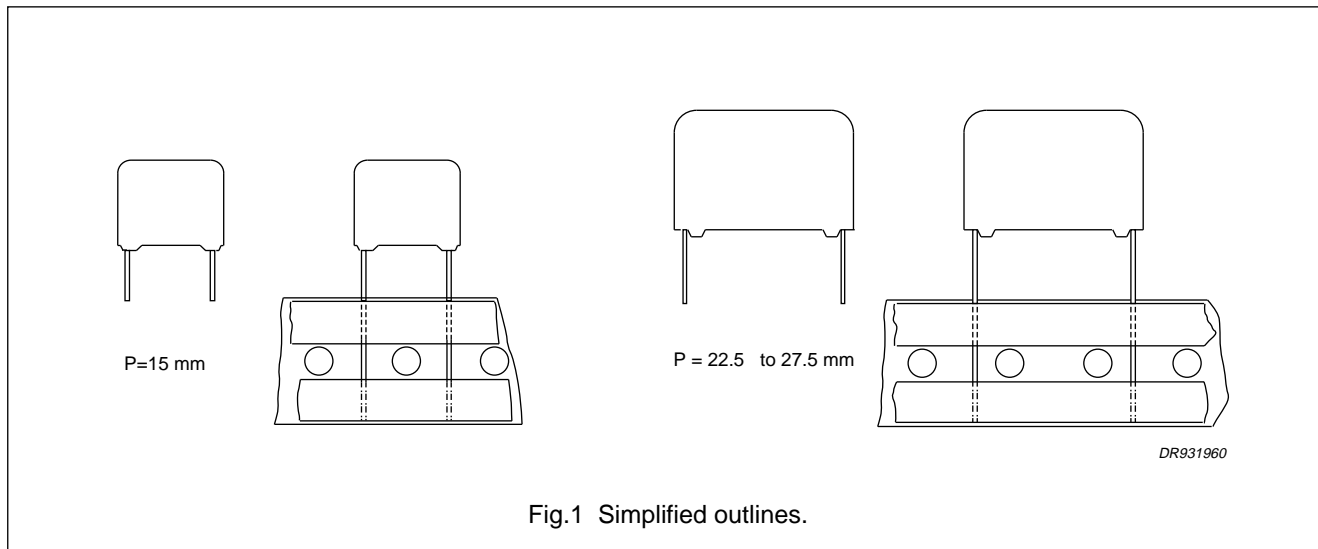


**AC and pulse
metallized polypropylene film capacitors**

**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

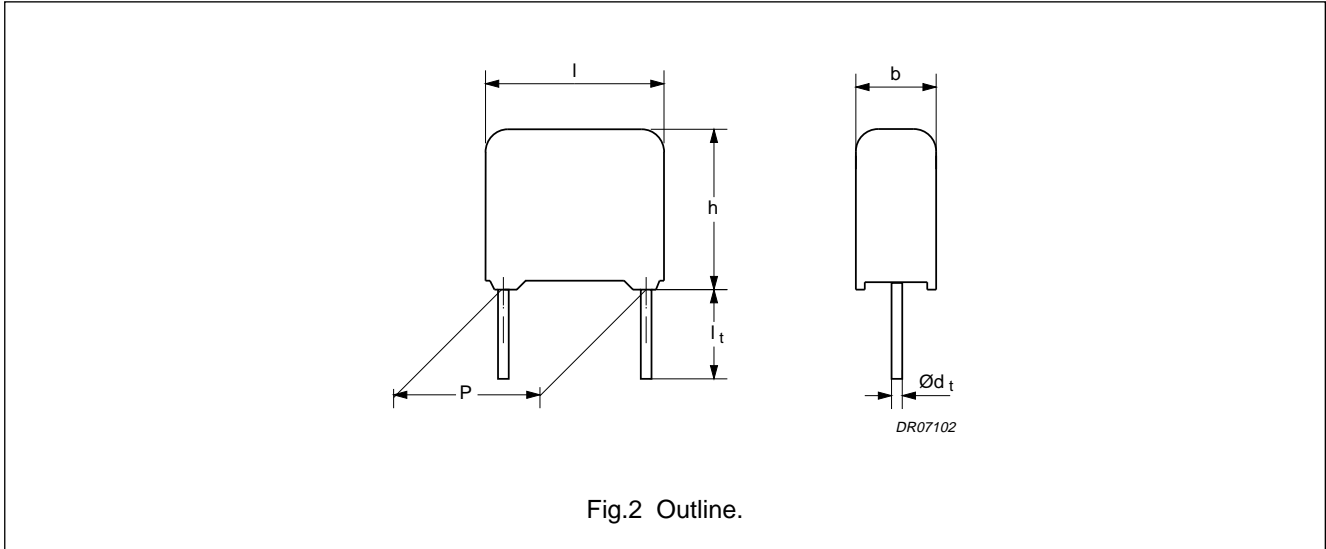
DESCRIPTION	VALUE
Capacitance range (E24 series)	0.001 to 0.82 μ F
Capacitance tolerance	\pm 5%; \pm 3.5%
Rated voltage (DC)	250 V; 630 V; 1000 V; 1600 V; 2000 V
Rated voltage (AC)	125 V; 300 V; 400 V; 500 V; 600 V
Rated peak-to-peak voltage	350 V; 850 V; 1100 V; 1400 V; 1700 V
Climatic category	55/100/56
Maximum application temperature	100 $^{\circ}$ C
Rated temperature	85 $^{\circ}$ 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



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 V/μs	
R between leads	>100000 MΩ	
R between interconnected leads and case	>100000 MΩ	
Ionization voltage (typical value) at 50 pC peak discharge	>400 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 ±1.0 mm	±5%	2222 376 42...	on request
	l _t = 3.5 ±0.3 mm	±5%	2222 376 48...	on request
Taped on reel	H = 18.5 mm; note 1	±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 (μF)	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 = $\pm 5\%$		
Pitch = $27.5 \pm 0.4 \text{ mm}$; $d_t = 0.80 \pm 0.08 \text{ mm}$					
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		11.0	42334		
0.36	$13.0 \times 23.0 \times 31.0$	11.0	42364	100	250
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		
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

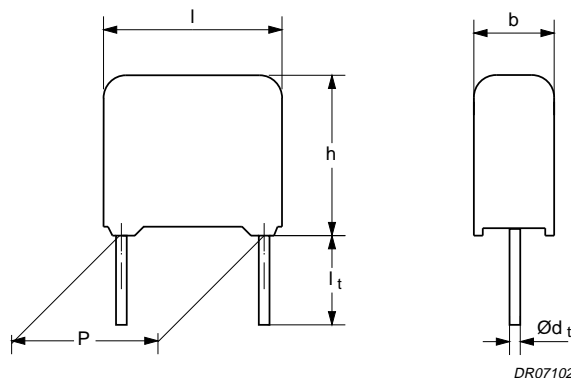


Fig.3 Outline.

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 P = 22.5 mm P = 27.5 mm	$\leq 3 \times 10^{-4}$ $\leq 3 \times 10^{-4}$ $\leq 4 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$ $\leq 20 \times 10^{-4}$
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 (μF)	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 = $\pm 5\%$		
Pitch = $15.0 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}$					
0.0068 0.0075 0.0082 0.0091	5.0 × 11.0 × 17.5	1.1	62682 62752 62822 62912	1000	1100
0.01 0.011 0.012 0.013	6.0 × 12.0 × 17.5	1.5	62103 62113 62123 62133	1000	900
0.015 0.016 0.018	7.0 × 13.5 × 17.5	2.0	62153 62163 62183	1000	800
0.02 0.022	8.5 × 15.0 × 17.5	2.6	62203 62223	1000	650
Pitch = $22.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}$					
0.024 0.027 0.03	6.0 × 15.5 × 26.0	2.8	62243 62273 62303	200	600
0.033 0.036 0.039	7.0 × 16.5 × 26.0	3.5	62333 62363 62393	200	550
0.043 0.047 0.051 0.056	8.5 × 18.0 × 26.0	4.5 4.5 4.5 5.1	62433 62473 62513 62563	200	450
Pitch = $27.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}$					
0.062 0.068 0.075	9.0 × 19.0 × 31.0	6.2	62623 62683 62753	100	400
0.082 0.091 0.1 0.11	11.0 × 21.0 × 31.0	8.3	62823 62913 62104 62114	100	300
0.12 0.13 0.15 0.16	13.0 × 23.0 × 31.0	10.8	62124 62134 62154 62164	100	250
0.18 0.2	15.0 × 25.0 × 31.0	13.0	62184 62204	100	200
0.22 0.24 0.27	18.0 × 28.0 × 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

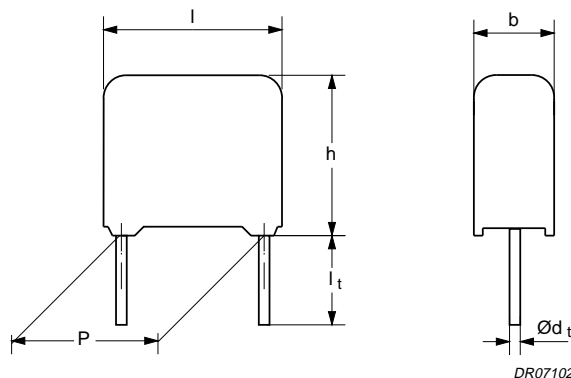


Fig.4 Outline.

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 P = 22.5 mm P = 27.5 mm	$\leq 3 \times 10^{-4}$ $\leq 3 \times 10^{-4}$ $\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$
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	$H = 18.5 \text{ mm}; \text{note 1}$	$\pm 5\%$	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

 $U_{Rdc} = 1000 V^{(1)}$; $U_{Rac} = 400 V/U_{p-p} = 1100 V$

loose and taped

C (μF)	DIMENSIONS $b \times h \times l$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 376 AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 5.0 \pm 1.0$ mm	short leads	H = 18.5 mm
			last 5 digits of catalogue number	SPQ	SPQ
C-tol = $\pm 5\%$					
Pitch = 15.0 ± 0.4 mm; $d_t = 0.80 \pm 0.08$ mm					
0.0047 0.0051 0.0056	5.0 × 11.0 × 17.5	1.1	72472 72512 72562	1000	1100
0.0062 0.0068 0.0075 0.0082	6.0 × 12.0 × 17.5	1.5	72622 72682 72752 72822	1000	900
0.0091 0.01 0.011 0.012	7.0 × 13.5 × 17.5	2.0	72912 72103 72113 72123	1000	800
Pitch = 22.5 ± 0.4 mm; $d_t = 0.80 \pm 0.08$ mm					
0.013	6.0 × 15.5 × 26.0	2.8	72133	200	600
0.015 0.016 0.018	7.0 × 16.5 × 26.0	3.5	72153 72163 72183	200	550
0.02 0.022 0.024 0.027 0.03 0.033 0.036	8.5 × 18.0 × 26.0	4.5	72203 72223 72243 72273 72303 72333 72363	200	450
0.039	10.0 × 19.5 × 26.0	5.4	72393	200	350
Pitch = 27.5 ± 0.4 mm; $d_t = 0.80 \pm 0.08$ mm					
0.043 0.047 0.051	9.0 × 19.0 × 31.0	6.2	72433 72473 72513	100	400
0.056 0.062 0.068 0.075	11.0 × 21.0 × 31.0	8.3	72563 72623 72683 72753	100	300
0.082 0.091 0.1	13.0 × 23.0 × 31.0	10.8	72823 72913 72104	100	250
0.11 0.12 0.13 0.15	15.0 × 25.0 × 31.0	13.0	72114 72124 72134 72154	100	200
0.16 0.18	18.0 × 28.0 × 31.0	19.0	72164 72184	100	150

Note

1. For $C \geq 0.11 \mu F$: $U_{Rdc} = 1000 - 2.75 (C - 100) V$ (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

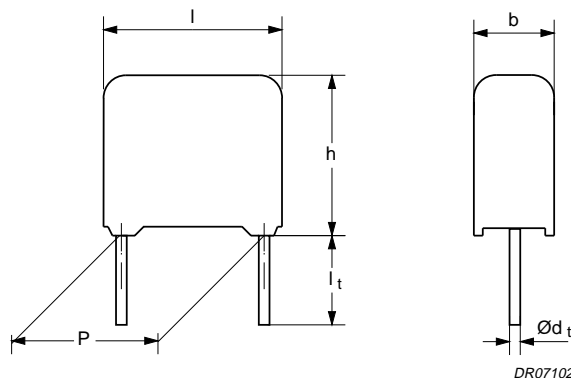


Fig.5 Outline.

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 P = 22.5 mm P = 27.5 mm	$\leq 3 \times 10^{-4}$ $\leq 3 \times 10^{-4}$ $\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at U_{Rdc}	>10000 V/ μ s	
R between leads	>100000 M Ω	
R between interconnected leads and case	>100000 M Ω	
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	$l_t = 5.0 \pm 1.0$ mm	$\pm 5\%$	2222 376 82...	on request
		$\pm 3.5\%$	2222 376 83...	on request
	$l_t = 3.5 \pm 0.3$ 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 (μF)	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 = $\pm 5\%$		
Pitch = $15.0 \pm 0.4 \text{ mm}$; $d_t = 0.80 \pm 0.08 \text{ mm}$					
0.0018	$5.0 \times 11.0 \times 17.5$	1.1	82182	1000	1100
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		
Pitch = $22.5 \pm 0.4 \text{ mm}$; $d_t = 0.80 \pm 0.08 \text{ mm}$					
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
Pitch = $27.5 \pm 0.4 \text{ mm}$; $d_t = 0.80 \pm 0.08 \text{ mm}$					
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

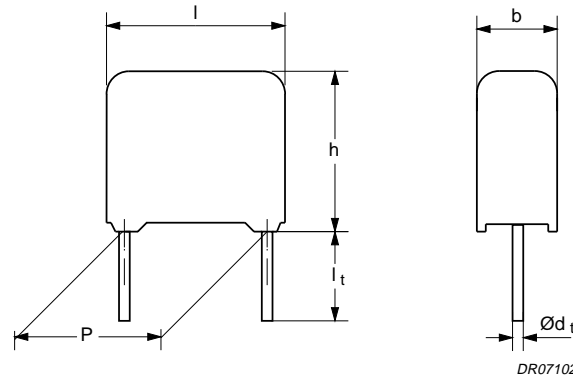


Fig.6 Outline.

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 P = 22.5 mm P = 27.5 mm	$\leq 3 \times 10^{-4}$ $\leq 3 \times 10^{-4}$ $\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$ $\leq 10 \times 10^{-4}$ $\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at U_{Rdc}	>10000 V/ μ s	
R between leads	>100000 M Ω	
R between interconnected leads and case	>100000 M Ω	
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 (μF)	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 = $\pm 5\%$		
Pitch = $15.0 \pm 0.4 \text{ mm}$; $d_t = 0.80 \pm 0.08 \text{ mm}$					
0.001 0.0011	5.0 × 11.0 × 17.5	1.1	92102 92112	1000	1100
0.0012 0.0013 0.0015 0.0016	6.0 × 12.0 × 17.5	1.5	92122 92132 92152 92162	1000	900
0.0018 0.002	7.0 × 13.5 × 17.5	2.0	92182 92202	1000	800
0.0022 0.0024 0.0027 0.003	8.5 × 15.0 × 17.5	2.6	92222 92242 92272 92302	1000	650
Pitch = $22.5 \pm 0.4 \text{ mm}$; $d_t = 0.80 \pm 0.08 \text{ mm}$					
0.0033 0.0036 0.0039	6.0 × 15.5 × 26.0	2.8	92332 92362 92392	200	600
0.0043 0.0047 0.0051	7.0 × 16.5 × 26.0	3.5	92432 92472 92512	200	550
0.0056 0.0062 0.0068 0.0075 0.0082	8.5 × 18.0 × 26.0	4.5	92562 92622 92682 92752 92822	200	450
0.0091 0.01	10.0 × 19.5 × 26.0	5.4	92912 92103	200	350
Pitch = $27.5 \pm 0.4 \text{ mm}$; $d_t = 0.80 \pm 0.08 \text{ mm}$					
0.011 0.012 0.013 0.015	11.0 × 21.0 × 31.0	7.4	92113 92123 92133 92153	100	300
0.016 0.018 0.02 0.022	13.0 × 23.0 × 31.0	10.2	92163 92183 92203 92223	100	250
0.024 0.027	15.0 × 25.0 × 31.0	13.0	92243 92273	100	200
0.03 0.033	18.0 × 28.0 × 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

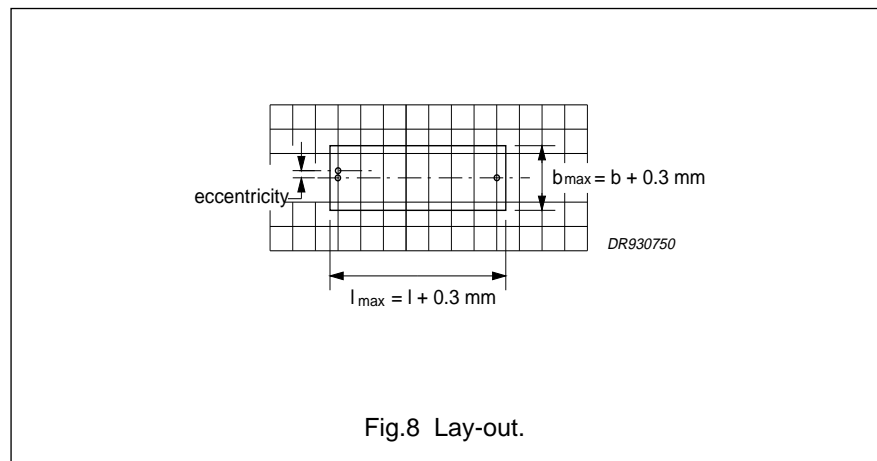
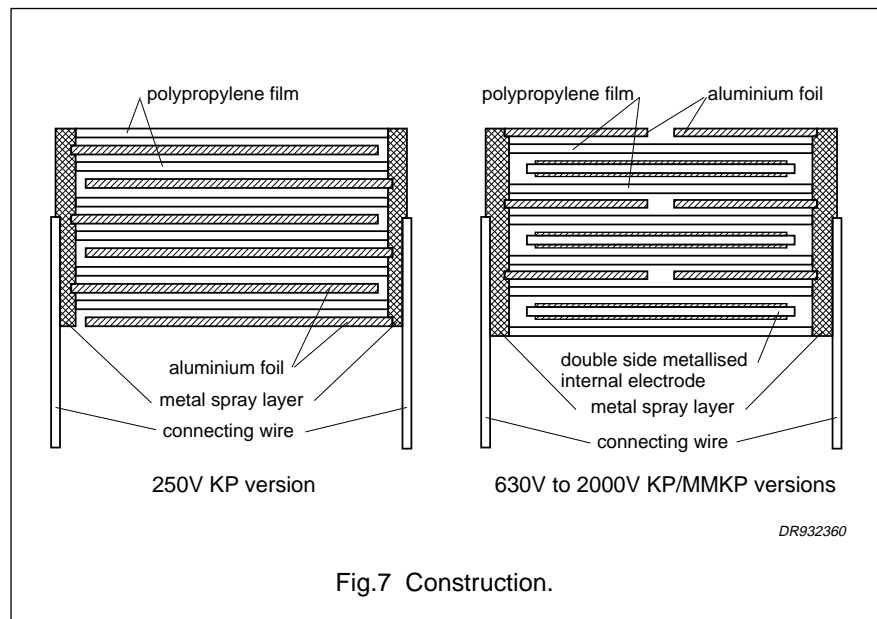
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

- For pitches of ≤ 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 ± 1 °C, an atmospheric pressure of 86 to 106 kPa and a relative humidity of $50 \pm 2\%$.

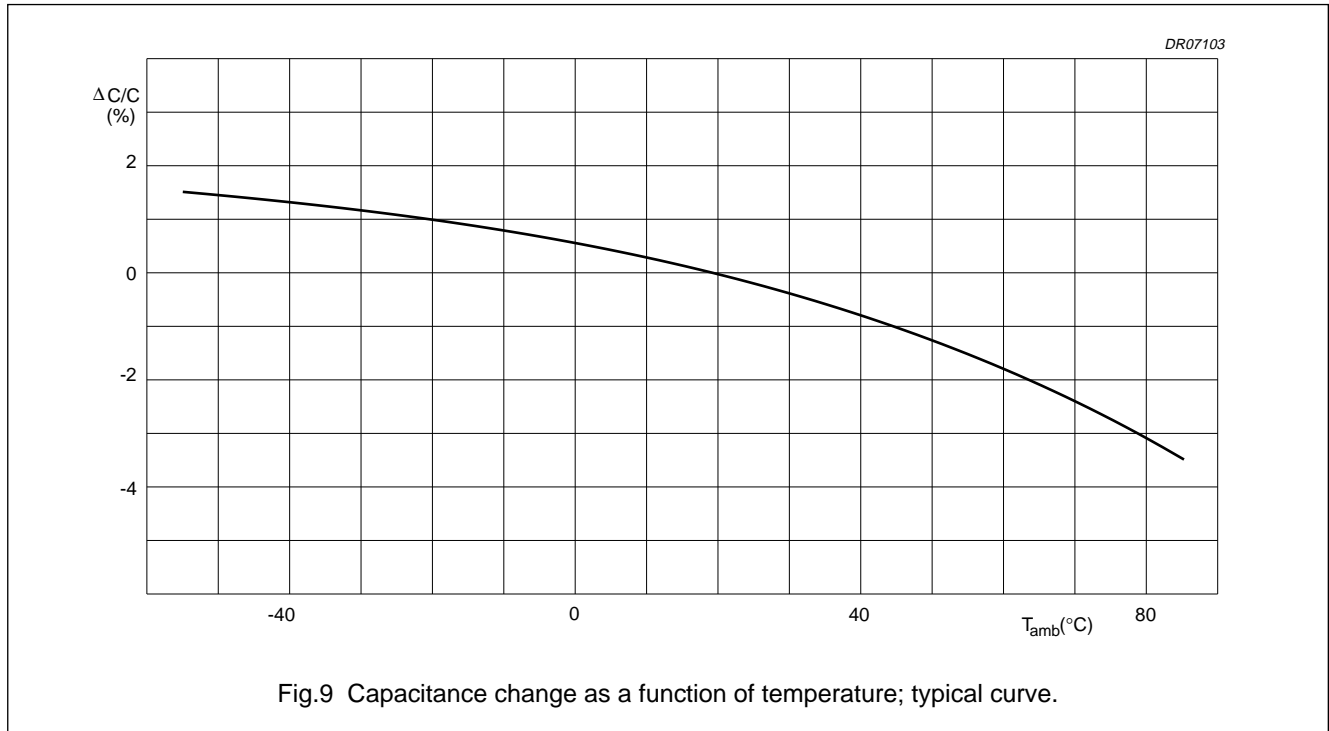
For reference testing, a conditioning period shall be applied of 96 ± 4 hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

AC and pulse metallized polypropylene film capacitors

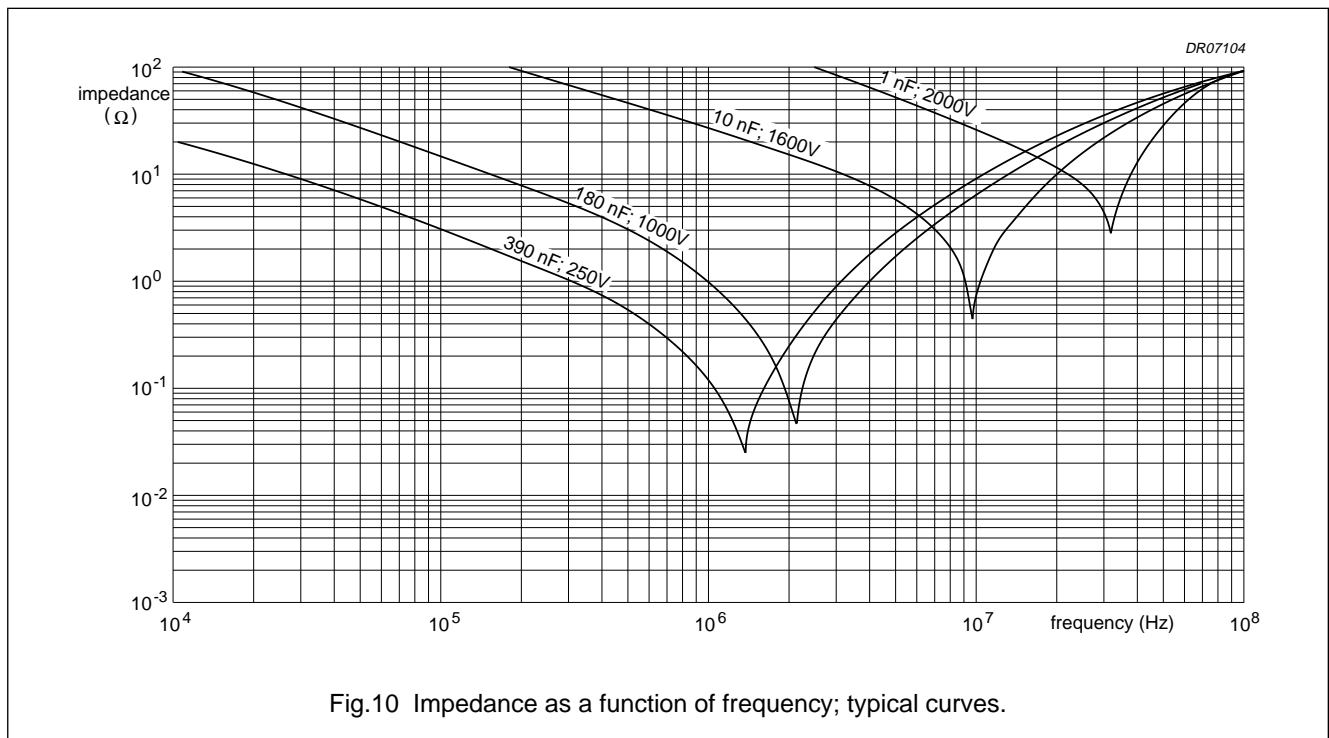
KP/MMKP 376

Capacitance

All capacitance values are specified at 1 kHz.



Impedance



AC and pulse metallized polypropylene film capacitors

KP 376
KP/MMKP 376

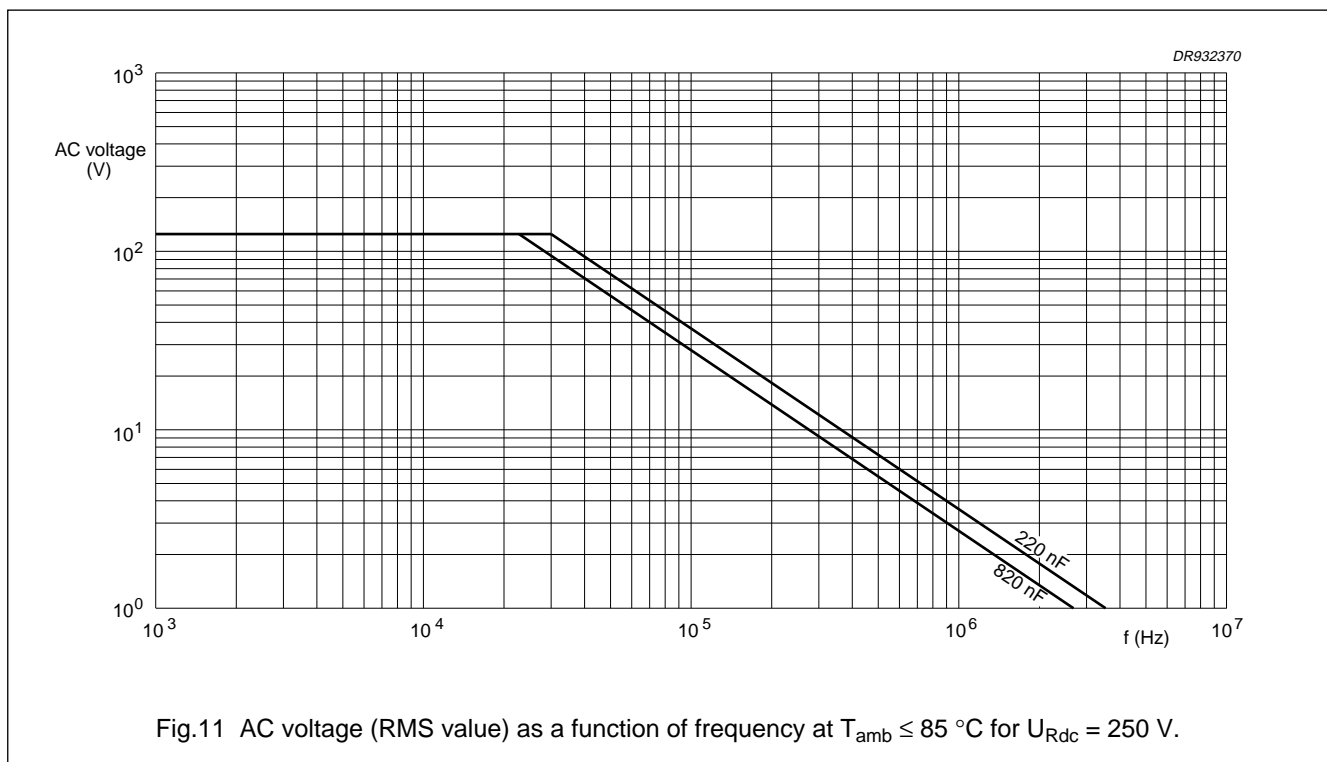
Temperature

- Temperature characteristics related to $20 \pm 2 \text{ }^\circ\text{C}$:
 $-55 \text{ to } +20 \text{ }^\circ\text{C}$: $0\% \leq \Delta C/C \leq 3.75\%$
 $20 \text{ to } 100 \text{ }^\circ\text{C}$: $-7\% \leq \Delta C/C \leq 0\%$
- Storage temperature: $T_{\text{stg}} = -25 \text{ to } +40 \text{ }^\circ\text{C}$ 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 $T_{\text{amb}} \leq 85 \text{ }^\circ\text{C}$



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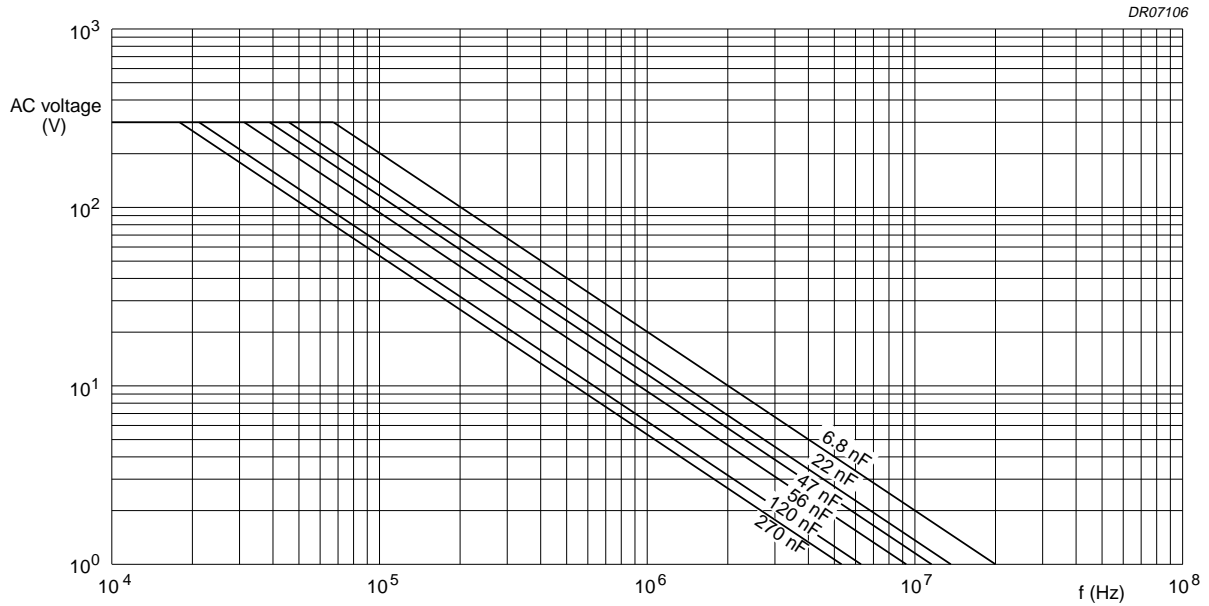


Fig.12 AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 85\text{ }^{\circ}\text{C}$ for $U_{Rdc} = 630\text{ V}$.

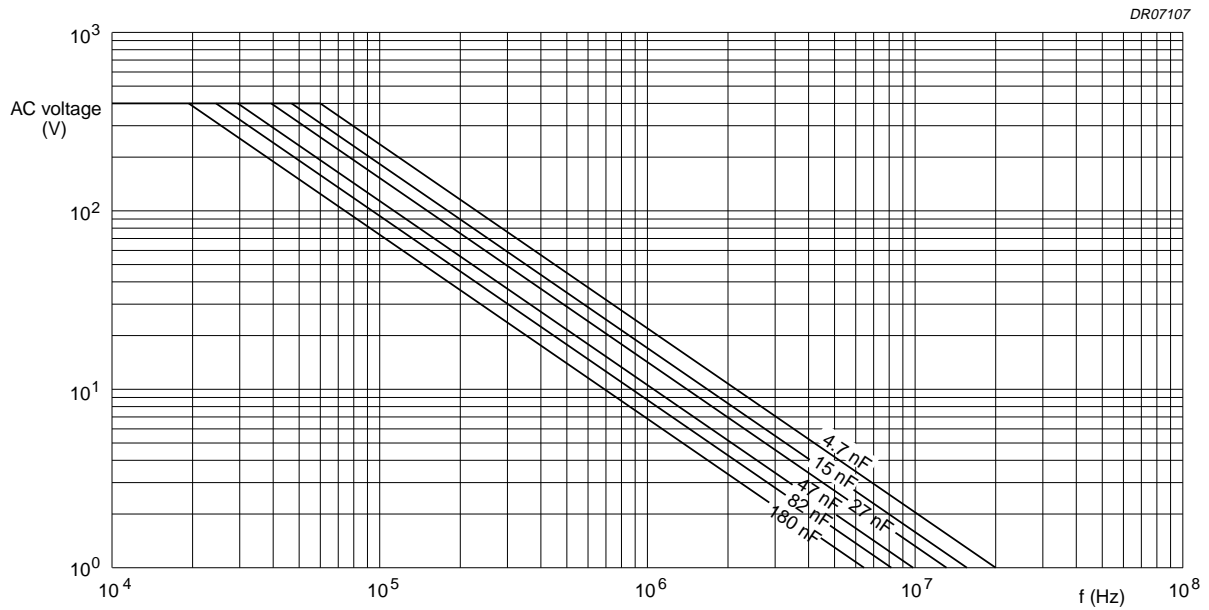


Fig.13 AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 85\text{ }^{\circ}\text{C}$ for $U_{Rdc} = 1000\text{ V}$.

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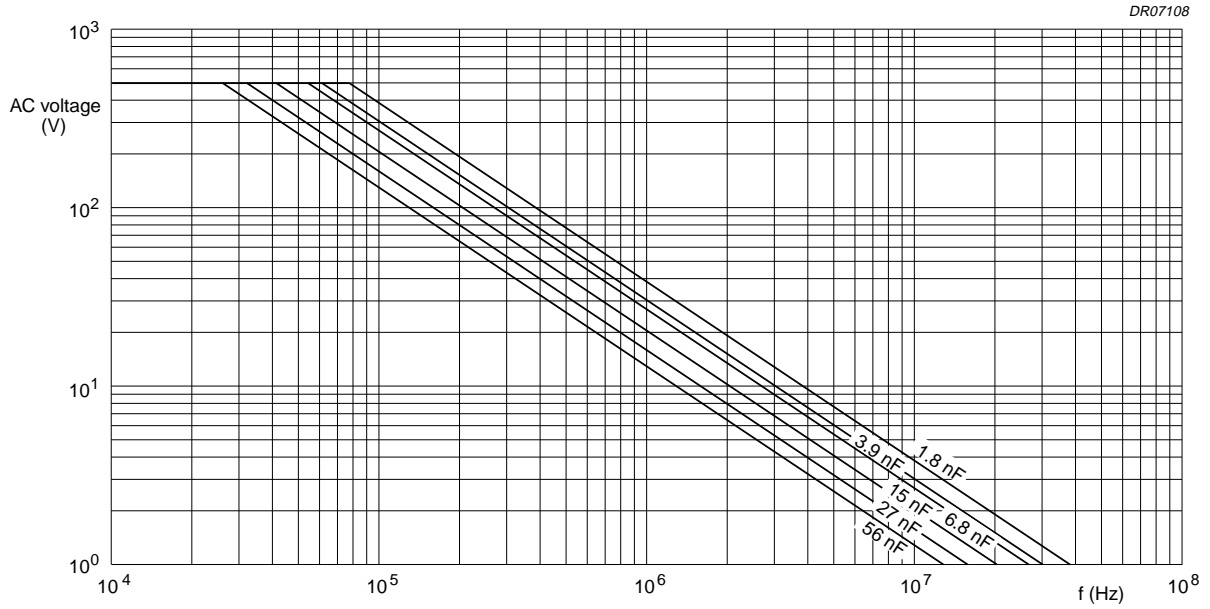


Fig.14 AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 85^\circ C$ for $U_{Rdc} = 1600 V$.

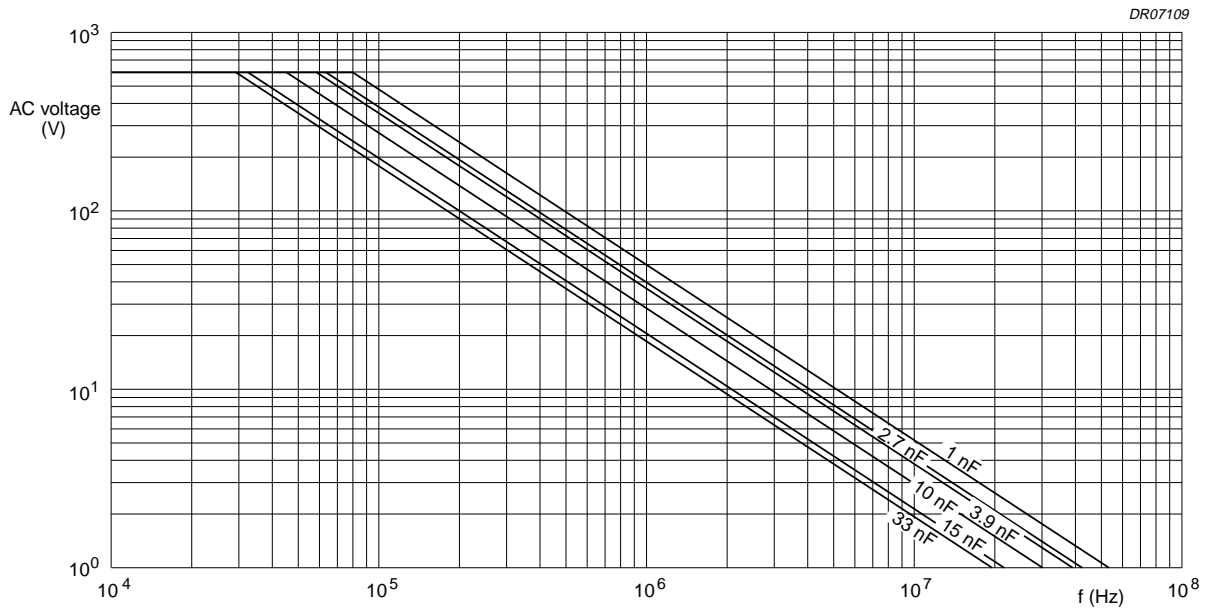


Fig.15 AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 85^\circ C$ for $U_{Rdc} = 2000 V$.

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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.

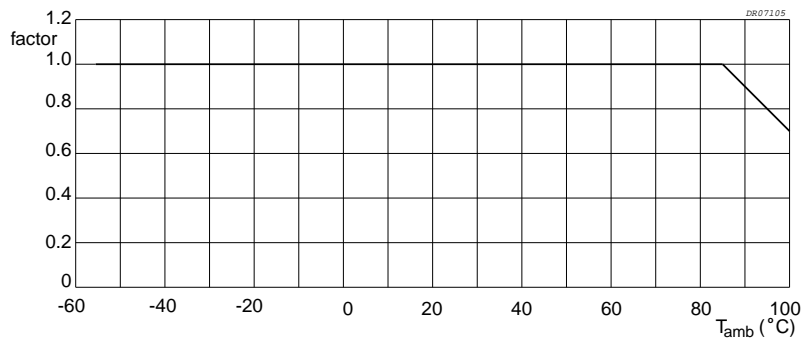


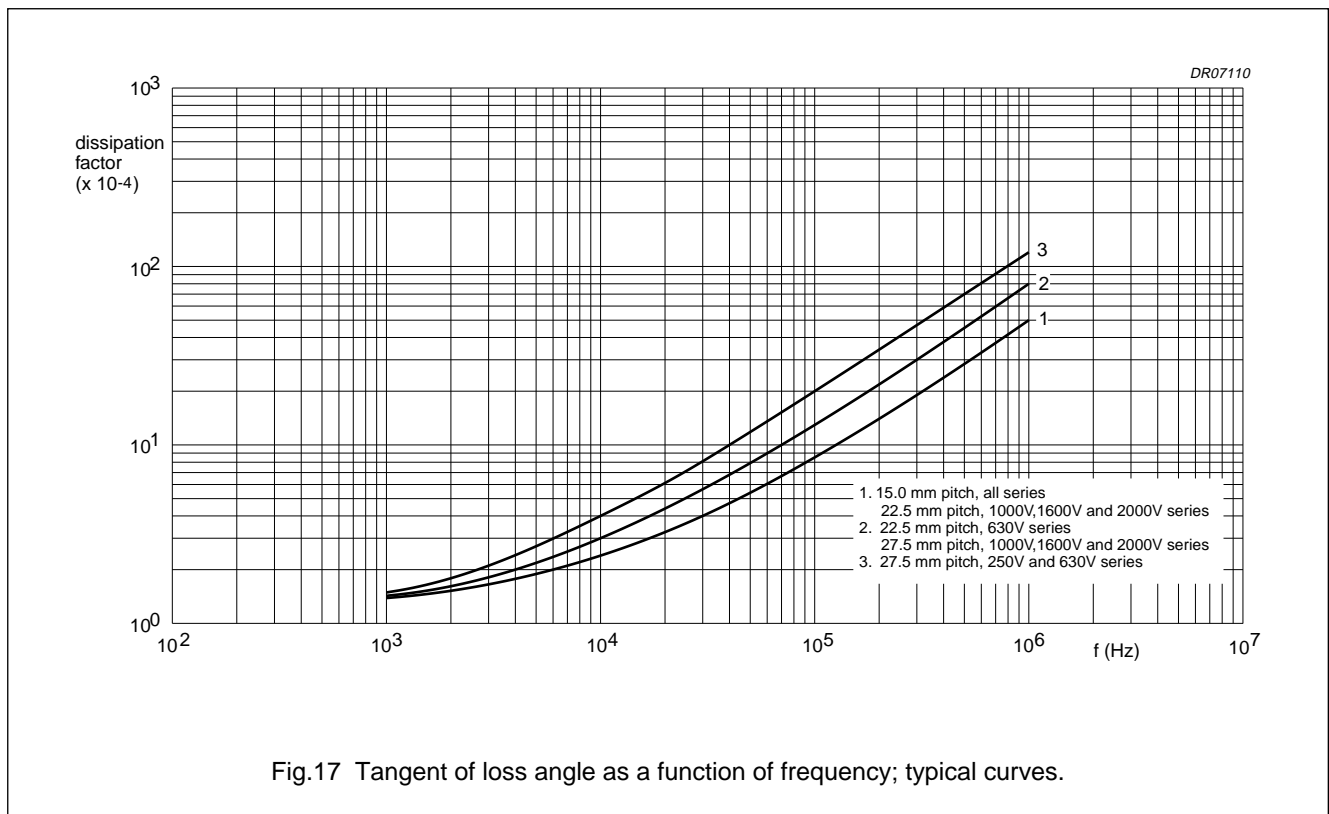
Fig.16 Multiplying factor as a function of temperature.

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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	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 15 \times 10^{-4}$



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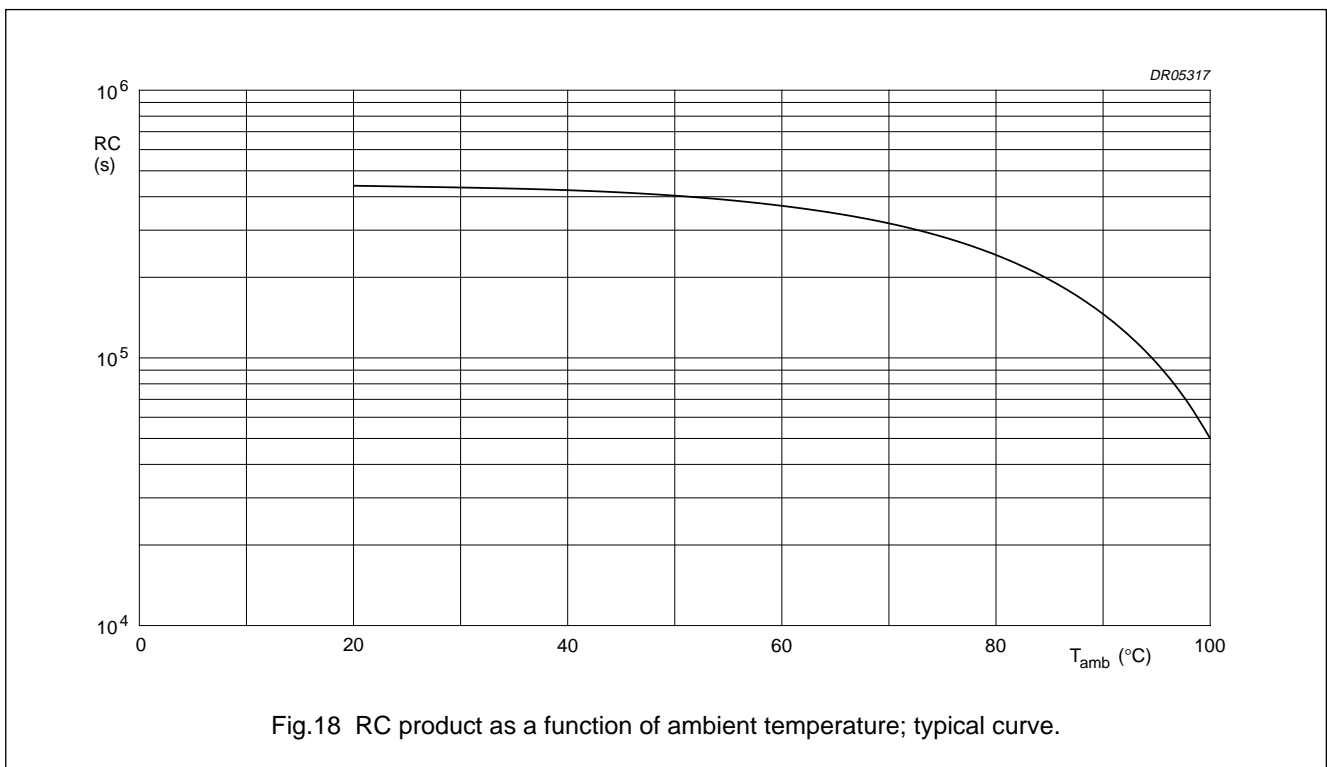
Rated voltage pulse slope $(dU/dt)_R$

- $>10000 \text{ V}/\mu\text{s}$ (limited by network conditions).

Insulation resistance

The insulation resistance is measured after a voltage has been applied for 1 minute ± 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: $>100000 \text{ M}\Omega$.



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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

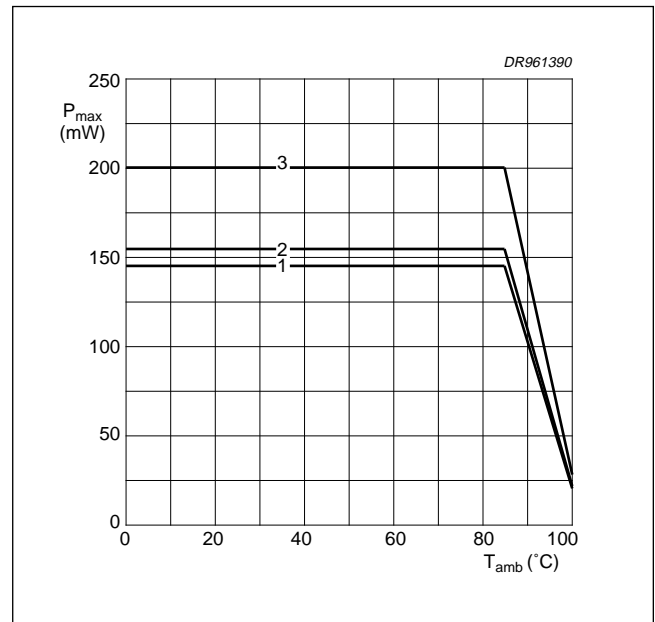


Fig.19 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

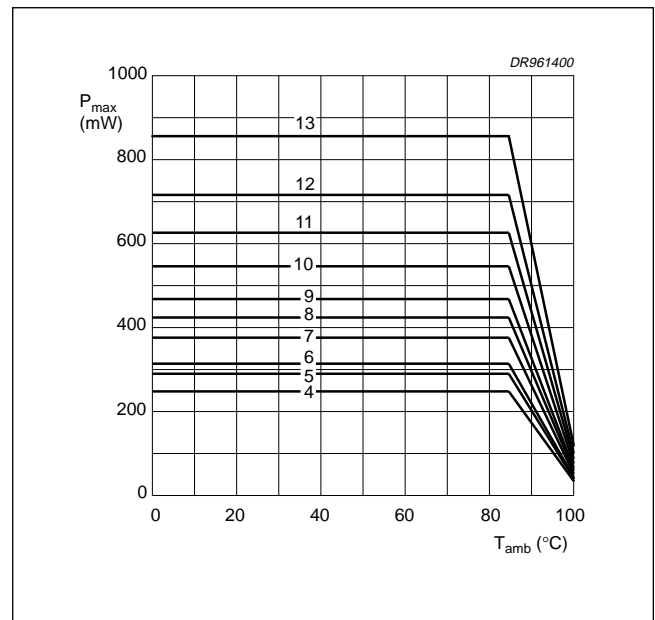


Fig.20 Maximum permissible power dissipation as a function of ambient temperature, at various capacitor dimensions.

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Application note⁽¹⁾

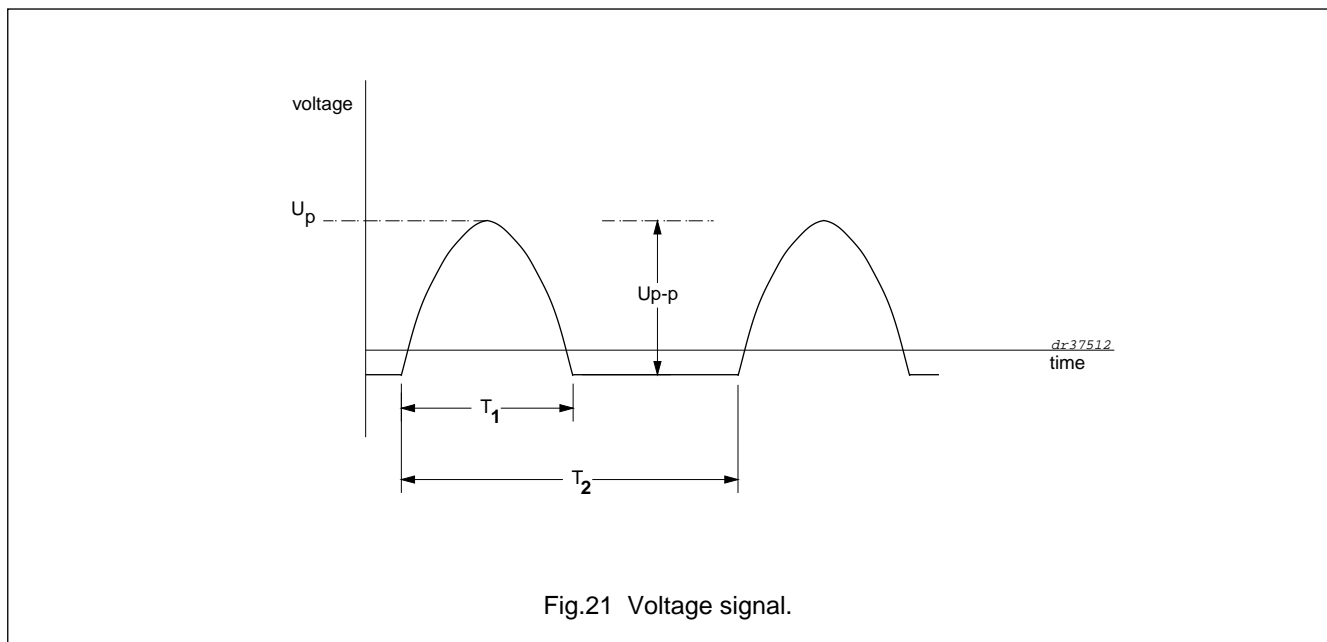
To select the capacitor for a certain application, the following conditions must be checked:

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 V (DC).
2. The peak-to-peak voltage 1200 V is lower than $2 \times \sqrt{2}$ times 500 V (AC) = $1414 U_{p-p}$.
3. The voltage pulse slope: of no consideration.
4. The dissipated power is 170 mW as calculated with Fourier terms.
This is less than 370 mW , allowed for a capacitor with dimensions: $b_{\max} = 8.5$ and pitch = 22.5 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.

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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 = ±5%; A = ±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 = ±5%; A = ±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).

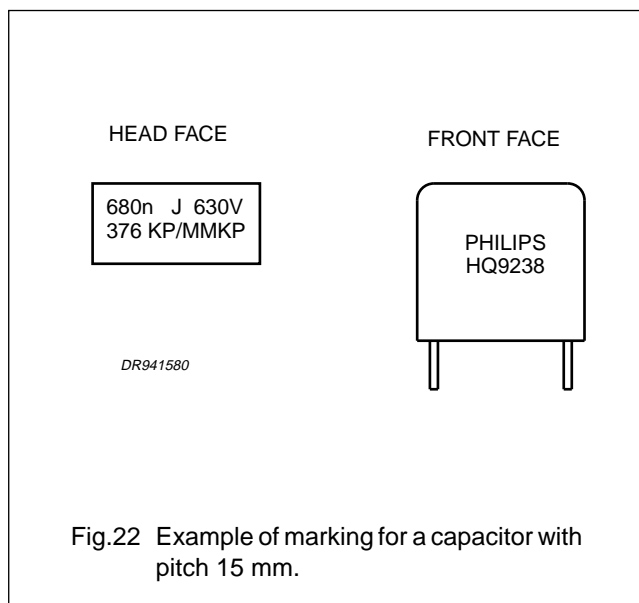


Fig.22 Example of marking for a capacitor with pitch 15 mm.

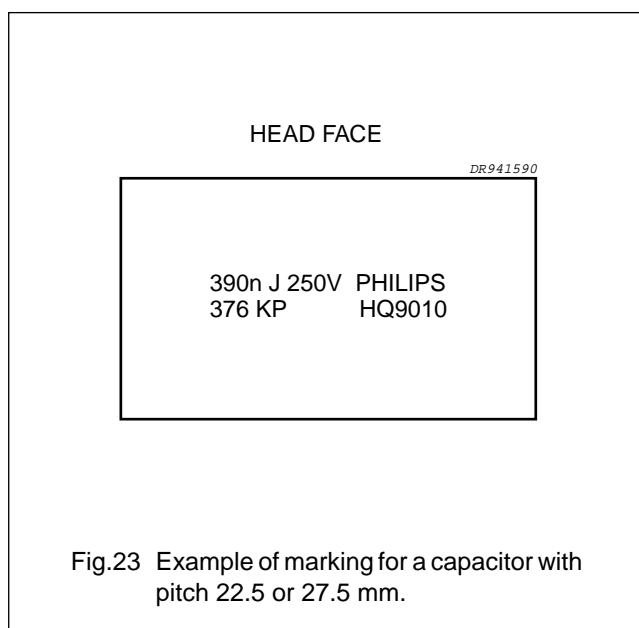


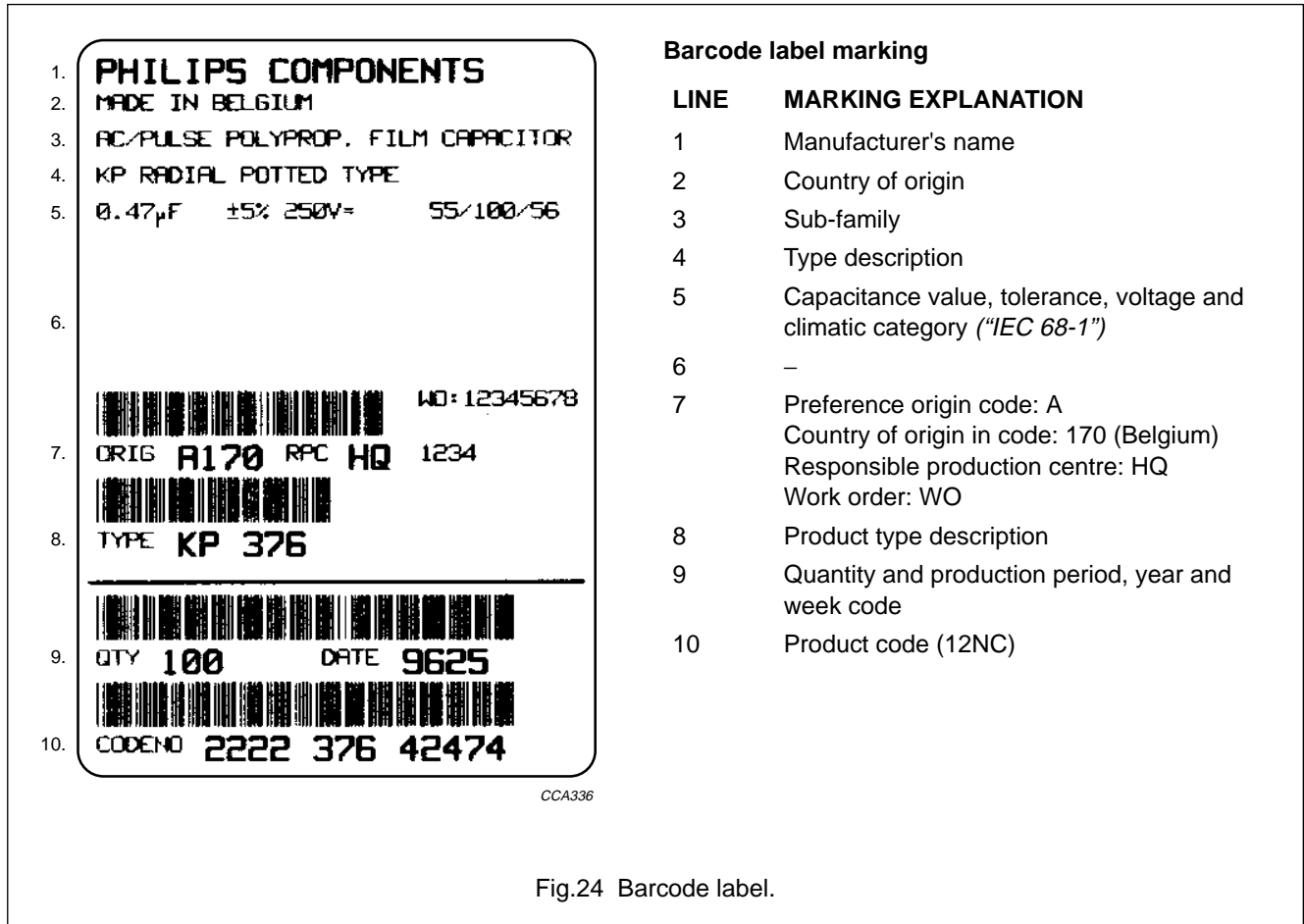
Fig.23 Example of marking for a capacitor with pitch 22.5 or 27.5 mm.

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Package marking

The package containing the capacitors is marked as shown in Fig.24.



CCA336

Fig.24 Barcode label.

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QUICK REFERENCE TEST REQUIREMENTS (see note 1)

TEST	PROCEDURE (quick reference)	REQUIREMENTS
Robustness of leads		
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 1\%$
Component solvent resistance	isopropyl alcohol; 23 °C; 5 minutes	$\Delta \tan \delta \leq 10 \times 10^{-4}$
Robustness of component		
Vibration: "IEC 68-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s ² ; 6 hours	$ \Delta C/C \leq 2\%$ (C > 0.0047 μF) $ \Delta C/C \leq 3\%$ (C ≤ 0.0047 μF)
Shock: "IEC 68-2-27"	half sinewave; 490 m/s ² ; 11 ms	$ \Delta C/C \leq 1\%$ (250 V) $\Delta \tan \delta \leq 10 \times 10^{-4}$
Climatic sequence		
Dry heat: "IEC 68-2-2"	16 hours; 100 °C	$ \Delta C/C \leq 3\%$ $\Delta \tan \delta \leq 20 \times 10^{-4}$
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; -55 °C	
Damp heat, cyclic, test Db, remaining cycles: "IEC 68-2-30"		

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TEST	PROCEDURE (quick reference)	REQUIREMENTS
Other applicable tests		
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: 1000 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: 1000 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: 2000 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: 2000 hours; $1.25 \times U_{Rdc}$; 85 °C $1.25 \times U_{Cdc}$; 100 °C	$ \Delta C/C \leq 3\%$ $\Delta \tan \delta \leq 20 \times 10^{-4}$ $R_{ins} \geq 50\%$ 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

1. For detailed information, see "Type specification"