DATA SHEET

MKP 338 1 X1
Interference suppression film capacitors

Product specification
Supersedes data of 2002 Oct 08
File under BCcomponents, BC05

2002 Nov 06

BC COMPONENTS

Interference suppression film capacitors MKP 338 1 X1

MKP RADIAL POTTED TYPE

PITCH 15/22.5/27.5 mm
PITCH 7.5 mm (bent back leads)

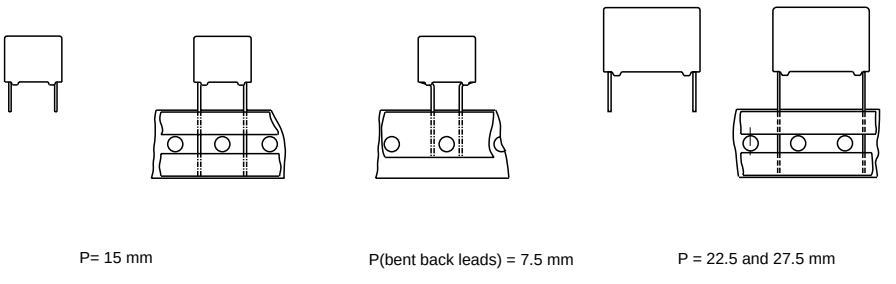


Fig.1 Simplified outlines.

FEATURES

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

APPLICATIONS

- For X1 electromagnetic interference suppression
- Specially designed to meet the requirements of the *"IEC 60384-14 2nd edition and EN 132400"*, requiring a 4 kV peak pulse voltage test UL1414 and CSA-C22.2 No. 1 specifications.

DETAIL SPECIFICATION

For more detailed data and test requirements see *"Type detail specification HQN-384-14/119"*.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series)	0.01 to 1 μF
Capacitance tolerance	±20%; ±10%; ±5%
Rated (AC) voltage, 50 to 60 Hz	440 V
Rated (DC) voltage	1000 V
Climatic category	55/105/56/B
Rated temperature	105 °C
Maximum application temperature	105 °C
Reference specifications	IEC 60384-14 2nd edition and EN 132400
Safety approvals:	
250 V	UL1414
440 V	UL1283
440 V	ENEC
Materials	qualified in accordance with UL94V-O
Safety class	X1; across the line

Interference suppression film capacitors MKP 338 1 X1

SAFETY APPROVALS AND SAFETY TEST REPORT

Approvals

SAFETY APPROVALS (X1)		VOLTAGE	VALUE	FILE NUMBERS
	EN132400	440 V (AC)	10 nF to 1 µF	ENEC/B04/2001
	UL1414	250 V (AC)	10 nF to 1 µF	E112471
	UL1283 and CSA 22.2.8	440 V (AC)	100 nF to 1 µF	E109565

Safety test report

SAFETY TEST REPORT	VOLTAGE	VALUE	FILE NUMBERS
CB TEST CERTIFICATE	440 V (AC)	10 nF to 1 µF: 55/105/56/B	FI 1653

The Enec-approval together with the CB-Certificate replace all national approval marks of the following countries (they have already signed the ENEC-Agreement): Austria; Belgium; Czech. Republic; Denmark; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Luxembourg; Netherlands; Norway, Portugal; Slovenian; Spain; Sweden; Switzerland and United Kingdom.

Interference suppression film capacitors MKP 338 1 X1

COMPOSITION OF CATALOGUE NUMBER

TYPE AND PITCHES	
338 1 X1	7.5 mm (bent back)
	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically)

MULTIPLIER (nF)	
0.1	2
1	3
10	4
100	5

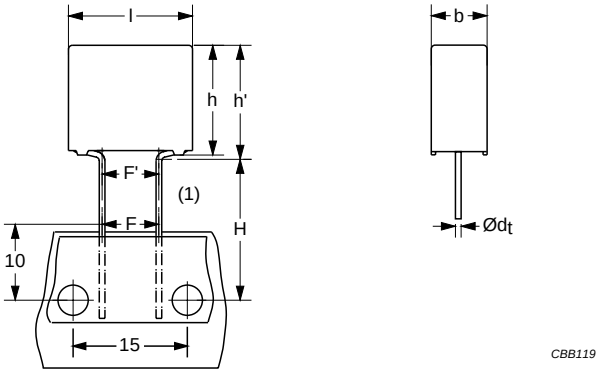
Example:
104 = 10 x 10 = 100 nF

2222	338	1.	XX	X

TYPE	PACKAGING	STANDARD DIMENSIONS	C-TOL	PREFERRED TYPES
338 1 X1	loose in box	lead length 3.5 mm	±20%	10
		lead length 5.0 mm		12
		lead length 25.0 mm		14
	taped on reel	bent back to 7.5 mm		16
		ALTERNATIVE TAPED VERSIONS		**ON REQUEST**
338 1 X1	taped on reel		±20%	17
		ALTERNATIVE C-TOL		**ON REQUEST**
338 1 X1	loose in box	lead length 3.5 mm	±10%	see tables for details
		lead length 5.0 mm	±10%	
		lead length 25.0 mm	±10%	
	taped on reel	bent back to 7.5 mm	±10%	
			±10%	
	loose in box	lead length 3.5 mm	±5%	see HQN-384-14/119
		lead length 5.0 mm	±5%	
		lead length 25.0 mm	±5%	
	taped on reel	bent back to 7.5 mm	±5%	
			±5%	

Interference suppression film capacitors MKP 338 1 X1

MKP 338 1 GENERAL DATA **PITCH 7.5 mm (bent back leads)**



(1) $|F - F'| < 0.3$ mm
$F = 7.5\ ^{+0.6}_{-0.1}$ mm

Fig.3 Outline.

Specific reference data for the 440 V AC (X1) capacitors

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 470$ nF	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
$C > 470$ nF	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$	–
Rated voltage pulse slope (dU/dt)R at 615 V	250 V/µs		
R between leads, for $C \leq 0.33$ µF at 100 V; 1 minute	>15000 MΩ		
RC between leads, for $C > 0.33$ µF at 100 V; 1 minute	>5000 s		
R between leads and case; 100 V; 1 minute	>30000 MΩ		
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	3400 V; 1 minute		
Withstanding (AC) voltage between leads and case	2380 V; 1 minute		

Available 440 V AC (X1) versions

PACKAGING	DIMENSIONS	C-tol(1)	ORDERING	CATALOGUE NUMBER
Taped on reel; bent back	H = 16.0 mm; for P_0 = 15.0 mm; reel diameter = 500 mm	±20%	preferred	see tables for details
		±10%	on request	

Note

1. ±5% tolerance values and other values are available on special request.

Interference suppression film capacitors MKP 338 1 X1

Bent back pitch: 7.5 mm; C-tol = ±20% **U_{Rac} = 440 V**

(for reference: U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS b × h′ × l (mm)	MASS (g)	CATALOGUE NUMBER 2222 338 ..... AND PACKAGING	
			REEL[1]	
			H = 16.0 mm; P_0 = 15.0 mm	SPQ
Bent back pitch = 7.5 ±0.4 mm; d_t = 0.60 ±0.06 mm				
0.01	5.0 × 13.0 × 17.5	1.2	16**103**	950
0.015			16**153**	
0.022			16**223**	
0.033	6.0 × 14.0 × 17.5	1.4	16**333**	800
Bent back pitch = 7.5 ±0.4 mm; d_t = 0.80 ±0.08 mm				
0.047	7.0 × 15.5 × 17.5	1.9	16**473**	700
0.068	8.5 × 17.0 × 17.5	2.6	16**683**	550
0.1	10.0 × 18.5 × 17.5	3.1	16**104**	500

Note

1. Reel diameter = 356 mm is available on request.

Bent back pitch: 7.5 mm; C-tol = ±10% **U_{Rac} = 440 V**

(for reference: U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS b × h′ × l (mm)	MASS (g)	CATALOGUE NUMBER 2222 338 ..... AND PACKAGING	
			REEL[1]	
			H = 16.0 mm; P_0 = 15.0 mm	SPQ
Bent back pitch = 7.5 ±0.4 mm; d_t = 0.60 ±0.06 mm				
0.01	5.0 × 13.0 × 17.5	1.2	18**714**	950
0.015			18**716**	
0.022	6.0 × 14.0 × 17.5	1.4	18**718**	800
Bent back pitch = 7.5 ±0.4 mm; d_t = 0.80 ±0.08 mm				
0.033	7.0 × 15.5 × 17.5	1.9	18**721**	700
0.047	8.5 × 17.0 × 17.5	2.6	18**723**	550
0.068	10.0 × 18.5 × 17.5	3.1	18**725**	500

Note

1. Reel diameter = 356 mm is available on request.

Interference suppression film capacitors MKP 338 1 X1

MKP 338 1 GENERAL DATA **PITCH 15 mm**

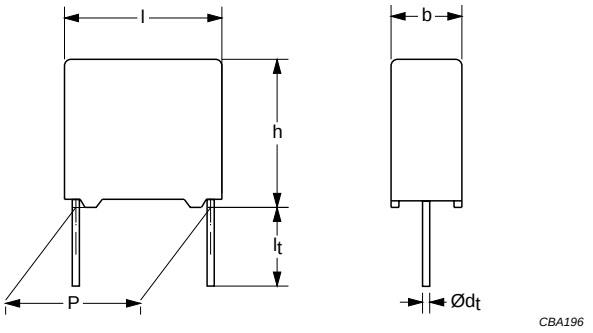


Fig.4 Outline.

Specific reference data for the 440 V AC (X1) capacitors

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 470$ nF	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
$C > 470$ nF	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$	–
Rated voltage pulse slope (dU/dt)R at 615 V	250 V/µs		
R between leads, for $C \leq 0.33$ µF at 100 V; 1 minute	>15000 MΩ		
RC between leads, for $C > 0.33$ µF at 100 V; 1 minute	>5000 s		
R between leads and case; 100 V; 1 minute	>30000 MΩ		
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	3400 V; 1 minute		
Withstanding (AC) voltage between leads and case	2380 V; 1 minute		

Available 440 V AC (X1) versions

PACKAGING	DIMENSIONS	C-tol(1)	ORDERING	CATALOGUE NUMBER
Loose in box	l_t = 3.5 ±0.3 mm	±20%	preferred	see tables for details
		±10%	on request	
	l_t = 5.0 ±1.0 mm	±20%	preferred	
		±10%	on request	
	l_t = 25.0 ±2.0 mm	±20%	preferred	
		±10%	on request	
Taped on reel	H = 18.5 mm; for P_0 = 12.7 mm; reel diameter = 500 mm	±20%	on request	
		±10%	on request	

Note

1. ±5% tolerance values and other values are available on special request.

Interference suppression film capacitors MKP 338 1 X1

Pitch: 15 mm; C-tol = ±20% **U_{Rac} = 440 V**

(for reference: U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS b × h × l (mm)	MASS (g)	CATALOGUE NUMBER 2222 338 ..... AND PACKAGING						
			LOOSE IN BOX					REEL	
			short leads			long leads		H = 18.5 mm P_0 = 12.7mm	
			l_t = 3.5 ±0.3 mm	l_t = 5.0 ±0.3 mm	SPQ	l_t = 25.0 ±2.0 mm	SPQ		SPQ
Pitch = 15.0 ±0.4 mm; d_t = 0.60 ±0.06 mm									
0.01	5.0 × 11.0 × 17.5	1.2	10**103**	12**103**	1000	14**103**	1000	17**103**	1100
0.015			10**153**	12**153**		14**153**		17**153**	
0.022			10**223**	12**223**		14**223**		17**223**	
0.033	6.0 × 12.0 × 17.5	1.4	10**333**	12**333**	1000	14**333**	1000	17**333**	900
Pitch = 15.0 ±0.4 mm; d_t = 0.80 ±0.08 mm									
0.047	7.0 × 13.5 × 17.5	1.9	10**473**	12**473**	750	14**473**	500	17**473**	800
0.068	8.5 × 15.0 × 17.5	2.6	10**683**	12**683**	750	14**683**	500	17**683**	650
0.1	10.0 × 16.5 × 17.5	3.1	10**104**	12**104**	500	14**104**	450	17**104**	600

Pitch: 15 mm; C-tol = ±10% **U_{Rac} = 440 V**

(for reference: U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS b × h × l (mm)	MASS (g)	CATALOGUE NUMBER 2222 338 ..... AND PACKAGING						
			LOOSE IN BOX					REEL	
			short leads			long leads		H = 18.5 mm P_0 = 12.7mm	
			l_t = 3.5 ±0.3 mm	l_t = 5.0 ±0.3 mm	SPQ	l_t = 25.0 ±2.0 mm	SPQ		SPQ
Pitch = 15.0 ±0.4 mm; d_t = 0.60 ±0.06 mm									
0.01	5.0 × 11.0 × 17.5	1.2	18**114**	18**314**	1000	18**514**	1000	18**914**	1100
0.015			18**116**	18**316**		18**516**		18**916**	
0.022	6.0 × 12.0 × 17.5	1.4	18**118**	18**318**	1000	18**518**	1000	18**918**	900
Pitch = 15.0 ±0.4 mm; d_t = 0.80 ±0.08 mm									
0.033	7.0 × 13.5 × 17.5	1.9	18**121**	18**321**	750	18**521**	500	18**921**	800
0.047	8.5 × 15.0 × 17.5	2.6	18**123**	18**323**	750	18**523**	500	18**923**	650
0.068	10.0 × 16.5 × 17.5	3.1	18**125**	18**325**	500	18**525**	450	18**925**	600

Interference suppression film capacitors MKP 338 1 X1

MKP 338 1 GENERAL DATA **PITCH 22.5 mm**

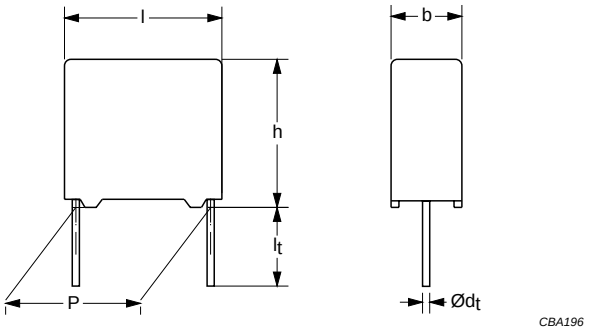


Fig.5 Outline.

Specific reference data for the 440 V AC (X1) capacitors

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 470$ nF	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
$C > 470$ nF	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$	–
Rated voltage pulse slope (dU/dt)R at 615 V:	150 V/µs		
R between leads, for $C \leq 0.33$ µF at 100 V; 1 minute	>15000 MΩ		
RC between leads, for $C > 0.33$ µF at 100 V; 1 minute	>5000 s		
R between leads and case; 100 V; 1 minute	>30000 MΩ		
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	3400 V; 1 minute		
Withstanding (AC) voltage between leads and case	2380 V; 1 minute		

Available 440 V AC (X1) versions

PACKAGING	DIMENSIONS	C-tol[1]	ORDERING	CATALOGUE NUMBER
Loose in box	$l_t = 3.5 \pm 0.3$ mm	±20%	preferred	see tables for details
		±10%	on request	
	$l_t = 5.0 \pm 1.0$ mm	±20%	preferred	
		±10%	on request	
	$l_t = 25.0 \pm 2.0$ mm	±20%	preferred	
		±10%	on request	
Taped on reel	H = 18.5 mm; for $P_0 = 12.7$ mm; reel diameter = 500 mm	±20%	on request	
		±10%	on request	

Note

1. ±5% tolerance values and other values are available on special request.

Interference suppression film capacitors MKP 338 1 X1

Pitch: 22.5 mm; C-tol = ±20% **U_{Rac} = 440 V**

(for reference: U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS b × h × l (mm)	MASS (g)	CATALOGUE NUMBER 2222 338 ..... AND PACKAGING						
			LOOSE IN BOX					REEL	
			short leads			long leads		H = 18.5 mm P_0 = 12.7mm	
			l_t = 3.5 ±0.3 mm	l_t = 5.0 ±0.3 mm	SPQ	l_t = 25.0 ±2.0 mm	SPQ		SPQ
Pitch = 22.5 ±0.4 mm; d_t = 0.80 ±0.08 mm									
0.15	8.5 × 18.0 × 26.0	4.4	10**154**	12**154**	200	14**154**	250	14**154**	450
0.22	10.0 × 19.5 × 26.0	5.5	10**224**	12**224**	200	14**224**	200	14**224**	350

Pitch: 22.5 mm; C-tol = ±10% **U_{Rac} = 440 V**

(for reference: U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS b × h × l (mm)	MASS (g)	CATALOGUE NUMBER 2222 338 ..... AND PACKAGING						
			LOOSE IN BOX					REEL	
			short leads			long leads		H = 18.5 mm P_0 = 12.7mm	
			l_t = 3.5 ±0.3 mm	l_t = 5.0 ±0.3 mm	SPQ	l_t = 25.0 ±2.0 mm	SPQ		SPQ
Pitch = 22.5 ±0.4 mm; d_t = 0.80 ±0.08 mm									
0.1	7.0 × 16.5 × 26.0	3.2	18**127**	18**327**	200	18**527**	250	18**927**	550
0.15	8.5 × 18.0 × 26.0	4.4	18**129**	18**329**	200	18**529**	250	18**929**	450

Interference suppression film capacitors MKP 338 1 X1

MKP 338 1 GENERAL DATA **PITCH 27.5 mm**

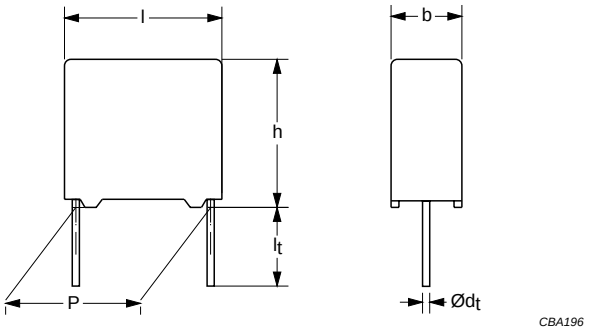


Fig.6 Outline.

Specific reference data for the 440 V AC (X1) capacitors

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 470$ nF	$\leq 10 \times 10^{-4}$	$\leq 20 \times 10^{-4}$	$\leq 100 \times 10^{-4}$
$C > 470$ nF	$\leq 20 \times 10^{-4}$	$\leq 70 \times 10^{-4}$	–
Rated voltage pulse slope (dU/dt)R at 615 V	100 V/µs		
R between leads, for $C \leq 0.33$ µF at 100 V; 1 minute	>15000 MΩ		
RC between leads, for $C > 0.33$ µF at 100 V; 1 minute	>5000 s		
R between leads and case; 100 V; 1 minute	>30000 MΩ		
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	3400 V; 1 minute		
Withstanding (AC) voltage between leads and case	2380 V; 1 minute		

Available 440 V AC (X1) versions

PACKAGING	DIMENSIONS	C-tol[1]	ORDERING	CATALOGUE NUMBER
Loose in box	$l_t = 3.5 \pm 0.3$ mm	±20%	preferred	see tables for details
		±10%	on request	
	$l_t = 5.0 \pm 1.0$ mm	±20%	preferred	
		±10%	on request	
	$l_t = 25.0 \pm 2.0$ mm	±20%	preferred	
		±10%	on request	

Note

1. ±5% tolerance values and other values are available on special request.

Interference suppression film capacitors MKP 338 1 X1

Pitch: 27.5 mm; C-tol = ±20% **U_{Rac} = 440 V**

(for reference: U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS b × h × l (mm)	MASS (g)	CATALOGUE NUMBER 2222 338 ..... AND PACKAGING				
			LOOSE IN BOX				
			short leads			long leads	
			l_t = 3.5 ±0.3 mm	l_t = 5.0 ±0.3 mm	SPQ	l_t = 25.0 ±2.0 mm	SPQ
Pitch = 27.5 ±0.4 mm; d_t = 0.80 ±0.08 mm							
0.33	13.0 × 23.0 × 31.0	10.4	10**334**	12**334**	100	14**334**	125
0.47	15.0 × 25.0 × 31.0	12.8	10**474**	12**474**	100	14**474**	125
0.68	18.0 × 28.0 × 31.0	17.2	10**684**	12**684**	100	14**684**	100
1	21.0 × 31.0 × 31.0	20.4	10**105**	12**105**	50	14**105**	75

Pitch: 27.5 mm; C-tol = ±10% **U_{Rac} = 440 V**

(for reference: U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS b × h × l (mm)	MASS (g)	CATALOGUE NUMBER 2222 338 ..... AND PACKAGING				
			LOOSE IN BOX				
			short leads			long leads	
			l_t = 3.5 ±0.3 mm	l_t = 5.0 ±0.3 mm	SPQ	l_t = 25.0 ±2.0 mm	SPQ
Pitch = 27.5 ±0.4 mm; d_t = 0.80 ±0.08 mm							
0.22	11.0 × 21.0 × 31.0	7.8	18**132**	18**332**	100	18**532**	125
0.33	13.0 × 23.0 × 31.0	12.8	18**134**	18**334**	100	18**534**	125
0.47	15.0 × 25.0 × 31.0	12.8	18**136**	18**336**	100	18**536**	125
0.68	18.0 × 28.0 × 31.0	17.2	18**138**	18**338**	100	18**538**	100

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
- Small stand-off pips allow removal of solder flux etc. during cleaning of the printed-circuit board.

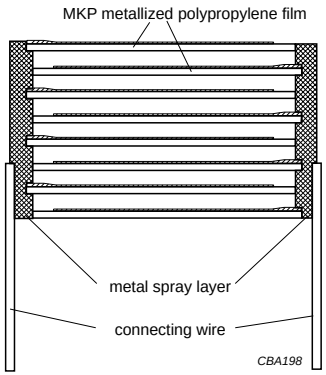


Fig.7 Construction.

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 means of automatic insertion machines.
For detailed tape specifications refer to this handbook, chapter *"Packaging information"*.

SPECIFIC METHOD OF MOUNTING TO WITHSTAND VIBRATION AND SHOCK

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

- For pitches ≤15 mm 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 60717"* as reference: $h_{max} \leq h + 0.3$ mm.

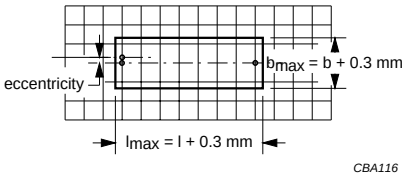


Fig.8 Lay-out.

Storage temperature

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

RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS

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

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

CHARACTERISTICS

Capacitance

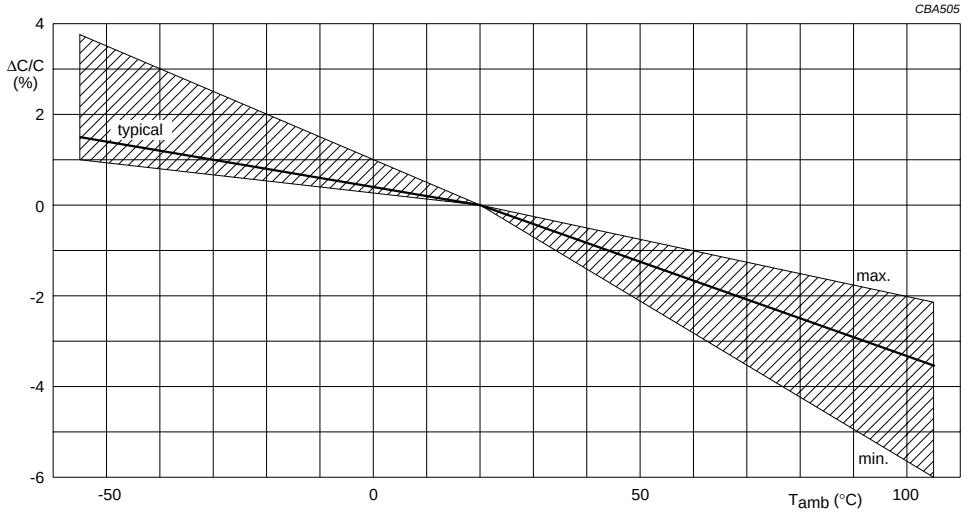


Fig.9 Capacitance change at 1 kHz as a function of temperature.

Tangent of loss angle

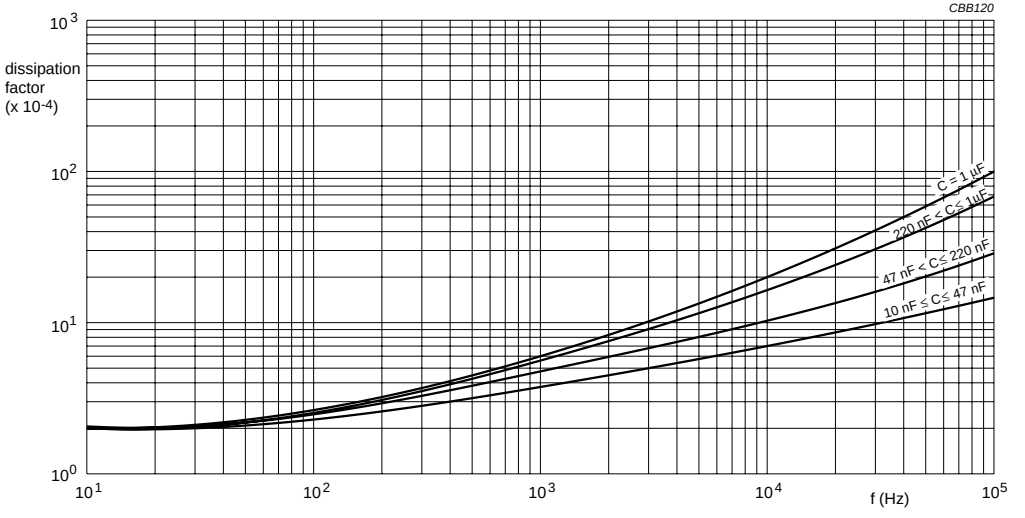


Fig.10 Tangent of loss angle as a function of frequency: typical curves.

Impedance

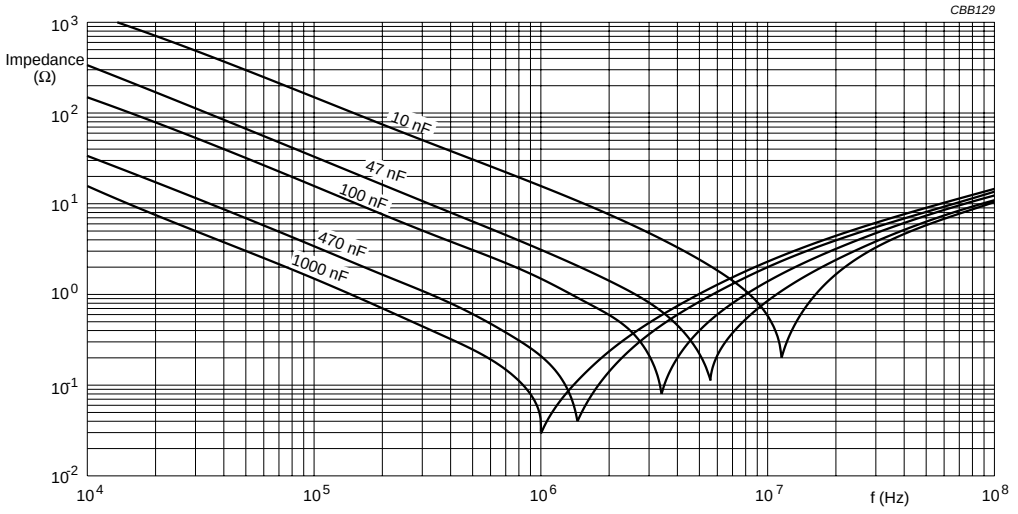


Fig.11 Impedance as a function of frequency: typical curves.

Resonant frequency

Fig.12 Resonant frequency as a function of capacitance: typical curve.

Maximum RMS voltage and AC current (sinewave) as a function of frequency for $T_{amb} \leq 100$ °C

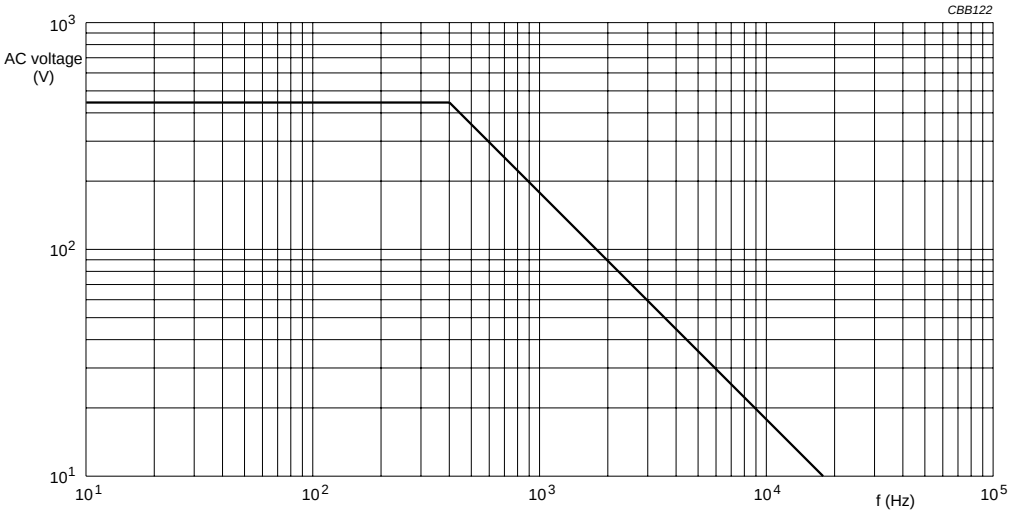


Fig.13 AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 100$ °C.

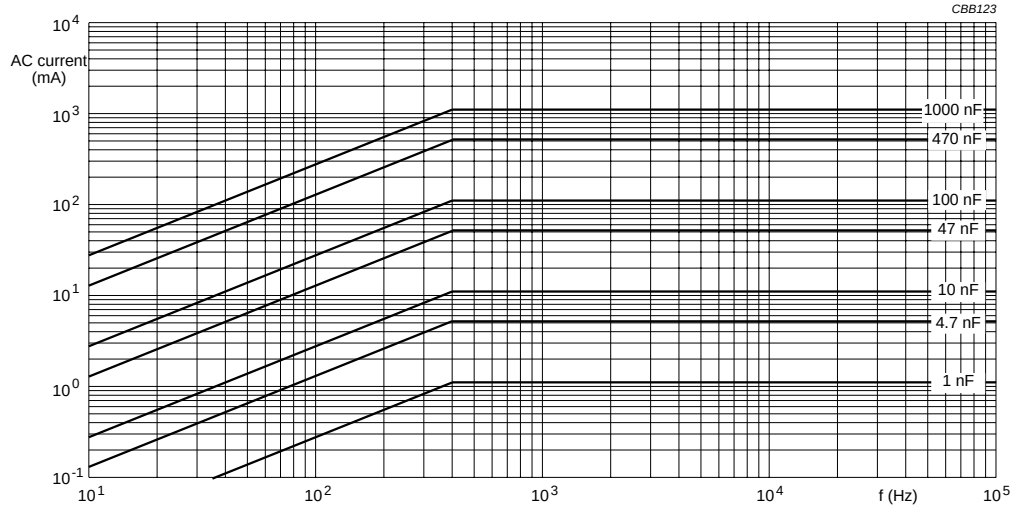


Fig.14 AC current (RMS value) as a function of frequency at $T_{amb} \leq 100$ °C.

Insulation resistance

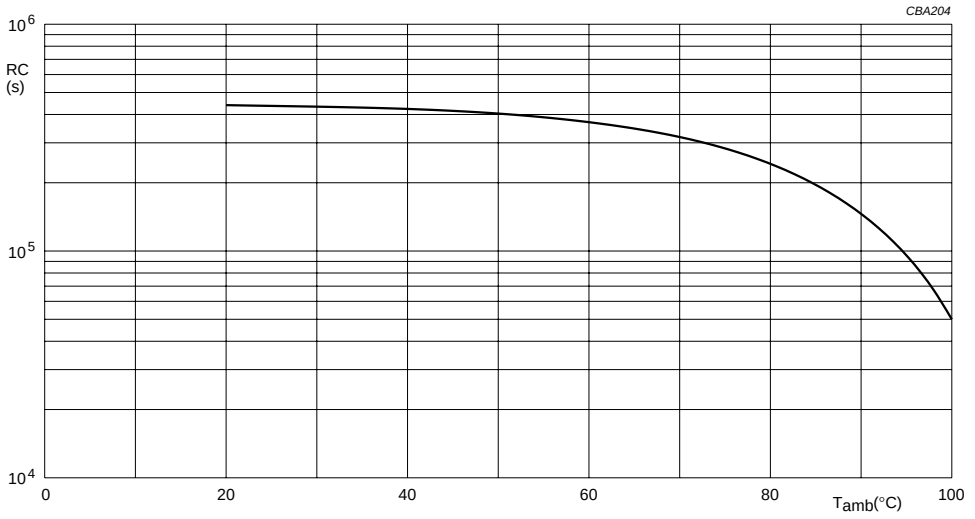


Fig.15 RC product as a function of ambient free air temperature: typical curve.

APPLICATION NOTES

- For X1 electromagnetic interference suppression in across the line applications (50/60 Hz) with a maximum mains voltage of 440 V (AC) ±10% instability.
- 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 383 ...or 2222 479 .....
- The maximum ambient temperature must not exceed 105 °C.
- Rated voltage pulse slope:
  - If the pulse voltage is lower than the rated voltage, the values of the specific reference data can be multiplied by 615 V (DC) and divided by the applied voltage.

MARKING

Product marking

The capacitors are marked by laser print; on the top for pitch ≥ 22.5 mm (see Fig.17), or on the top and one side for pitch = 15 mm (see Fig.16) with the following information:

1. Rated capacitance code in accordance with "IEC 60062"
2. Tolerance on rated capacitance; M = ±20%; K = ±10%; J = ±5%
3. Rated (AC) voltage (440 V)
4. Sub-class (e.g. X1)
5. Manufacturer's type designation (e.g. 338 1)
6. Code for dielectric material (MKP)
7. Manufacturer
8. Year and week of manufacture (e.g. 0020)
9. Safety approvals: products will be marked with approvals depending on the available marking space per product. Although all approvals remain valid as indicated in the reference data.

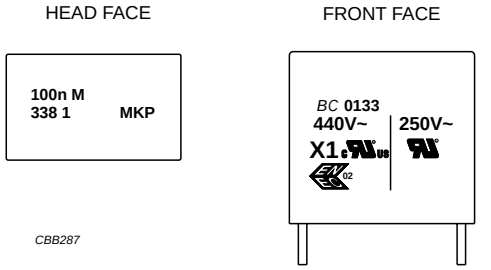


Fig.16 Example of marking for a capacitor with pitch = 15 mm.

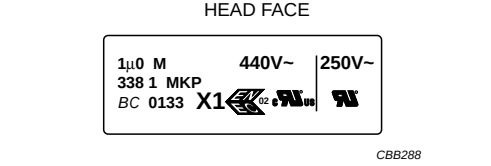
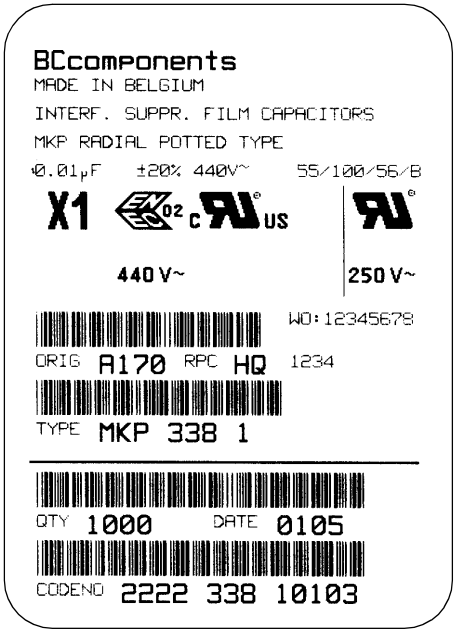


Fig.17 Example of marking for a capacitor with pitch = 22.5 or 27.5 mm.

Package marking

The package containing the capacitors is marked as shown Fig.18.



Barcode label marking

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 60068-1"*)
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)

Fig.18 Barcode label.

QUICK REFERENCE TEST REQUIREMENTS

TEST	PROCEDURE (quick reference)	REQUIREMENTS
Robustness of leads		
Tensile strength: *"IEC 60068-2-21"*	load 10 N; 10 s	no visible damage legible marking $\lvert\Delta C/C\rvert \leq 5\%$ $\Delta\tan\delta \leq 80 \times 10^{-4}$ at 10 kHz
Bending: *"IEC 60068-2-21"*	load 5 N; 4 × 90 °	
Resistance to soldering heat: *"IEC 60068-2-20"*	solder bath: 260 °C; 10 s solder bath: 350 °C; 3.5 s	
Component solvent resistance	isopropyl alcohol; 23 °C; 5 minutes	
Robustness of component		
Rapid change of temperature: *"IEC 60068-2-14"*	5 cycles 1 cycle = 30 minutes at –55 °C and 30 minutes at 100 °C	$\lvert\Delta C/C\rvert \leq 5\%$ $\Delta\tan\delta \leq 80 \times 10^{-4}$ at 10 kHz
Vibration: *"IEC 60068-2-6"*	10 to 55 Hz; amplitude 0.75 mm; 6 hours	
Shock: *"IEC 60068-2-27"*	half sinewave; 490 m/s^2; 11 ms	
Climatic sequence		
Dry heat: *"IEC 60068-2-2"*	16 hours; 100 °C	$\lvert\Delta C/C\rvert \leq 5\%$ $\Delta\tan\delta \leq 80 \times 10^{-4}$ at 10 kHz $R_{ins} \geq 50\%$ of specified value
Damp heat, cyclic, test Db, first cycle: *"IEC 60068-2-30"*		
Cold: *"IEC 60068-2-1"*	2 hours; –55 °C	
Damp heat, cyclic, test Db, remaining cycles: *"IEC 60068-2-30"*		
Voltage proof: *"IEC 60384-14"*	V_p = 1900 V (DC); 1 minute	
Other applicable tests		
Damp heat, steady state: *"IEC 60068-2-3"*	21 days; 40 °C; 90 to 95% RH no load V_p = 1900 V (DC); 1 minute	$\lvert\Delta C/C\rvert \leq 5\%$ $\Delta\tan\delta \leq 70 \times 10^{-4}$ $R_{ins} \geq 50\%$ of specified value
Endurance (AC): *"IEC 60384-14"*	3 × 4.0 kV pulse voltage 1000 hours; 1.25 × U_{Rac} at 100 °C; once per hour; 0.1 s; 1000 V (RMS) via resistor of 47 Ω; V_p = 1900 V (DC); 1 minute	$\lvert\Delta C/C\rvert \leq 10\%$ $\Delta\tan\delta \leq 80 \times 10^{-4}$ at 10 kHz $R_{ins} \geq 50\%$ of specified value

TEST	PROCEDURE (quick reference)	REQUIREMENTS
Charge and discharge: *"IEC 60384-14"*	10000 cycles; 5 ms; 1.5 × dV/dt	$\|\Delta C/C\| \leq 10\%$ $\Delta\tan\delta \leq 80 \times 10^{-4}$ at 10 kHz $R_{ins} \geq 50\%$ of specified value
Passive flammability: *"IEC 60384-14"*	class B	no burning
Active flammability: *"IEC 60384-14"*	20 × 4 kV discharge	no burning
Heat storage: *"IEC 60384-14"*	1000 hours; 100 °C	$\|\Delta C/C\| \leq 5\%$ $\Delta\tan\delta \leq 80 \times 10^{-4}$ at 10 kHz
Resistance to soldering heat with preheating: *"IEC 60384-14"*	preheating: 100 °C; solder bath: 260 °C; 10 s	$\|\Delta C/C\| \leq 5\%$ $\Delta\tan\delta \leq 80 \times 10^{-4}$ at 10 kHz
Active flammability test	voltage proof up to 2 × peak impulse voltage of 4.13 or until breakdown (100 V/sec, current limited 2mA) failed capacitors connected to a 250 V (AC) power supply during 5 minutes	no burning