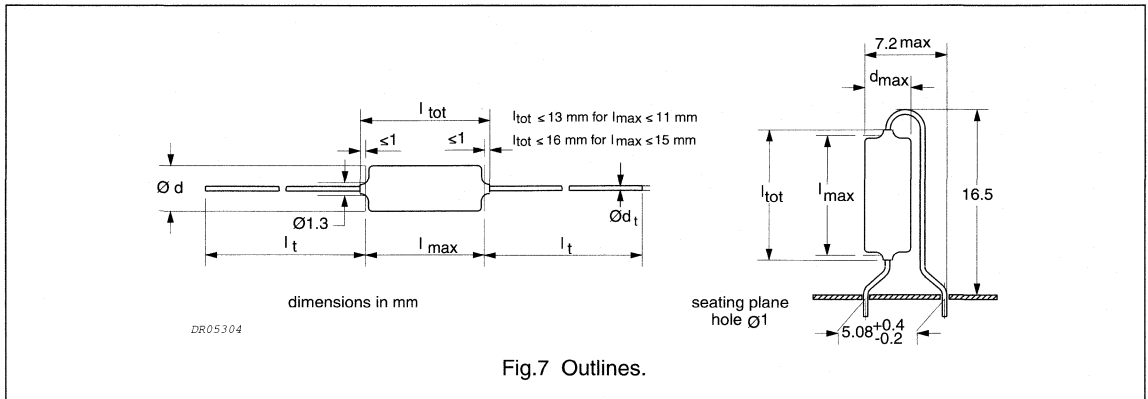
## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of ±2% or ±1%) and the E96 series (with a tolerance of ±1%). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- The shading indicates preferred types.

## Polypropylene film foil capacitors

KP 464

## KP 464 GENERAL DATA



## Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1 MHz <sup>(1)</sup>
Tangent of loss angle: C ≤ 1000 pF	≤ 5 × 10 <sup>-4</sup>	–	≤ 10 × 10 <sup>-4</sup>
1 000 pF < C ≤ 5000 pF	≤ 5 × 10 <sup>-4</sup>	≤ 10 × 10 <sup>-4</sup>	–
R between leads	>100000 MΩ		
R between interconnected leads and case	>100000 MΩ		

## Note

- For unidirectional capacitors ≤ 13 × 10<sup>-4</sup>.

## Available 630 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; note 1	±1%	2222 464 8....	preferred
	±2%	2222 464 7....	preferred
	±5%	2222 464 6....	on request
Loose in box	±1%	2222 464 4....	on request
	±2%	2222 464 3....	on request
	±5%	2222 464 2....	on request
Unidirectional; note 1	±1%	2222 464 1....	on request
	±2%	2222 464 0....	on request

## Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammpack	52.5; note 1

## Note

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

## Polypropylene film foil capacitors

KP 460 to 464

 $U_{Rdc} = 630 \text{ V}$ ;  $U_{Rac} = 200 \text{ V}$ 

loose, taped and unidirectional

C <sup>(1)</sup> (E 24) (pF)	DIMENSIONS $d_{max} \times l_{max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 464 ..... AND PACKAGING							
			TAPED ON REEL				LOOSE IN BOX	UNIDIRECTIONAL		
			TAPE DISTANCE 63.5 mm							
			last 5 digits of catalogue number <sup>(2)</sup>		SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ	
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$						
<b><math>l_t = 28.0 \text{ mm}</math>; <math>d_t = 0.60 \pm 0.06 \text{ mm}</math></b>										
620	5.5 × 15.0	0.5	76201	86201	1500	250	-	-	-	
680		0.5	76801	86801						
750		0.5	77501	87501						
820		0.6	78201	88201						
910		0.6	79101	89101						
1000		0.6	71002	81002						
1100		0.7	71102	81102						
1200		0.7	71202	81202						
1300	6.0 × 15.0	0.7	71302	81302	1500	250	-	-	-	
1500		0.8	71502	81502						
1600		0.8	71602	81602						
1800		0.9	71802	81802						
2000	6.5 × 15.0	0.9	72002	82002	1000	200	-	-	-	
2200		1.0	72202	82202						
2400		1.0	72402	82402						
2700	7.0 × 15.0	1.1	72702	82702	1000	150	-	-	-	
3000		1.2	73002	83002						
3300	7.5 × 15.0	1.3	73302	83302	1000	150	-	-	-	
3600		1.3	73602	83602						
3900		1.4	73902	83902						
4300	8.0 × 15.0	1.5	74302	84302	1000	150	-	-	-	
4700		1.5	74702	84702						

## Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of  $\pm 2\%$  or  $\pm 1\%$ ) and the E96 series (with a tolerance of  $\pm 1\%$ ). The specifications of these intermediate values are equal to the specifications of the next higher value of the E24 series.
- The shading indicates preferred types.

## Polypropylene film foil capacitors

KP 460 to 464

**CONSTRUCTION****Description**

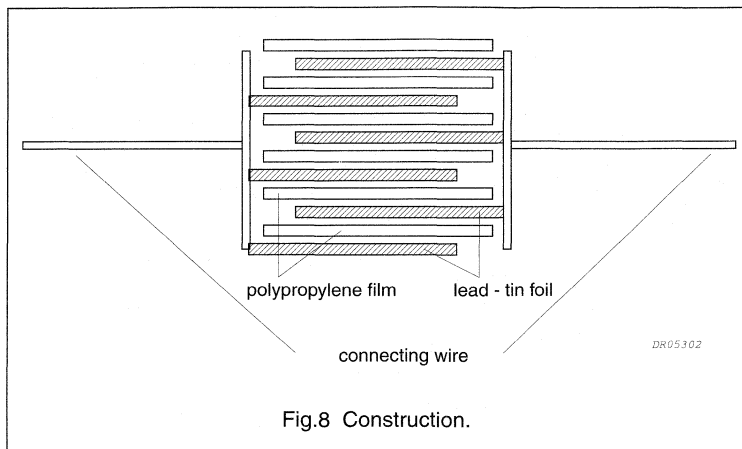
- Low-inductive wound cell of metal foil and a polypropylene film
- Protected by a hard, water-repellent solvent-resistant blue epoxy lacquer
- Axial iron leads, solder-coated.

**Mounting****NORMAL USE**

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

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

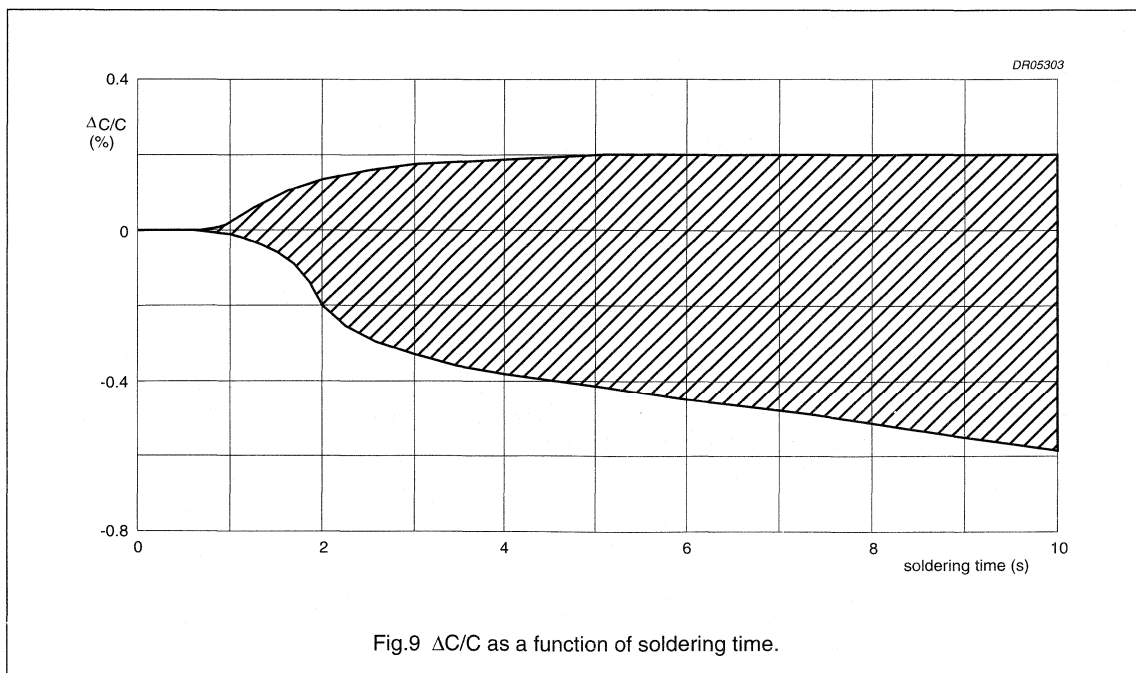
The capacitors shall be mechanically fixed by the leads.

**SOLDERING CONDITIONS**

The capacitance stability is dependent on the maximum temperature the capacitor reaches during soldering.

Figure 9 shows the typical effect of  $\Delta C/C$  as a function of soldering time

under the worst possible mounting conditions (horizontal on the PCB, minimum possible pitch) and with 80 °C preheating.





## Polypropylene film foil capacitors

KP 460 to 464

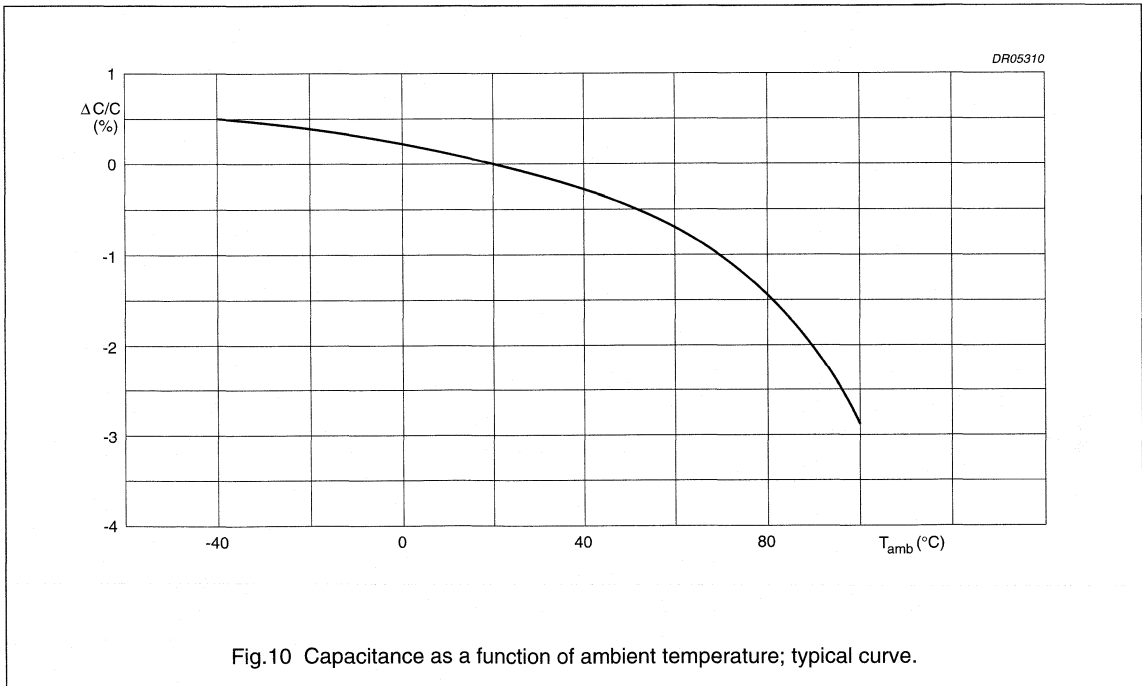
**RATINGS AND CHARACTERISTICS**

Unless otherwise specified, all electrical values apply to an ambient free air temperature of  $23 \pm 1$  °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 of  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

**Capacitance**

- All capacitance values are specified at 1 kHz.
- Temperature coefficient:
  - between  $-40$  and  $+20$  °C for  $C \leq 1000$  pF:  $-(125 \pm 125) \times 10^{-6}/K$
  - between  $-40$  and  $+20$  °C for  $C > 1000$  pF:  $-(125 \pm 60) \times 10^{-6}/K$
  - between  $+20$  and  $+100$  °C:  $-(125 \pm 125) \times 10^{-6}/K$ .

**Temperature**

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

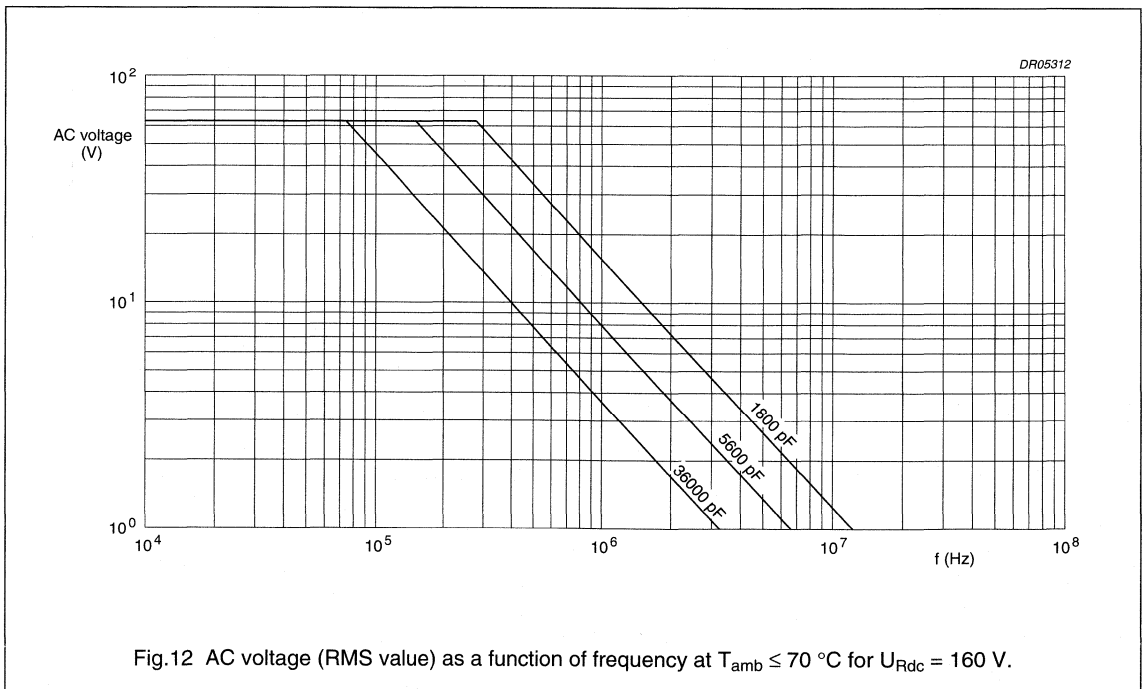
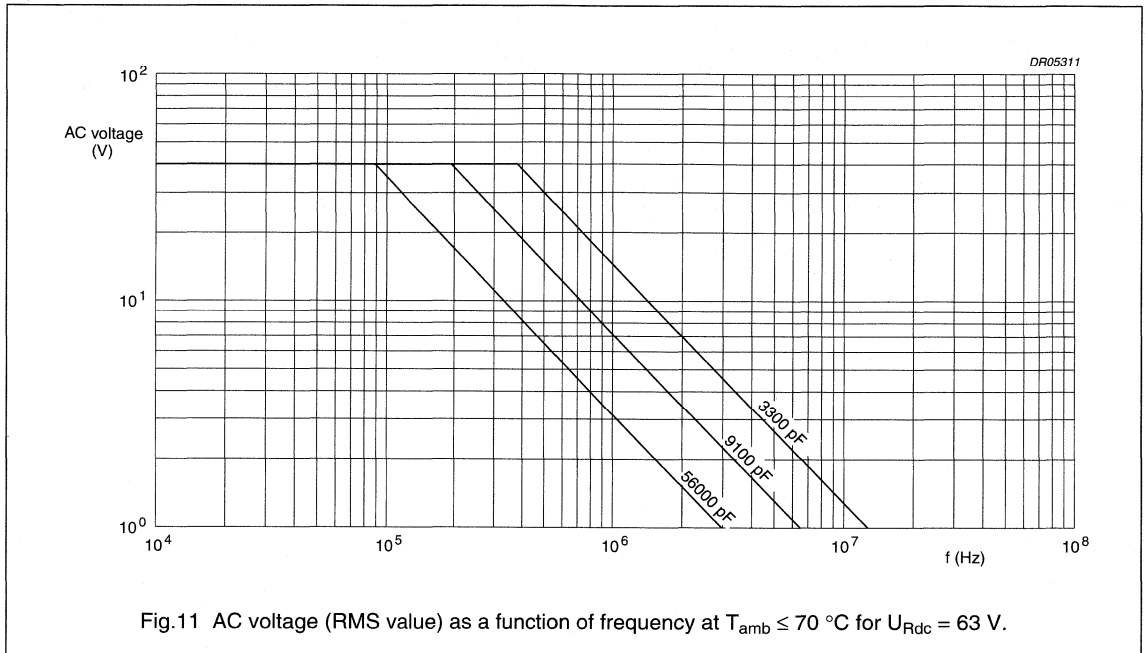
**Voltage**

- Category voltage:  $U_C = 0.7 \times U_{Rdc}$
- Test voltage between leads:  $2 \times U_{Rdc}$
- Test voltage between interconnected leads and case (foil method):  $2 \times U_{Rdc}$  (min. 400 V).

Polypropylene film foil capacitors

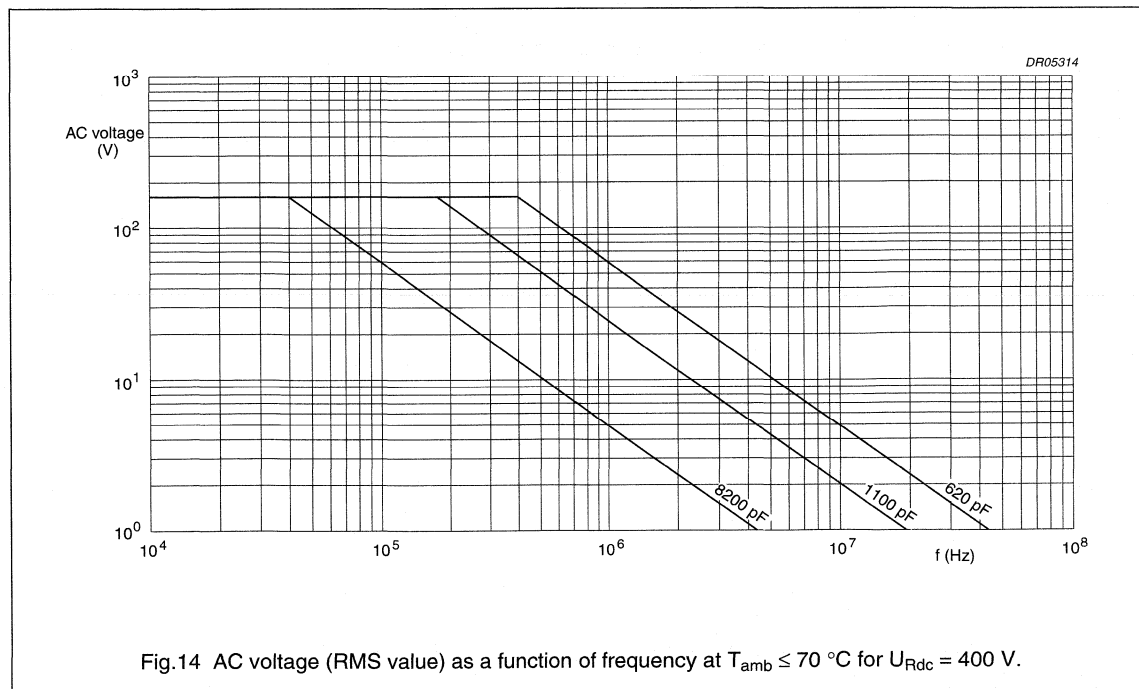
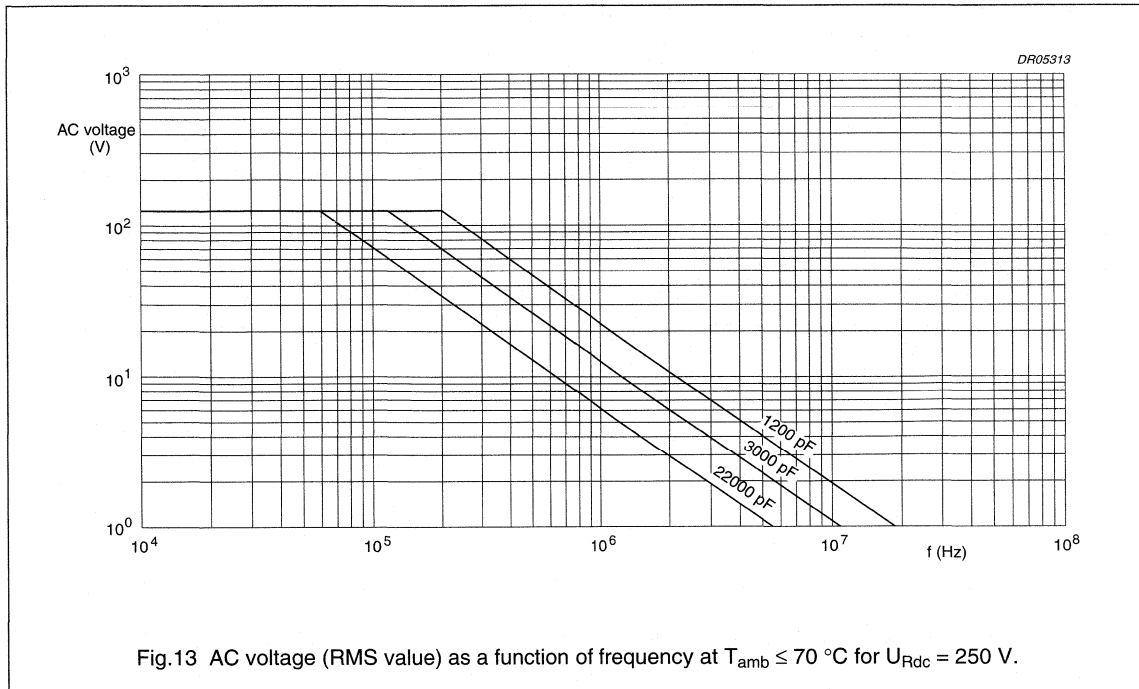
KP 460 to 464

Maximum RMS voltage (sinewave) as a function of frequency for  $T_{amb} \leq 70\text{ }^{\circ}\text{C}$



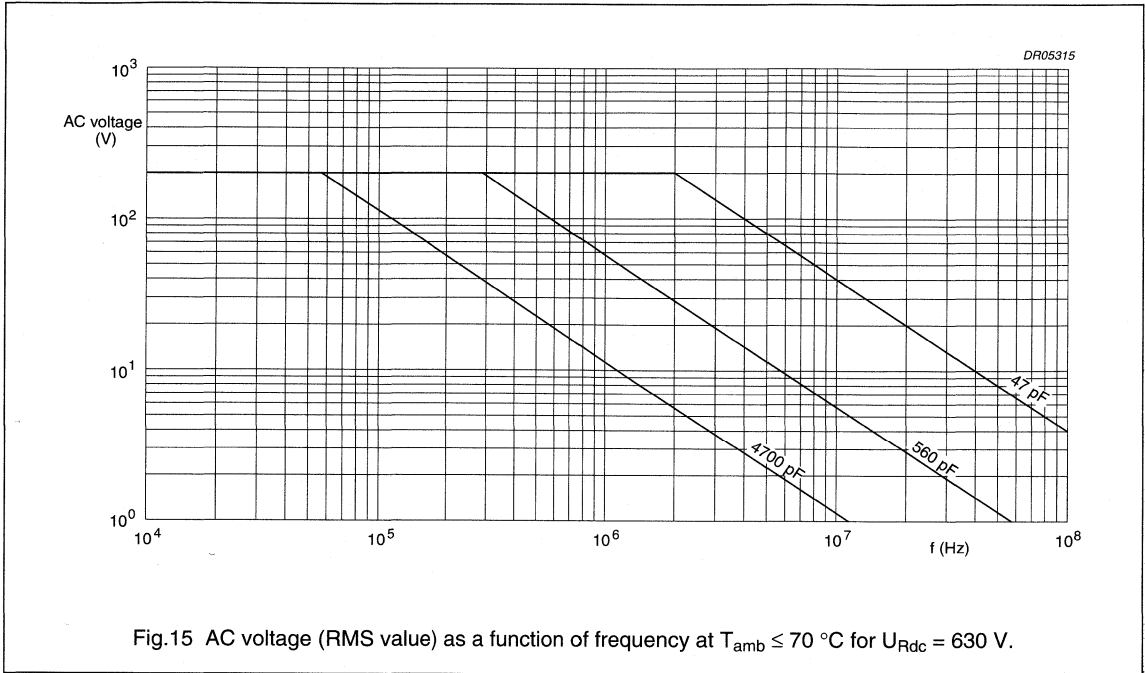
Polypropylene film foil capacitors

KP 460 to 464



Polypropylene film foil capacitors

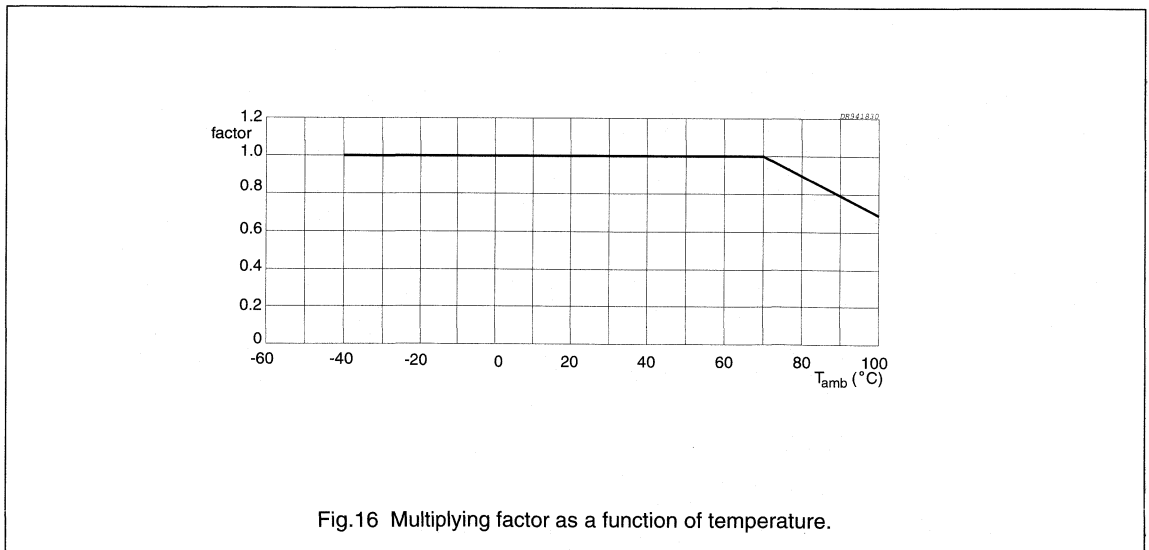
KP 460 to 464



**Maximum RMS voltage (sinewave) as a function of frequency for  $T_{amb} > 70^\circ\text{C}$**

The maximum RMS voltage in Figs 11 to 15 has to be multiplied by a factor given in Fig.16.

The power dissipation has to be checked, and must not exceed the maximum allowed power shown in Fig.19.





## Polypropylene film foil capacitors

KP 460 to 464

**Insulation resistance**

The insulation resistance is measured after a voltage has been applied for 1 minute  $\pm 5$  seconds, the voltage being  $10 \pm 1$  V for the 63 V version,  $100 \pm 15$  V for the 160, 250 and 400 V versions and  $500 \pm 50$  V for the 630 V version:

- R between leads:  $>100000$  M $\Omega$
- R between interconnected leads and case (foil method):  $>100000$  M $\Omega$ .

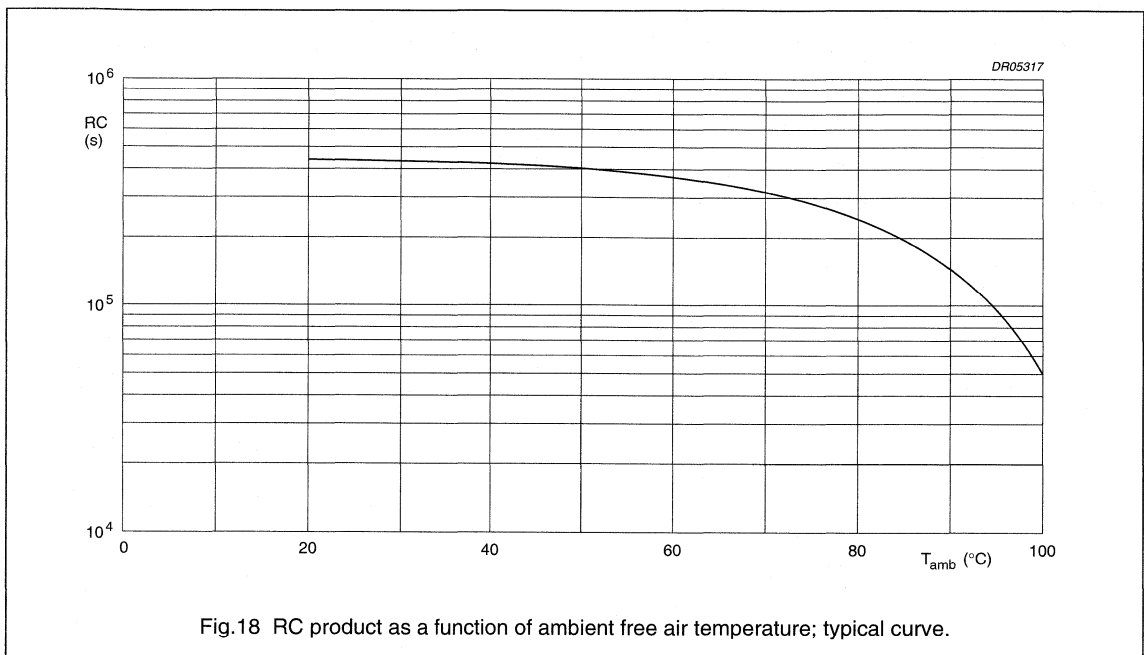


Fig.18 RC product as a function of ambient free air temperature; typical curve.

**Inductance**

- L dependent on lead and capacitor length:  $\leq 10$  nH/cm.

## Polypropylene film foil capacitors

KP 460 to 464

## Maximum dissipation

CURVE (see Fig. 19)	DIMENSIONS $d_{\max} \times l_{\max}$ (mm)
1	5.0 × 11.0
2	5.5 × 15.0
3	6.0 × 15.0
4	6.5 × 15.0
5	7.0 × 15.0
6	7.5 × 15.0
7	8.0 × 15.0

## Application note

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{Rdc}$ ).
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than  $2 \times \sqrt{2}$  times the rated AC voltage ( $U_{Rac}$ ) to avoid the ionisation inception level.
3. There is no limit for the peak current ( $I_p$ ) or voltage pulse slope ( $dU/dt$ ) in the application.
4. The dissipated power shall not be greater than the maximum permissible power dissipation stated in Fig. 19.
5. The free air ambient temperature for the capacitor is not exceeding the category temperature.

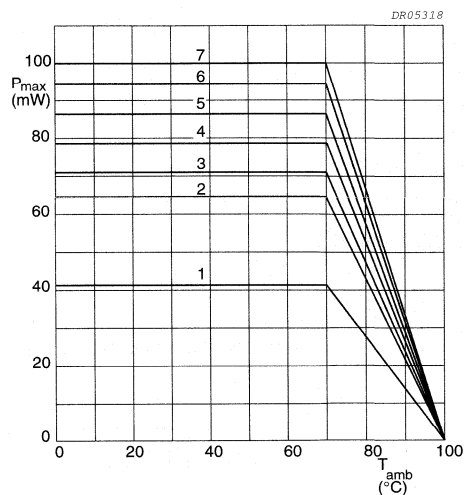


Fig. 19 Maximum dissipation as a function of ambient temperature.

## Polypropylene film foil capacitors

KP 460 to 464

**MARKING****Product marking**

The capacitors are marked in black ink with the following information:





1. Rated capacitance code in accordance with "IEC 62"
2. Rated voltage (DC) (e.g. 63 V)
3. Tolerance on rated capacitance: F =  $\pm 1\%$ ; G 2%; J =  $\pm 5\%$
4. Code for dielectric material (KP)
5. Production date code in accordance with "IEC 62, clause 5"
6. Manufacturer (PHILIPS).

**Package marking**

The package containing the capacitors is marked as shown in Fig.20.

**MARKING EXAMPLE**

8n2  
G 63  
KPD2  
PHILIPS.

<ol style="list-style-type: none"> <li>1. <b>PHILIPS COMPONENTS</b></li> <li>2. <b>MADE IN BELGIUM</b></li> <li>3. <b>POLYPROPYLENE FILM-FOIL CAPACITOR</b></li> <li>4. <b>KP AXIAL EPOXY LACQUERED TYPE</b></li> <li>5. <b>47pF <math>\pm 1\%</math> 530V= 40/100/56</b> <b>ULC=0.7 X ULR</b></li> <li>6.</li> <li>7.  <b>WO: 12345678</b> <b>ORIG A170 RPC HQ 1234</b></li> <li>8.  <b>TYPE KP 464</b></li> <li>9.  <b>QTY 250 DATE 9625</b></li> <li>10.  <b>CODEND 2222 464 44709</b></li> </ol>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>–</td> </tr> <tr> <td>7</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO</td> </tr> <tr> <td>8</td> <td>Product type description</td> </tr> <tr> <td>9</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>10</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description	5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")	6	–	7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO	8	Product type description	9	Quantity and production period, year and week code	10	Product code (12NC)
LINE	MARKING EXPLANATION																						
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CCA346

Fig.20 Barcode label.



## Polypropylene film foil capacitors

KP 460 to 464

## 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; 5 s  isopropyl alcohol; 23 °C; 5 minutes	no visible damage legible marking
Resistance to soldering heat: "IEC 68-2-20"		$ \Delta C/C  \leq 2\% + 1 \text{ pF}$ ( $C \leq 1100 \text{ pF}$ ) $ \Delta C/C  \leq 1\%$ ( $C > 1100 \text{ pF}$ )
Component solvent resistance		
<b>Robustness of component</b>		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s <sup>2</sup> ; 6 hours	$ \Delta C/C  \leq 2\% + 1 \text{ pF}$ ( $C \leq 1100 \text{ pF}$ ) $ \Delta C/C  \leq 1\%$ ( $C > 1100 \text{ pF}$ )
Shock: "IEC 68-2-27"	half sinewave; 490 m/s <sup>2</sup> ; 11 ms	$R_{\text{ins}} \geq 50\%$ of specified value
<b>Climatic sequence</b>		
Dry heat: "IEC 68-2-2"	16 hours; 100 °C	$ \Delta C/C  \leq 1\% + 1 \text{ pF}$ ( $C \leq 1100 \text{ pF}$ ) $ \Delta C/C  \leq 1\%$ ( $C > 1100 \text{ pF}$ )
Damp heat, cyclic, test Db, first cycle: "IEC 68-2-30"	2 hours; -40 °C	$R_{\text{ins}} \geq 50\%$ of specified value
Cold: "IEC 68-2-1"		
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		
<b>Other applicable tests</b>		
Damp heat, steady state: "IEC 68-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C  \leq 1\% + 1 \text{ pF}$ ( $C \leq 1100 \text{ pF}$ ) $ \Delta C/C  \leq 1\%$ ( $C > 1100 \text{ pF}$ ) $R_{\text{ins}} \geq 50\%$ of specified value
Endurance (DC): "IEC 384-13"	1 000 hours; $1.5 \times U_{\text{Rdc}}$ ; 85 °C $1.5 \times U_{\text{Cdc}}$ ; 100 °C	$ \Delta C/C  \leq 2\% + 1 \text{ pF}$ ( $C \leq 1100 \text{ pF}$ ) $ \Delta C/C  \leq 1\%$ ( $C > 1100 \text{ pF}$ ) $R_{\text{ins}} \geq 100\%$ of specified value
Variation of capacitance with temperature: "IEC 384-13"	static method; one cycle	$ \Delta C/C  \leq 2\% + 1 \text{ pF}$ ( $C \leq 1100 \text{ pF}$ ) $ \Delta C/C  \leq 1\%$ ( $C > 1100 \text{ pF}$ ) $R_{\text{ins}} \geq 10\,000 \text{ M}\Omega$
Heat storage: "IEC 384-13"	1 000 hours; 100 °C	$ \Delta C/C  \leq 2\% + 1 \text{ pF}$ ( $C \leq 1100 \text{ pF}$ ) $ \Delta C/C  \leq 1\%$ ( $C > 1100 \text{ pF}$ )
Resistance to soldering heat with preheating: "IEC 384-13"	body temperature: 100 °C bath temperature: 260 °C dwell time: 5 s	$ \Delta C/C  \leq 2\% + 1 \text{ pF}$ ( $C \leq 1100 \text{ pF}$ ) $ \Delta C/C  \leq 1\%$ ( $C > 1100 \text{ pF}$ )

**Note**

- For detailed information: see "Type specification".



## Polystyrene film foil capacitors

KS 443

## KS RADIAL POTTED CAPACITORS

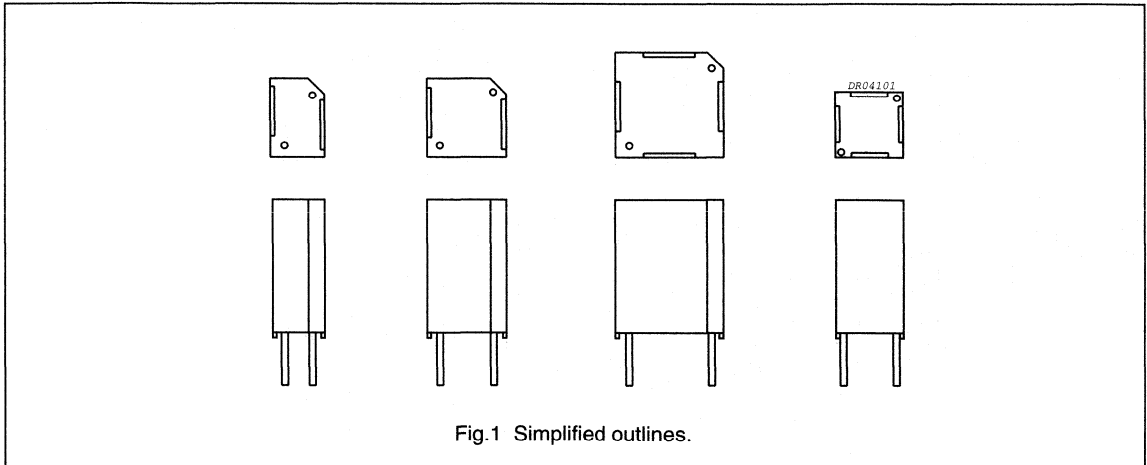


Fig. 1 Simplified outlines.

## FEATURES

- 2.54 to 7.62 mm lead pitch
- Supplied loose and taped on reel
- The dimensions are such that, in combination with currently available ferrites, a high package density is possible.

## APPLICATIONS

- In LC filters, particularly in telephony equipment, where high requirements are imposed on precision, stability, resistance to humidity, dissipation factor and reliability.

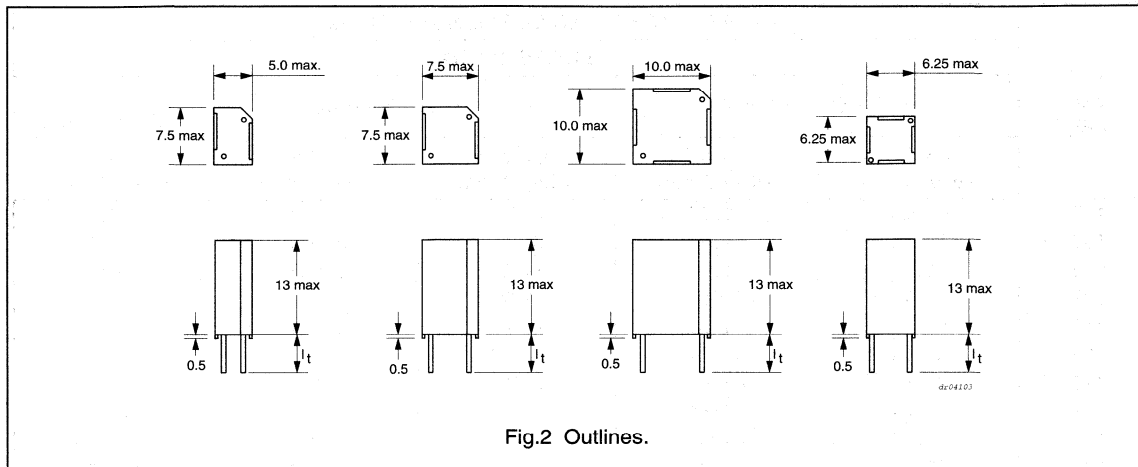
## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E96 series)	100 to 34000 pF
Capacitance tolerance	±1%
Rated voltage (DC)	63 V
Climatic category	55/070/56 (class 1) 55/085/56 (class 3)
Rated temperature	70 °C (class 1) 85 °C (class 3)
Reference specification	IEC 384-7
Stability class	Class 1 and 3

Polystyrene film foil capacitors

KS 443

KS 443 GENERAL DATA



Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1 MHz
Tangent of loss angle:			
C ≤ 500 pF	≤5 × 10 <sup>-4</sup>	–	≤10 × 10 <sup>-4</sup>
500 pF < C ≤ 1000 pF	≤5 × 10 <sup>-4</sup>	–	≤15 × 10 <sup>-4</sup>
1000 pF < C ≤ 10000 pF	≤5 × 10 <sup>-4</sup>	≤10 × 10 <sup>-4</sup>	–
10000 pF < C ≤ 15000 pF	≤5 × 10 <sup>-4</sup>	≤15 × 10 <sup>-4</sup>	–
15000 pF < C ≤ 20000 pF	≤5 × 10 <sup>-4</sup>	≤25 × 10 <sup>-4</sup>	–
20000 pF < C ≤ 30000 pF	≤5 × 10 <sup>-4</sup>	≤40 × 10 <sup>-4</sup>	–
C > 30000 pF	≤5 × 10 <sup>-4</sup>	≤60 × 10 <sup>-4</sup>	–
R between leads	>500000 MΩ		
R between interconnected leads	>500000 MΩ		

Available versions

loose (taped versions on request)

C (E96) (pF)	DIMENSIONS b × h × l (mm)	LAST 5 DIGITS OF CATALOGUE NUMBER 2222 443 .....			
		SPQ	LOOSE IN BOX		ORDERING
			l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm	
100 to 3920	5.0 × 13.0 × 7.5	200	–	41001 to 43922	on request
4120 to 15000	7.5 × 13.0 × 7.5	200	–	44122 to 41503	on request
15400 to 34000	10.0 × 13.0 × 10.0	100	–	41543 to 43403	on request
100 to 3920	5.0 × 13.0 × 7.5	200	61001 to 63922	–	on request
100 to 3920	6.25 × 13.0 × 6.25	200	–	31001 to 33922	on request
100 to 3920	7.5 × 13.0 × 7.5	200	71001 to 73922	81001 to 83922	on request
4120 to 7500	6.25 × 13.0 × 6.25	200	–	34122 to 37502	on request
4120 to 15000	7.5 × 13.0 × 7.5	200	64122 to 61503	–	on request
15400 to 34000	10.0 × 13.0 × 10.0	100	61543 to 63403	–	on request

## Polystyrene film foil capacitors

KS 443

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 25 \text{ V}$ 

loose

C <sup>(1)</sup> (E96) (pF)	LAST 5 DIGITS OF CATALOGUE NUMBER 2222 443 .....				
	LOOSE IN BOX				
	b × l = 5.0 × 7.5 mm		b × l = 7.5 × 7.5 mm		b × l = 6.25 × 6.25 mm
	$I_t = 3.0$ +0.4/-0 mm	$I_t = 5.0$ +0/-1.0 mm	$I_t = 3.0$ +0.4/-0 mm	$I_t = 5.0$ +0/-1.0 mm	$I_t = 5.0$ +0/-1.0 mm
100	61001	41001	71001	81001	31001
102	61021	41021	71021	81021	31021
105	61051	41051	71051	81051	31051
107	61071	41071	71071	81071	31071
110	61101	41101	71101	81101	31101
113	61131	41131	71131	81131	31131
115	61151	41151	71151	81151	31151
118	61181	41181	71181	81181	31181
121	61211	41211	71211	81211	31211
124	61241	41241	71241	81241	31241
127	61271	41271	71271	81271	31271
130	61301	41301	71301	81301	31301
133	61331	41331	71331	81331	31331
137	61371	41371	71371	81371	31371
140	61401	41401	71401	81401	31401
143	61431	41431	71431	81431	31431
147	61471	41471	71471	81471	31471
150	61501	41501	71501	81501	31501
154	61541	41541	71541	81541	31541
158	61581	41581	71581	81581	31581
162	61621	41621	71621	81621	31621
165	61651	41651	71651	81651	31651
169	61691	41691	71691	81691	31691
174	61741	41741	71741	81741	31741
178	61781	41781	71781	81781	31781
182	61821	41821	71821	81821	31821
187	61871	41871	71871	81871	31871
191	61911	41911	71911	81911	31911
196	61961	41961	71961	81961	31961
200	62001	42001	72001	82001	32001
205	62051	42051	72051	82051	32051
210	62101	42101	72101	82101	32101
215	62151	42151	72151	82151	32151
221	62211	42211	72211	82211	32211
226	62261	42261	72261	82261	32261
232	62321	42321	72321	82321	32321
237	62371	42371	72371	82371	32371

**Note**

- In addition to the values of the E96 series as quoted, intermediate values of the E192 series are available with a tolerance  $\pm 1\%$ . The specifications of these intermediate values are equal to the specifications of the next higher value of the E96 series.

## Polystyrene film foil capacitors

KS 443

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 25 \text{ V}$ 

loose

C <sup>(1)</sup> (E96) (pF)	LAST 5 DIGITS OF CATALOGUE NUMBER 2222 443 .....				
	LOOSE IN BOX				
	b × l = 5.0 × 7.5 mm		b × l = 7.5 × 7.5 mm		b × l = 6.25 × 6.25 mm
	l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm	l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm
243	62431	42431	72431	82431	32431
249	62491	42491	72491	82491	32491
255	62551	42551	72551	82551	32551
261	62611	42611	72611	82611	32611
267	62671	42671	72671	82671	32671
274	62741	42741	72741	82741	32741
280	62801	42801	72801	82801	32801
287	62871	42871	72871	82871	32871
294	62941	42941	72941	82941	32941
301	63011	43011	73011	83011	33011
309	63091	43091	73091	83091	33091
316	63161	43161	73161	83161	33161
324	63241	43241	73241	83241	33241
332	63321	43321	73321	83321	33321
340	63401	43401	73401	83401	33401
348	63481	43481	73481	83481	33481
357	63571	43571	73571	83571	33571
365	63651	43651	73651	83651	33651
374	63741	43741	73741	83741	33741
383	63831	43831	73831	83831	33831
392	63921	43921	73921	83921	33921
402	64021	44021	74021	84021	34021
412	64121	44121	74121	84121	34121
422	64221	44221	74221	84221	34221
432	64321	44321	74321	84321	34321
442	64421	44421	74421	84421	34421
453	64531	44531	74531	84531	34531
464	64641	44641	74641	84641	34641
475	64751	44751	74751	84751	34751
487	64871	44871	74871	84871	34871
499	64991	44991	74991	84991	34991
511	65111	45111	75111	85111	35111
523	65231	45231	75231	85231	35231
536	65361	45361	75361	85361	35361
549	65491	45491	75491	85491	35491
562	65621	45621	75621	85621	35621
576	65761	45761	75761	85761	35761
590	65901	45901	75901	85901	35901

**Note**

- In addition to the values of the E96 series as quoted, intermediate values of the E192 series are available with a tolerance  $\pm 1\%$ . The specifications of these intermediate values are equal to the specifications of the next higher value of the E96 series.

## Polystyrene film foil capacitors

KS 443

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 25 \text{ V}$ 

loose

C <sup>(1)</sup> (E96) (pF)	LAST 5 DIGITS OF CATALOGUE NUMBER 2222 443 .....				
	LOOSE IN BOX				
	b × l = 5.0 × 7.5 mm		b × l = 7.5 × 7.5 mm		b × l = 6.25 × 6.25 mm
	$l_t = 3.0$ +0.4/-0 mm	$l_t = 5.0$ +0/-1.0 mm	$l_t = 3.0$ +0.4/-0 mm	$l_t = 5.0$ +0/-1.0 mm	$l_t = 5.0$ +0/-1.0 mm
604	66041	46041	76041	86041	36041
619	66191	46191	76191	86191	36191
634	66341	46341	76341	86341	36341
649	66491	46491	76491	86491	36491
665	66651	46651	76651	86651	36651
681	66811	46811	76811	86811	36811
698	66981	46981	76981	86981	36981
715	67151	47151	77151	87151	37151
732	67321	47321	77321	87321	37321
750	67501	47501	77501	87501	37501
768	67681	47681	77681	87681	37681
787	67871	47871	77871	87871	37871
806	68061	48061	78061	88061	38061
825	68251	48251	78251	88251	38251
845	68451	48451	78451	88451	38451
866	68661	48661	78661	88661	38661
877	68771	48771	78771	88771	38771
909	69091	49091	79091	89091	39091
931	69311	49311	79311	89311	39311
953	69531	49531	79531	89531	39531
976	69761	49761	79761	89761	39761
1000	61002	41002	71002	81002	31002
1020	61022	41022	71022	81022	31022
1050	61052	41052	71052	81052	31052
1070	61072	41072	71072	81072	31072
1100	61102	41102	71102	81102	31102
1130	61132	41132	71132	81132	31132
1150	61152	41152	71152	81152	31152
1180	61182	41182	71182	81182	31182
1210	61212	41212	71212	81212	31212
1240	61242	41242	71242	81242	31242
1270	61272	41272	71272	81272	31272
1300	61302	41302	71302	81302	31302
1330	61332	41332	71332	81332	31332
1370	61372	41372	71372	81372	31372
1400	61402	41402	71402	81402	31402
1430	61432	41432	71432	81432	31432
1470	61472	41472	71472	81472	31472

**Note**

- In addition to the values of the E96 series as quoted, intermediate values of the E192 series are available with a tolerance  $\pm 1\%$ . The specifications of these intermediate values are equal to the specifications of the next higher value of the E96 series.

## Polystyrene film foil capacitors

KS 443

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 25 \text{ V}$ 

loose

C <sup>(1)</sup> (E96) (pF)	LAST 5 DIGITS OF CATALOGUE NUMBER 2222 443 .....				
	LOOSE IN BOX				
	b × l = 5.0 × 7.5 mm		b × l = 7.5 × 7.5 mm		b × l = 6.25 × 6.25 mm
	l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm	l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm
1500	61502	41502	71502	81502	31502
1540	61542	41542	71542	81542	31542
1580	61582	41582	71582	81582	31582
1620	61622	41622	71622	81622	31622
1650	61652	41652	71652	81652	31652
1690	61692	41692	71692	81692	31692
1740	61742	41742	71742	81742	31742
1780	61782	41782	71782	81782	31782
1820	61822	41822	71822	81822	31822
1870	61872	41872	71872	81872	31872
1910	61912	41912	71912	81912	31912
1960	61962	41962	71962	81962	31962
2000	62002	42002	72002	82002	32002
2050	62052	42052	72052	82052	32052
2100	62102	42102	72102	82102	32102
2150	62152	42152	72152	82152	32152
2210	62212	42212	72212	82212	32212
2260	62262	42262	72262	82262	32262
2320	62322	42322	72322	82322	32322
2370	62372	42372	72372	82372	32372
2430	62432	42432	72432	82432	32432
2490	62492	42492	72492	82492	32492
2550	62552	42552	72552	82552	32552
2610	62612	42612	72612	82612	32612
2670	62672	42672	72672	82672	32672
2740	62742	42742	72742	82742	32742
2800	62802	42802	72802	82802	32802
2870	62872	42872	72872	82872	32872
2940	62942	42942	72942	82942	32942
3010	63012	43012	73012	83012	33012
3090	63092	43092	73092	83092	33092
3160	63162	43162	73162	83162	33162
3240	63242	43242	73242	83242	33242
3320	63322	43322	73322	83322	33322
3400	63402	43402	73402	83402	33402
3480	63482	43482	73482	83482	33482
3570	63572	43572	73572	83572	33572
3650	63652	43652	73652	83652	33652
3740	63742	43742	73742	83742	33742
3830	63832	43832	73832	83832	33832
3920	63922	43922	73922	83922	33922

## Note

- In addition to the values of the E96 series as quoted, intermediate values of the E192 series are available with a tolerance  $\pm 1\%$ . The specifications of these intermediate values are equal to the specifications of the next higher value of the E96 series.



## Polystyrene film foil capacitors

KS 443

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 25 \text{ V}$ 

loose

C <sup>(1)</sup> (E96) (pF)	LAST 5 DIGITS OF CATALOGUE NUMBER 2222 443 .....		
	LOOSE IN BOX		
	b × l = 7.5 × 7.5 mm		b × l = 6.25 × 6.25 mm
	l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm
4120	64122	44122	34122
4220	64222	44222	34222
4320	64322	44322	34322
4420	64422	44422	34422
4530	64532	44532	34532
4640	64642	44642	34642
4750	64752	44752	34752
4870	64872	44872	34872
4990	64992	44992	34992
5110	65112	45112	35112
5230	65232	45232	35232
5360	65362	45362	35362
5490	65492	45492	35492
5620	65622	45622	35622
5760	65762	45762	35762
5900	65902	45902	35902
6040	66042	46042	36042
6190	66192	46192	36192
6340	66342	46342	36342
6490	66492	46492	36492
6650	66652	46652	36652
6810	66812	46812	36812
6980	66982	46982	36982
7150	67152	47152	37152
7320	67322	47322	37322
7500	67502	47502	37502
7680	67682	47682	-
7870	67872	47872	-
8060	68062	48062	-
8250	68252	48252	-
8450	68452	48452	-
8660	68662	48662	-
8870	68872	48872	-
9090	69092	49092	-
9310	69312	49312	-
9530	69532	49532	-
9760	69762	49762	-
10000	61003	41003	-

**Note**

- In addition to the values of the E96 series as quoted, intermediate values of the E192 series are available with a tolerance  $\pm 1\%$ . The specifications of these intermediate values are equal to the specifications of the next higher value of the E96 series.

## Polystyrene film foil capacitors

KS 443

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 25 \text{ V}$ 

loose

C <sup>(1)</sup> (E96) (pF)	LAST 5 DIGITS OF CATALOGUE NUMBER 2222 443 .....		
	LOOSE IN BOX		
	b × l = 7.5 × 7.5 mm		b × l = 6.25 × 6.25 mm
	l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm
10200	61023	41023	—
10500	61053	41053	—
10700	61073	41073	—
11000	61103	41103	—
11300	61133	41133	—
11500	61153	41153	—
11800	61183	41183	—
12100	61213	41213	—
12400	61243	41243	—
12700	61273	41273	—
13000	61303	41303	—

**Note**

- In addition to the values of the E96 series as quoted, intermediate values of the E192 series are available with a tolerance  $\pm 1\%$ . The specifications of these intermediate values are equal to the specifications of the next higher value of the E96 series.

## Polystyrene film foil capacitors

KS 443

 $U_{Rdc} = 63 \text{ V}$ ;  $U_{Rac} = 25 \text{ V}$ 

loose

C <sup>(1)</sup> (E96) (pF)	LAST 5 DIGITS OF CATALOGUE NUMBER 2222 443 .....			
	LOOSE IN BOX			
	b × l = 7.5 × 7.5 mm		b × l = 10.0 × 10.0 mm	
	l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm	l <sub>t</sub> = 3.0 +0.4/-0 mm	l <sub>t</sub> = 5.0 +0/-1.0 mm
13300	61333	41333	-	-
13700	61373	41373	-	-
14000	61403	41403	-	-
14300	61433	41433	-	-
14700	61473	41473	-	-
15000	61503	41503	-	-
15400	-	-	61543	41543
15800	-	-	61583	41583
16200	-	-	61623	41623
16500	-	-	61653	41653
16900	-	-	61693	41693
17400	-	-	61743	41743
17800	-	-	61783	41783
18200	-	-	61823	41823
18700	-	-	61873	41873
19100	-	-	61913	41913
20000	-	-	62003	42003
21000	-	-	62103	42103
21500	-	-	62153	42153
22100	-	-	62213	42213
22600	-	-	62263	42263
23200	-	-	62323	42323
23700	-	-	62373	42373
24300	-	-	62433	42433
24900	-	-	62493	42493
25500	-	-	62553	42553
26100	-	-	62613	42613
27400	-	-	62743	42743
28000	-	-	62803	42803
28700	-	-	62873	42873
29400	-	-	62943	42943
30100	-	-	63013	43013
30900	-	-	63093	43093
31600	-	-	63163	43163
32400	-	-	63243	43243
33200	-	-	63323	43323
34000	-	-	63403	43403

**Note**

- In addition to the values of the E96 series as quoted, intermediate values of the E192 series are available with a tolerance  $\pm 1\%$ . The specifications of these intermediate values are equal to the specifications of the next higher value of the E96 series.

## Polystyrene film foil capacitors

KS 443

**MARKING****Product marking**

CAPACITORS WITH DIMENSIONS 5.0 × 7.5 mm AND  
6.25 × 6.25 mm

The capacitors are marked on the top in black ink with the following information:

1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: F = ±1%
3. Rated voltage (DC) (e.g. 63 V)
4. Production date code in accordance with "IEC 62, clause 5"
5. Code for dielectric material (KS).

The earth side is indicated by a vertical line to the left of the 2<sup>nd</sup> and 3<sup>rd</sup> lines of marking, or by the bevelled corner if applicable.

CAPACITORS WITH DIMENSIONS 7.5 × 7.5 mm AND  
10 × 10 mm

The capacitors are marked on the top in black ink with the following information:

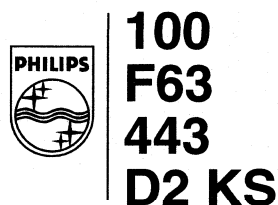
1. Rated capacitance code in accordance with "IEC 62"
2. Tolerance on rated capacitance: F = ±1%
3. Rated voltage (DC) (e.g. 63 V)
4. Code for dielectric material (KS)
5. Manufacturer's type designation (443)
6. Production date code in accordance with "IEC 62, clause 5"
7. Manufacturer's identification symbol.

The earth side is indicated by a vertical line to the left of the 2<sup>nd</sup> and 3<sup>rd</sup> lines of marking, or by the bevelled corner.



**100**  
**F63**  
**D2 KS**

Fig.3 Example of marking for capacitors with dimensions 5.0 × 7.5 mm and 6.25 × 6.25 mm.

**100**  
**F63**  
**443**  
**D2 KS**

Fig.4 Example of marking for capacitors with dimensions 7.5 × 7.5 mm and 10 × 10 mm.

## Polystyrene film foil capacitors





KS 443

## Package marking

The package containing the capacitors is marked as shown in Fig.5.

Barcode label marking	
LINE	MARKING EXPLANATION
1.	Manufacturer's name
2.	Country of origin
3.	Sub-family
4.	Type description
5.	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")
6.	—
7.	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ Work order: WO
8.	Product type description
9.	Quantity and production period, year and week code
10.	Product code (12NC)

1.	<b>PHILIPS COMPONENTS</b>		
2.	MADE IN BELGIUM		
3.	POLYSTYRENE FILM-FOIL CAPACITOR		
4.	KS RADIAL POTTED TYPE		
5.	100pF	±1% 63V=	55/085/56
6.			
			WO: 12345678
7.	ORIG	A170	RPC HQ
			
8.	TYPE	KS 443	
<hr/>			
			
9.	QTY	200	DATE 9626
			
10.	CODENO	2222 443 41001	

CCA347

Fig.5 Barcode label.



## **FLUORESCENT LAMP STARTER CAPACITORS**

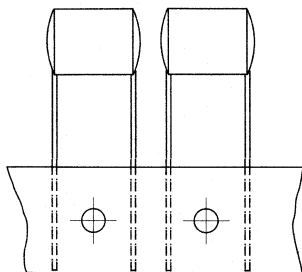




# Fluorescent lamp starter capacitors

**KT 311 90028 - KT 311 90029**  
**KP 311 90034 - KP 311 90035**

## KT AND KP RADIAL CAPACITORS



DRS90200

Fig.1 Simplified outlines.

### FEATURES

- 11.5 mm lead pitch
- Supplied loose in box, taped on reel.

### APPLICATIONS

- The capacitors are suitable for radio interference suppression and incorporation in starters for fluorescent lamp circuits.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance value	5.6 nF
Capacitance range	5.0 to 7.0 nF
Rated voltage (AC)	250 V
Climatic category	40/100/21
Rated temperature	85 °C
Tangent of loss angle at: 1 kHz for KT version 100 kHz for KP version	≤60 × 10 <sup>-4</sup> ≤10 × 10 <sup>-4</sup>
Reference specification	IEC 155 and IEC 384-11 for KT version IEC 384-13 for KP version

## Fluorescent lamp starter capacitors

KT 311 90028 - KT 311 90029

KP 311 90034 - KP 311 90035

## KT 311 9002. AND KP 311 9003. GENERAL DATA

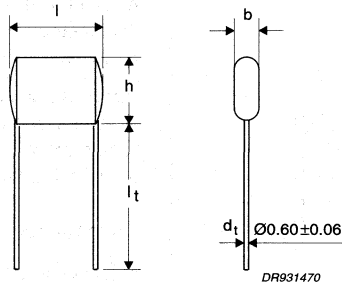


Fig.2 Outline.

## Specific reference data

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle: for KT versions for KP versions	$\leq 60 \times 10^{-4}$ -	- $\leq 10 \times 10^{-4}$
R between terminations	$\geq 50000 \text{ M}\Omega$	

## Mechanical and ordering data

loose and taped

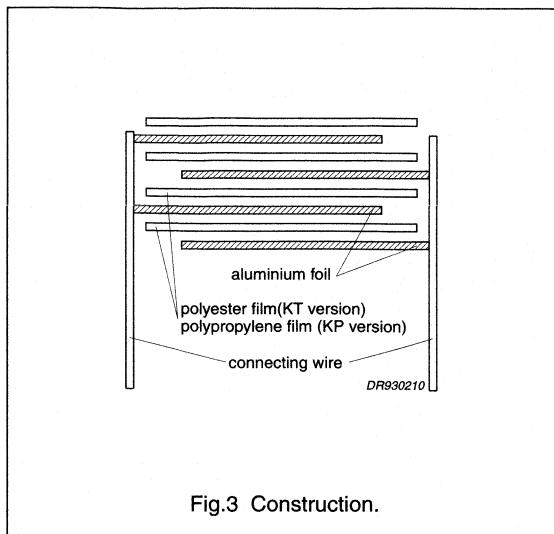
C <sup>(1)</sup> (nF)	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 311 ..... AND PACKAGING		SMALLEST PACKAGING QUANTITIES	
			loose in box $l_t = 27.0 \pm 1.0 \text{ mm}$	taped on reel	SPQ	
					loose in box	taped on reel
5.6	$3.6 \times 9.0 \times 14.2$	0.46	90028	90029	5000	4000
5.6	$4.6 \times 10.0 \times 14.5$	0.54	90034	90035	4000	3000

## Note

- A limit is imposed on the maximum tolerance combinations of length and thickness, by the following additional requirements:  
Capacitors must fit a jig, consisting of a cylinder with an inside diameter of  $19.3 - 0.1 \text{ mm}$ , containing a cylinder with an outside diameter of  $12.6 + 0.1 \text{ mm}$ , which is fixed against the wall of the outer cylinder.

## Fluorescent lamp starter capacitors

KT 311 90028 - KT 311 90029  
 KP 311 90034 - KP 311 90035

**CONSTRUCTION****Description**

- Impregnated non-inductive wound cell of aluminium foil with polyester film for the KT version or a polypropylene film for the KP version
- The lead connection is reinforced
- Radial copper leads, solder-coated.

**Mounting****NORMAL USE**

The capacitors are designed for point-to-point wiring.

**SPECIFIC METHOD OF MOUNTING FOR VIBRATION AND DUMP**

Not applicable.

**RATINGS AND CHARACTERISTICS**

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

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

**Capacitance**

- Capacitance values at 1 kHz: 5.6 nF
- Tolerance on rated capacitance: capacitance value varies from 5.0 to 7.0 nF.

**Temperature**

- Storage temperature:  $T_{stg} = -25$  to  $+40$  °C with maximum RH 80% without condensation
- Rated temperature: 85 °C.

**Voltage**

- Rated (AC) voltage (RMS value), 50 to 60 Hz: 250 V
- Test (DC) voltage: 1 minute, 2000 V (DC)
- Test (DC) voltage between terminations, 100% on line for 1 second: 3000 V (DC).

**Climatic category**

- 40/100/21.

**Tangent of loss angle**

- $\tan \delta$  at 1 kHz:  $\leq 60 \times 10^{-4}$  for KT 90028/90029
- $\tan \delta$  at 100 kHz:  $\leq 10 \times 10^{-4}$  for KP 90034/90035.

**Insulation resistance**

- The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm 5$  seconds at  $T_{amb} = 20$  °C.
- Insulation resistance between terminations:  $\geq 50000$  M $\Omega$ .

Fluorescent lamp starter capacitors

KT 311 90028 - KT 311 90029  
 KP 311 90034 - KP 311 90035





**MARKING**

**Product marking**

The capacitors have no marking.

**Package marking**

The package containing the capacitors is marked as shown in Fig.4.

Barcode label marking	
LINE	MARKING EXPLANATION
1.	PHILIPS COMPONENTS
2.	MADE IN BELGIUM
3.	INTERF. SUPPR. FILM CAPACITOR
4.	KT RADIAL GLUED CAPACITOR
5.	0.0056 pF ±0% 250V 40/100/21
6.	 WO: 12345687
7.	ORIG A170 RPC HQ 1234 
8.	TYPE KT 311
9.	 QTY 20000 DATE 9625
10.	 CODENO 2222 311 90029

CCA348

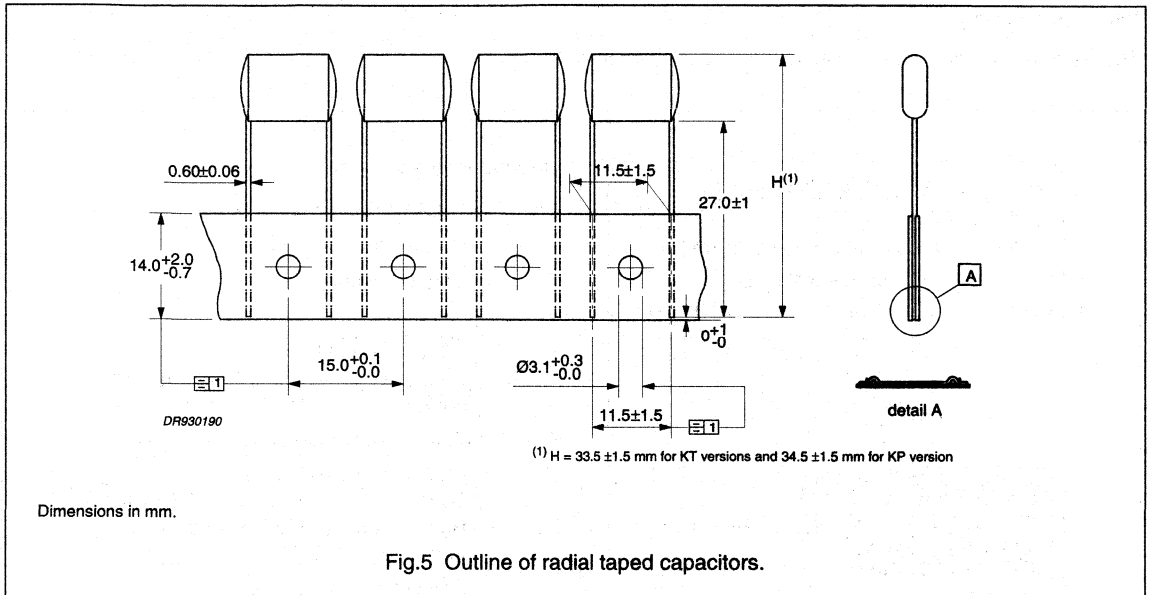
Fig.4 Barcode label.

Fluorescent lamp starter capacitors

KT 311 90028 - KT 311 90029  
 KP 311 90034 - KP 311 90035

**PACKAGING**

The maximum number of empty places per reel shall not exceed 0.25% of the total number of components per reel, but no more than 2 consecutive positions may be vacant.



**Characteristics of taped products**

DESCRIPTION	VALUE
Pull-out force of the component	$\geq 0.5$ N and $< 3$ N
Pull-out force of the adhesive tape	$\geq 1$ N
Tearing force of tape	$\geq 15$ N
<b>Storage conditions</b>	
Storage temperature	$-25$ to $+40$ °C
Maximum relative humidity without condensation	80%



## Fluorescent lamp starter capacitors

KT 311 90032/90033  
KT 311 90036 to 90039

KT RADIAL EPOXY LACQUERED CAPACITORS

PITCH 7.5 mm

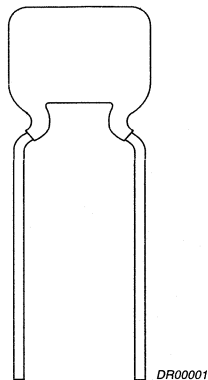


Fig.1 Simplified outline.

**FEATURES**

- 7.5 mm lead pitch
- Supplied loose in box.

**APPLICATIONS**

- The capacitors are suitable for radio interference suppression and incorporation in starters for fluorescent lamp circuits.

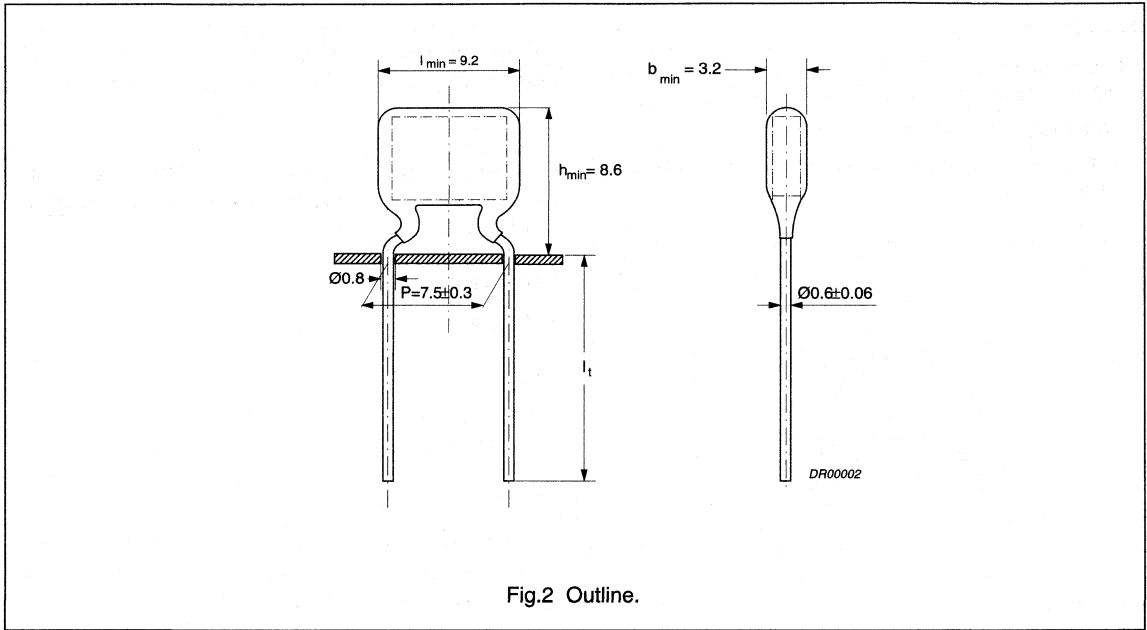
**QUICK REFERENCE DATA**

DESCRIPTION	VALUE
Capacitance value	1 200 pF; 3000 pF
Capacitance tolerance	±20%
Rated (AC) voltage $U_{Rac}$ , 50 to 60 Hz	250 V
Climatic category	40/125/56
Upper temperature	140 °C
Tangent of loss angle at 1 kHz	$60 \times 10^{-4}$
Reference specification	IEC 384-11

Fluorescent lamp starter capacitors

KT 311 90032/90033  
KT 311 90036 to 90039

KT 311 9003. GENERAL DATA



Specific reference data

DESCRIPTION	VALUE
	at 1 kHz
Tangent of loss angle	$\leq 60 \times 10^{-4}$
R between terminations	$\geq 50000 \text{ M}\Omega$

Mechanical and ordering data

loose

C (pF)	DIMENSIONS $b_{\max} \times h_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 311 ..... AND PACKAGING	SMALLEST PACKAGING QUANTITIES	
				SPQ	PQ
loose in box					
<b>Pitch = <math>7.5 \pm 0.3 \text{ mm}</math>; <math>l_t = 17 \pm 1 \text{ mm}</math></b>					
1200 3000	$4.0 \times 10.0 \times 10.0$	0.44	90037 90038	5000	20000
1200 3000	$4.2 \times 10.0 \times 10.0$	0.44	90032 90036		
<b>Pitch = <math>7.5 \pm 0.3 \text{ mm}</math>; <math>l_t = 23 \pm 1 \text{ mm}</math></b>					
1200	$4.0 \times 10.0 \times 10.0$	0.47	90039	5000	20000
1200	$4.2 \times 10.0 \times 10.0$	0.47	90033		



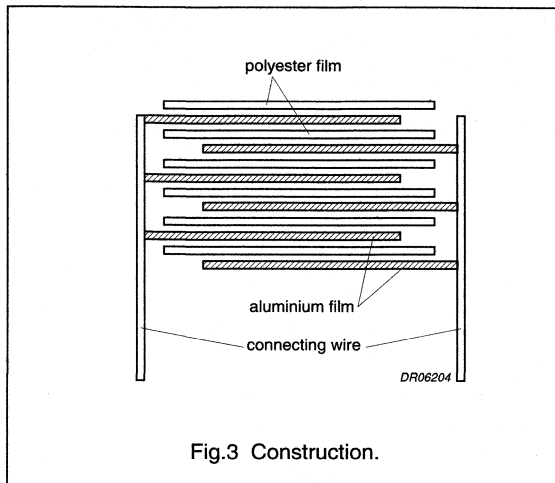
# Fluorescent lamp starter capacitors

KT 311 90032/90033  
KT 311 90036 to 90039

## CONSTRUCTION

### Description

- Impregnated non-inductive wound cell of aluminium foil with a polyethylene terephthalate (PETP) film
- Radial copper leads, solder-coated
- Protected by a hard, water repellent, solvent resistant epoxy lacquer.



### Mounting

#### NORMAL USE

The capacitors are designed for point-to-point wiring.

#### SPECIFIC METHOD OF MOUNTING FOR VIBRATION AND BUMP

Not applicable.

## RATINGS AND CHARACTERISTICS

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

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

### Capacitance

- Capacitance value is specified at 1 kHz.

### Temperature

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

### Voltage

- Rated (AC) voltage (RMS value), 50 to 60 Hz: 250 V
- Test (DC) voltage between terminations, 100% on line for 1 second: 2000 V (DC).

### Climatic category

- 40/125/56.

Fluorescent lamp starter capacitors

KT 311 90032/90033  
 KT 311 90036 to 90039

Tangent of loss angle

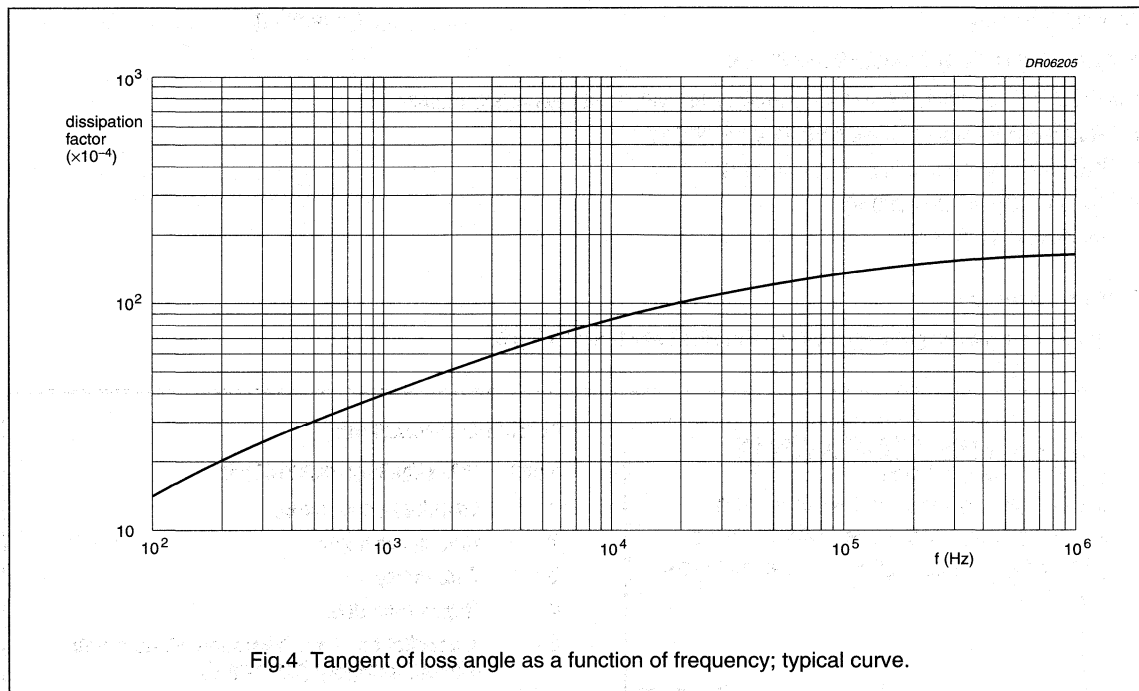


Fig.4 Tangent of loss angle as a function of frequency; typical curve.

Insulation resistance

- The insulation resistance is measured after a voltage of  $100 \pm 15$  V has been applied for 1 minute  $\pm 5$  seconds at  $T_{amb} = 20$  °C
- Insulation resistance between leads: for value see Table "Specific reference data".

Fluorescent lamp starter capacitors

KT 311 90032/90033  
 KT 311 90036 to 90039

**MARKING**

STYLES KT 311 90036/90038

**Product marking**

No marking.





STYLES KT 311 90032/90033/90037/90039

The capacitors are marked on the top in black ink with the following information:

1. Rated capacitance in code according to "IEC 62"
2. Tolerance on rated capacitance M: 20%
3. Rated (AC) voltage (250 V)
4. Marking: 1n2 M 250~.

**Package marking**

The package containing the capacitors is marked as shown in Fig.5.

<ol style="list-style-type: none"> <li>1. <b>PHILIPS COMPONENTS</b></li> <li>2. <b>MADE IN BELGIUM</b></li> <li>3. <b>INTERF. SUPPR. FILM CAPACITOR</b></li> <li>4. <b>KT RADIAL EPOXY LACQUERED TYPE</b></li> <li>5. <b>0.0012<math>\mu</math>F <math>\pm</math>20% 250V~ 40/125/56</b></li> <li>6. <b>1.2nF</b></li> <li>7.  <b>WO: 12345678</b></li> <li>8. <b>ORIG A170 RPC HQ</b></li> <li>9.  <b>TYPE KT 311</b></li> <li>10.  <b>QTY 5000 DATE 9637</b></li> <li>11.  <b>CODENO 2222 311 90032</b></li> </ol>	<p><b>Barcode label marking</b></p> <table border="1"> <thead> <tr> <th>LINE</th> <th>MARKING EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Manufacturer's name</td> </tr> <tr> <td>2</td> <td>Country of origin</td> </tr> <tr> <td>3</td> <td>Sub-family</td> </tr> <tr> <td>4</td> <td>Type description</td> </tr> <tr> <td>5</td> <td>Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")</td> </tr> <tr> <td>6</td> <td>Capacitance value (not for 2222 311 90033)</td> </tr> <tr> <td>7</td> <td>Work order number</td> </tr> <tr> <td>8</td> <td>Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ (Roeselare) Work order: WO</td> </tr> <tr> <td>9</td> <td>Product type description</td> </tr> <tr> <td>10</td> <td>Quantity and production period, year and week code</td> </tr> <tr> <td>11</td> <td>Product code (12NC)</td> </tr> </tbody> </table>	LINE	MARKING EXPLANATION	1	Manufacturer's name	2	Country of origin	3	Sub-family	4	Type description	5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")	6	Capacitance value (not for 2222 311 90033)	7	Work order number	8	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ (Roeselare) Work order: WO	9	Product type description	10	Quantity and production period, year and week code	11	Product code (12NC)
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2	Country of origin																								
3	Sub-family																								
4	Type description																								
5	Capacitance value, tolerance, voltage and climatic category ("IEC 68-1")																								
6	Capacitance value (not for 2222 311 90033)																								
7	Work order number																								
8	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ (Roeselare) Work order: WO																								
9	Product type description																								
10	Quantity and production period, year and week code																								
11	Product code (12NC)																								

CCA349

Fig.5 Barcode label.



## **DATA HANDBOOK SYSTEM**

**DATA HANDBOOK SYSTEM**

Philips Components data handbooks are available for selected product ranges and contain all relevant data available at the time of publication and each is revised and updated regularly.

Loose data sheets are sent to subscribers to keep them up-to-date on additions or alterations made during the lifetime of each edition.

Our data handbook titles are listed here.

**Display components**

*Book Title*

DC01	Colour Television Tubes
DC02	Monochrome Monitor Tubes and Deflection Units
DC03	Television Tuners, Coaxial Aerial Input Assemblies
DC04	Colour Monitor Tubes
DC05	Flyback Transformers, Mains Transformers and General-purpose FXC Assemblies

**Magnetic products**

MA01	Soft Ferrites
MA03	Piezoelectric Ceramics and Specialty Ferrites
MA04	Dry-reed Switches

**Passive components**

PA01	Electrolytic Capacitors
PA02	Varistors, Thermistors and Sensors
PA03	Potentiometers
PA04	Variable Capacitors
PA05	Film Capacitors
PA06	Ceramic Capacitors
PA07	Quartz Crystals for Special and Industrial Applications
PA08	Fixed Resistors
PA10	Quartz Crystals for Automotive and Standard Applications
PA11	Quartz Oscillators

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## OVERVIEW OF PHILIPS SEMICONDUCTORS DATA HANDBOOKS

Our sister product division, Philips Semiconductors, also has a comprehensive data handbook system to support their products. Their data handbook titles are listed here.

### Integrated circuits

<i>Book</i>	<i>Title</i>
IC01	Semiconductors for Radio and Audio Systems
IC02	Semiconductors for Television and Video Systems
IC03	Semiconductors for Wired Telecom Systems
IC04	HE4000B Logic Family CMOS
IC05	Advanced Low-power Schottky (ALS) Logic
IC06	High-speed CMOS Logic Family
IC11	General-purpose/Linear ICs
IC12	I <sup>2</sup> C Peripherals
IC13	Programmable Logic Devices (PLD)
IC14	8048-based 8-bit Microcontrollers
IC15	FAST TTL Logic Series
IC16	CMOS ICs for Clocks and Watches
IC17	Semiconductors for Wireless Communications
IC18	Semiconductors for In-Car Electronics
IC19	ICs for Data Communications
IC20	80C51-based 8-bit Microcontrollers
IC22	Multimedia ICs
IC23	BiCMOS Bus Interface Logic
IC24	Low Voltage CMOS & BiCMOS Logic
IC25	16-bit 80C51XA Microcontrollers (eXtended Architecture)
IC26	IC Package Databook

### Discrete semiconductors

SC01	Small-signal and Medium-power Diodes
SC02	Power Diodes
SC03	Thyristors and Triacs
SC04	Small-signal Transistors
SC05	Video Transistors and Modules for Monitors
SC06	High-voltage and Switching NPN Power Transistors
SC07	Small-signal Field-effect Transistors
SC08a	RF Power Transistors for HF and UHF
SC08b	RF Power Transistors for UHF
SC09	RF Power Modules
SC13	PowerMOS Transistors including TOPFETs and IGBTs
SC14	RF Wideband Transistors
SC15	Microwave Transistors (new version planned)
SC16	Wideband Hybrid IC Modules
SC17	Semiconductor Sensors

### Professional components

PC06 Circulators and Isolators

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## NOTES

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# STANDARD SERIES OF VALUES IN A DECADE FOR RESISTANCES AND CAPACITANCES

According to "IEC publication 63".

E192	E96	E48	E192	E96	E48	E192	E96	E48	E192	E96	E48	E24	E12	E6	E3
100	100	100	178	178	178	316	316	316	562	562	562	10	10	10	10
101			180			320			569			11			
102	102		182	182		324	324		576	576		12	12		
104			184			328			583			13			
105	105	105	187	187	187	332	332	332	590	590	590	15	15	15	
106			189			336			597			16			
107	107		191	191		340	340		604	604		18	18		
109			193			344			612			20			
110	110	110	196	196	196	348	348	348	619	619	619	22	22	22	22
111			198			352			626			24			
113	113		200	200		357	357		634	634		27	27		
114			203			361			642			30			
115	115	115	205	205	205	365	365	365	649	649	649	33	33	33	
117			208			370			657			36			
118	118		210	210		374	374		665	665		39	39		
120			213			379			673			43			
121	121	121	215	215	215	383	383	383	681	681	681	47	47	47	47
123			218			388			690			51			
124	124		221	221		392	392		698	698		56	56		
126			223			397			706			62			
127	127	127	226	226	226	402	402	402	715	715	715	68	68	68	
129			229			407			723			75			
130	130		232	232		412	412		732	732		82	82		
132			234			417			741			91			
133	133	133	237	237	237	422	422	422	750	750	750				
135			240			427			759						
137	137		243	243		432	432		768	768					
138			246			437			777						
140	140	140	249	249	249	442	442	442	787	787	787				
142			252			448			796						
143	143		255	255		453	453		806	806					
145			258			459			816						
147	147	147	261	261	261	464	464	464	825	825	825				
149			264			470			835						
150	150		267	267		475	475		845	845					
152			271			481			856						
154	154	154	274	274	274	487	487	487	866	866	866				
156			277			493			876						
158	158		280	280		499	499		887	887					
160			284			505			898						
162	162	162	287	287	287	511	511	511	909	909	909				
164			291			517			920						
165	165		294	294		523	523		931	931					
167			298			530			942						
169	169	169	301	301	301	536	536	536	953	953	953				
172			305			542			965						
174	174		309	309		549	549		976	976					
176			312			556			988						

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Printed in The Netherlands

533310/25000/02/pp634  
Document order number:

Date of release: October 1996  
9398 184 05011

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