

DATA SHEET

KP 460 to 464 **Polypropylene film foil capacitors**

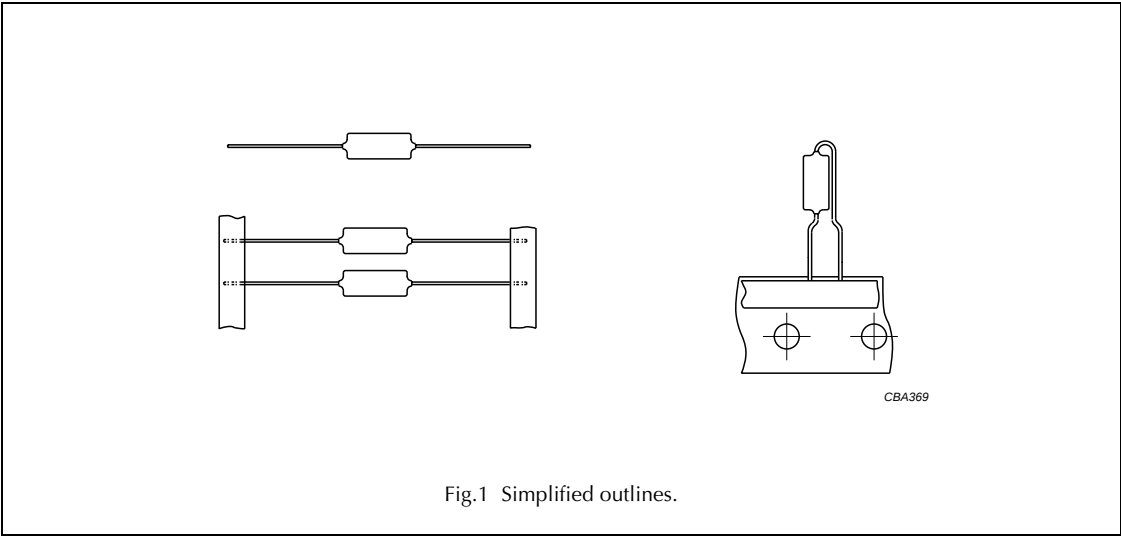
Product specification
Supersedes data of 2001 Sep 13
File under BCcomponents, BC05

2002 Oct 09

Polypropylene film foil capacitors

KP 460 to 464

KP AXIAL EPOXY LACQUERED TYPE



FEATURES

- Supplied loose in box, taped on reel or unidirectional.
- Intermediate values are available of the E96 series.

APPLICATIONS

- In circuits where close tolerance, reliability and low losses are of prime importance, for example: tuned circuits, filter and timing networks.

DETAIL SPECIFICATION

For more detailed data and test requirements see “Type detail specification HQN-384-13/101”.

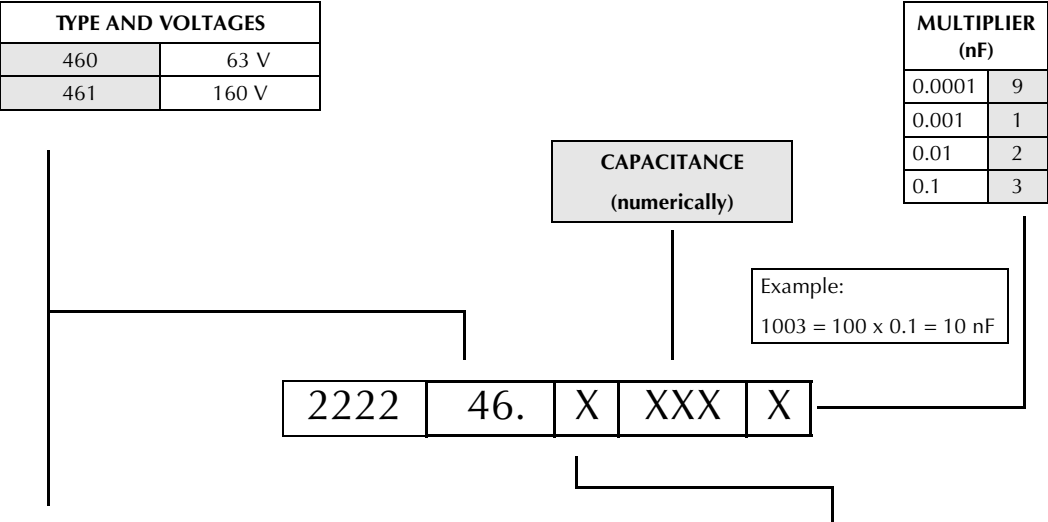
QUICK REFERENCE DATA

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 (DC) voltage	63 V; 160 V; 250 V; 400 V; 630 V
Rated (AC) voltage	40 V; 63 V; 125 V; 160 V; 200 V
Climatic category	40/100/56
Rated temperature	85 °C
Maximum application temperature	100 °C
Reference specification	IEC 60384-13
Stability class for:	
63; 160; 250 V versions	class 1
400; 630 V versions	class 2

Polypropylene film foil capacitors

KP 460 to 464

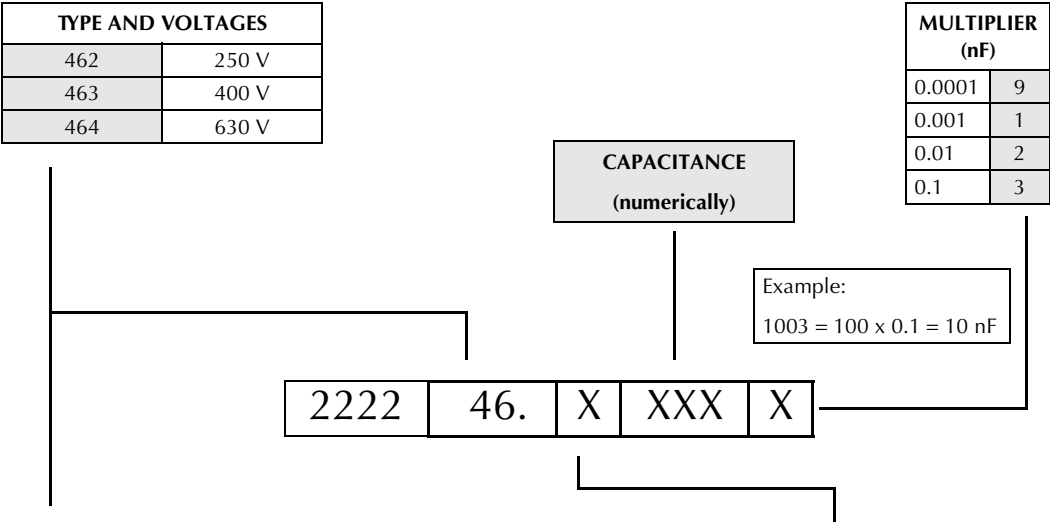
COMPOSITION OF CATALOGUE NUMBER



TYPE	PACKAGING	LEAD CONFIGURATION AND TAPE DISTANCE	PREFERRED TYPES		
			C-TOL	63 V	160 V
460	Taped on reel	tape distance 63.5 mm	±1%	8	
			±2%	7	
461	Taped on reel	tape distance 63.5 mm	±1%		8
			±2%		7
			ON REQUEST		
460	Taped on reel	tape distance 63.5 mm	±5%	6	
	Loose in box	lead length 30.0 or 28.0 mm	±1%	4	
			±2%	3	
			±5%	2	
	Unidirectional		±1%	1	
			±2%	0	
461	Taped on reel	tape distance 63.5 mm	±5%		6
	Loose in box	lead length 30.0 or 28.0 mm	±1%		4
			±2%		3
			±5%		2
	Unidirectional		±1%		1
			±2%		0

Polypropylene film foil capacitors

KP 460 to 464

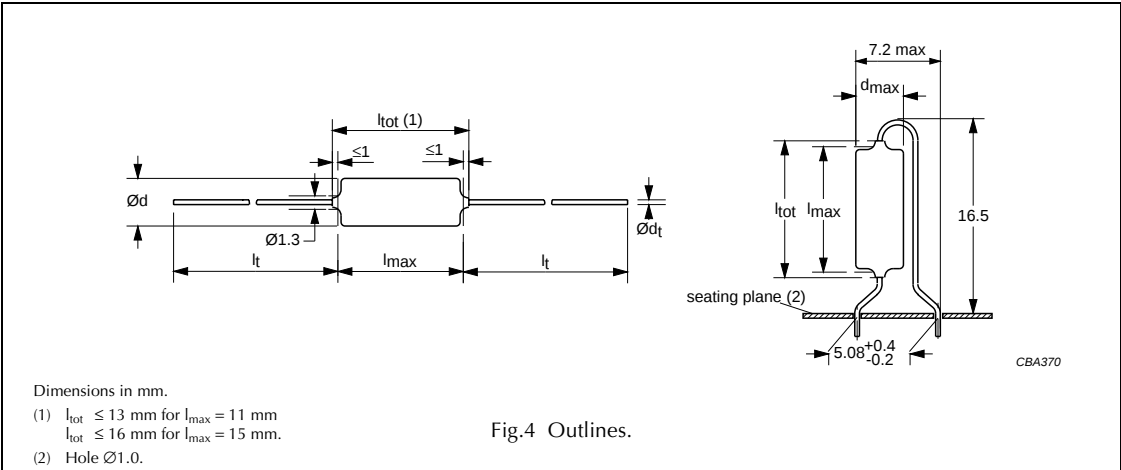


TYPE	PACKAGING	LEAD CONFIGURATION AND TAPE DISTANCE	PREFERRED TYPES			
			C-TOL	250 V	400 V	630 V
462	Taped on reel	tape distance 63.5 mm	±1%	8		
			±2%	7		
463	Taped on reel	tape distance 63.5 mm	±1%		8	
			±2%		7	
464	Taped on reel	tape distance 63.5 mm	±1%			8
			±2%			7
			ON REQUEST			
462	Taped on reel	tape distance 63.5 mm	±5%	6		
	Loose in box	lead length 30.0 or 28.0 mm	±1%	4		
			±2%	3		
			±5%	2		
	Unidirectional		±1%	1		
			±2%	0		
463	Taped on reel	tape distance 63.5 mm	±5%		6	
	Loose in box	lead length 30.0 or 28.0 mm	±1%		4	
			±2%		3	
			±5%		2	
	Unidirectional		±1%		1	
			±2%		0	
464	Taped on reel	tape distance 63.5 mm	±5%			6
	Loose in box	lead length 30.0 or 28.0 mm	±1%			4
			±2%			3
			±5%			2
	Unidirectional		±1%			1
			±2%			0

Polypropylene film foil capacitors

KP 460

KP 460 GENERAL DATA



Specific reference data for the 63 V DC capacitors

DESCRIPTION	VALUE	
Tangent of loss angle: 5000 pF < C ≤ 20000 pF 20000 pF < C ≤ 47000 pF C > 47000 pF	at 1 kHz	at 100 kHz
	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
	$\leq 5 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
	$\leq 5 \times 10^{-4}$	$\leq 40 \times 10^{-4}$
Rated voltage pulse slope (dU/dt)R at 63 V (DC)	10000 V/μs	
R between leads; at 10 V; 1 minute	>100000 MΩ	
R between interconnected leads and case; 10 V; 1 minute	>100000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	126 V; 1 minute	
Withstanding (DC) voltage between leads and case	400 V; 1 minute	

Available 63 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel	±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; notes	±1%	2222 460 1....	on request
	±2%	2222 460 0....	on request

Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammopack	52.5
	63.5
Taped on reel	52.5

Polypropylene film foil capacitors

KP 460

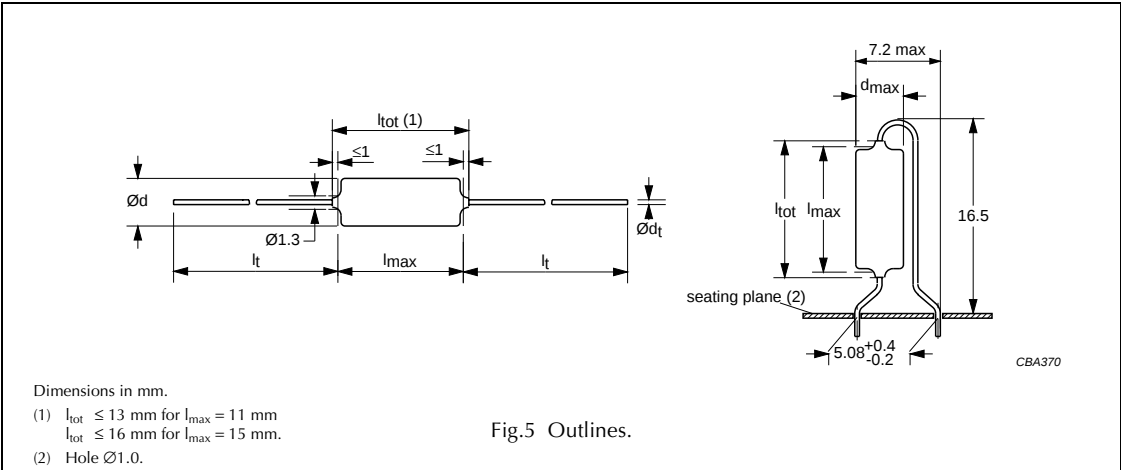
 $U_{Rdc} = 63 \text{ V}$; $U_{Rac} = 40 \text{ V}$

C (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										
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ				
			last 5 digits of catalogue number				last 5 digits of catalogue number						
l _t = 30.0 mm; d _t = 0.60 ±0.06 mm													
6800 7500 8200 9100	5.0 × 11.0	0.5 0.5 0.6 0.6	76802 77502 78202 79102	86802 87502 88202 89102	2500	250	06802 07502 08202 09102	16802 17502 18202 19102	1000				
l _t = 28.0 mm; d _t = 0.60 ±0.06 mm													
10000 11000 12000 13000 15000 16000 18000 20000 22000		6.0 × 15.0	0.6 0.6 0.7 0.8 0.7 0.7 0.8 0.8 0.9	71003 71103 71203 71303 71503 71603 71803 72003 72203			81003 81103 81203 81303 81503 81603 81803 82003 82203	1500		250			
24000 27000			0.9 1.0	72403 72703			82403 82703						1500 250
30000 33000 36000	1.1 1.2 1.2		73003 73303 73603	83003 83303 83603	1000 200								
39000 43000	1.3 1.4		73903 74303	83903 84303	1000 150								
47000 51000	1.5 1.6	74703 75103	84703 85103	1000 150									
56000 62000	1.7 1.8	75603 76203	85603 86203	1000 125									

Polypropylene film foil capacitors

KP 461

KP 461 GENERAL DATA



Specific reference data for the 160 V DC capacitors

DESCRIPTION	VALUE	
Tangent of loss angle: 1 000 pF < C ≤ 5 000 pF 5 000 pF < C ≤ 20 000 pF 20 000 pF < C ≤ 39 000 pF	at 1 kHz	at 100 kHz
	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
	$\leq 5 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
Rated voltage pulse slope (dU/dt)R at 160 V (DC)	10 000 V/μs	
R between leads; at 100 V; 1 minute	>100 000 MΩ	
R between interconnected leads and case; 100 V; 1 minute	>100 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	320 V; 1 minute	
Withstanding (DC) voltage between leads and case	400 V; 1 minute	

Available 160 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel	±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	±1%	2222 461 1....	on request
	±2%	2222 461 0....	on request

Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammopack	52.5
	63.5
Taped on reel	52.5

Polypropylene film foil capacitors

KP 461

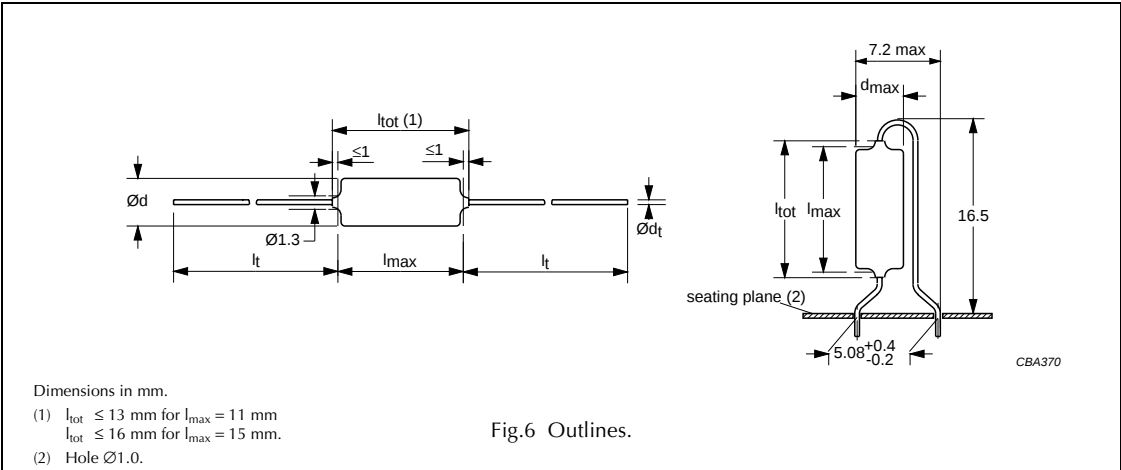
 $U_{Rdc} = 160 \text{ V}; U_{Rac} = 63 \text{ V}$

C (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						
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ
			last 5 digits of catalogue number				last 5 digits of catalogue number		
l _t = 30.0 mm; d _t = 0.60 ±0.06 mm									
3 600	5.0 × 11.0	0.5	73602	83602	2500	250	03602	13602	1 000
3 900		0.5	73902	83902			03902	13902	
4 300		0.5	74302	84302			04302	14302	
4 700		0.5	74702	84702			04702	14702	
5 100		0.5	75102	85102			05102	15102	
5 600		0.5	75602	85602			05602	15602	
6 200		0.6	76202	86202			06202	16202	
l _t = 28.0 mm; d _t = 0.60 ±0.06 mm									
6 800	6.0 × 15.0	0.4	76802	86802	1 500	250			
7 500		0.7	77502	87502					
8 200		0.6	78202	88202					
9 100		0.6	79102	89102					
10 000		0.7	71003	81003					
11 000		0.7	71103	81103					
12 000		0.7	71203	81203					
13 000	6.5 × 15.0	0.8	71303	81303	1 500	250			
15 000		0.8	71503	81503					
16 000		0.9	71603	81603					
18 000	7.0 × 15.0	0.9	71803	81803	1 500	250			
20 000		1.0	72003	82003					
22 000	7.5 × 15.0	1.1	72203	82203	1 000	200			
24 000		1.1	72403	82403					
27 000	8.0 × 15.0	1.2	72703	82703	1 000	150			
30 000		1.3	73003	83003					
33 000		1.4	73303	83303					
36 000	8.5 × 15.0	1.5	73603	83603	1 000	125			
39 000		1.6	73903	83903					

Polypropylene film foil capacitors

KP 462

KP 462 GENERAL DATA



Specific reference data for the 250 V DC capacitors

DESCRIPTION	VALUE	
Tangent of loss angle: 1 000 pF < C ≤ 5 000 pF 5 000 pF < C ≤ 20 000 pF 20 000 pF < C ≤ 22 000 pF	at 1 kHz	at 100 kHz
	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
	$\leq 5 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
Rated voltage pulse slope (dU/dt)R at 250 V (DC)	10 000 V/μs	
R between leads; at 100 V; 1 minute	>100 000 MΩ	
R between interconnected leads and case; 100 V; 1 minute	>100 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	500 V; 1 minute	
Withstanding (DC) voltage between leads and case	500 V; 1 minute	

Available 250 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel	±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	±1%	2222 462 1....	on request
	±2%	2222 462 0....	on request

Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammopack	52.5
	63.5
Taped on reel	52.5

Polypropylene film foil capacitors

KP 462

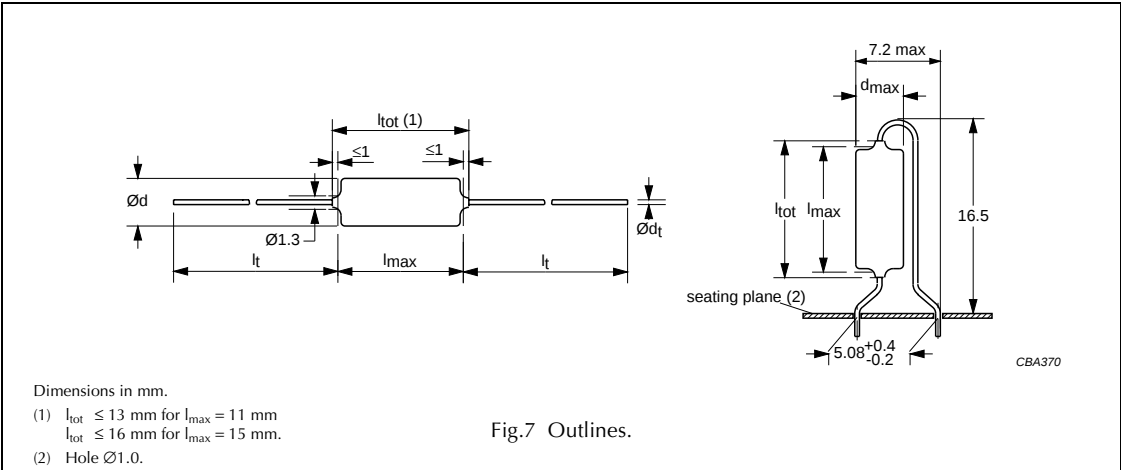
 $U_{Rdc} = 250 \text{ V}; U_{Rac} = 125 \text{ V}$

C (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						
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ
			last 5 digits of catalogue number				last 5 digits of catalogue number		
l _t = 30.0 mm; d _t = 0.60 ±0.06 mm									
1 200	5.0 × 11.0	0.5	71202	81202	2 500	250	01202	11202	1 000
1 300		0.5	71302	81302			01302	11302	
1 500		0.4	71502	81502			01502	11502	
1 600		0.5	71602	81602			01602	11602	
1 800		0.6	71802	81802			01802	11802	
2 000		0.6	72002	82002			02002	12002	
2 200		0.5	72202	82202			02202	12202	
2 400		0.5	72402	82402			02402	12402	
2 700		0.5	72702	82702			02702	12702	
3 000		0.5	73002	83002			03002	13002	
3 300		0.5	73302	83302			03302	13302	
l _t = 28.0 mm; d _t = 0.60 ±0.06 mm									
3 600	6.0 × 15.0	0.5	73602	83602	1 500	250			
3 900		0.5	73902	83902					
4 300		0.6	74302	84302					
4 700		0.6	74702	84702					
5 100		0.6	75102	85102					
5 600		0.6	75602	85602					
6 200		0.7	76202	86202					
6 800		0.7	76802	86802					
7 500		0.7	77502	87502					
8 200	6.5 × 15.0	0.8	78202	88202	1 500	250			
9 100		0.8	79102	89102					
10 000		0.9	71003	81003					
11 000	7.0 × 15.0	0.9	71103	81103	1 000	200			
12 000		1.0	71203	81203					
13 000		1.0	71303	81303					
15 000	7.5 × 15.0	1.1	71503	81503	1 000	150			
16 000		1.2	71603	81603					
18 000	8.0 × 15.0	1.3	71803	81803	1 000	150			
20 000	8.5 × 15.0	1.4	72003	82003	1 000	125			
22 000		1.5	72203	82203					

Polypropylene film foil capacitors

KP 463

KP 463 GENERAL DATA



Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1MHz ⁽¹⁾
Tangent of loss angle:			
$C \leq 1000 \text{ pF}$	$\leq 5 \times 10^{-4}$	—	$\leq 10 \times 10^{-4}$
$1000 \text{ pF} < C \leq 5000 \text{ pF}$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	—
Rated voltage pulse slope (dU/dt)R at 400 V (DC)	10000 V/ μ s		
R between leads; at 100 V; 1 minute	$>100000 \text{ M}\Omega$		
R between interconnected leads and case; 100 V; 1 minute	$>100000 \text{ M}\Omega$		
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	800 V; 1 minute		
Withstanding (DC) voltage between leads and case	800 V; 1 minute		

Note

1. For unidirectional capacitors $\leq 13 \times 10^{-4}$.

Available 400 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel; notes	$\pm 1\%$	2222 463 8...	preferred
	$\pm 2\%$	2222 463 7...	preferred
	$\pm 5\%$	2222 463 6...	on request
Loose in box	$\pm 1\%$	2222 463 4...	on request
	$\pm 2\%$	2222 463 3...	on request
	$\pm 5\%$	2222 463 2...	on request
Unidirectional	$\pm 1\%$	2222 463 1...	on request
	$\pm 2\%$	2222 463 0...	on request

Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammopack	52.5
	63.5
Taped on reel	52.5

Polypropylene film foil capacitors

KP 463

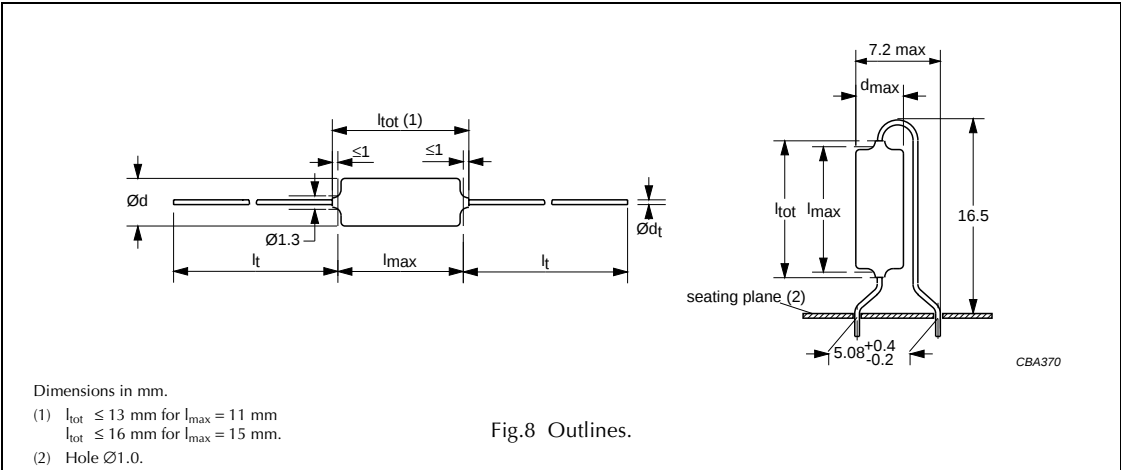
 $U_{Rdc} = 400 \text{ V}$; $U_{Rac} = 160 \text{ V}$

C (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						
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ
			last 5 digits of catalogue number				last 5 digits of catalogue number		
l _t = 30.0 mm; d _t = 0.60 ±0.06 mm									
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	
l _t = 28.0 mm; d _t = 0.60 ±0.06 mm									
1200	6.0 × 15.0	0.5	71202	81202	1500	250			
1300		0.5	71302	81302					
1500		0.5	71502	81502					
1600		0.5	71602	81602					
1800		0.5	71802	81802					
2000	0.5	72002	82002						
2200	6.5 × 15.0	0.5	72202	82202	1500	250			
2400		0.5	72402	82402					
2700		0.6	72702	82702					
3000		0.7	73002	83002					
3300	7.0 × 15.0	0.7	73302	83302	1000	200			
3600		0.7	73602	83602					
3900		0.8	73902	83902					
4300	7.5 × 15.0	0.8	74302	84302	1000	150			
4700		0.9	74702	84702					
5100		0.9	75102	85102					
5600	8.0 × 15.0	1.0	75602	85602	1000	150			
6200		1.0	76202	86202					
6800	8.5 × 15.0	1.1	76802	86802	1000	125			
7500		1.2	77502	87502					
8200		1.3	78202	88202					

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 1 MHz ⁽¹⁾
Tangent of loss angle: $C \leq 560 \text{ pF}$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope (dU/dt)R at 630 V (DC)	10000 V/ μ s	
R between leads; at 500 V; 1 minute	$>100000 \text{ M}\Omega$	
R between interconnected leads and case; 500 V; 1 minute	$>100000 \text{ M}\Omega$	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	1260 V; 1 minute	
Withstanding (DC) voltage between leads and case	1260 V; 1 minute	

Note

1. 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	$\pm 1\%$	2222 464 8....	preferred
	$\pm 2\%$	2222 464 7....	preferred
	$\pm 5\%$	2222 464 6....	on request
Loose in box	$\pm 1\%$	2222 464 4....	on request
	$\pm 2\%$	2222 464 3....	on request
	$\pm 5\%$	2222 464 2....	on request
Unidirectional	$\pm 1\%$	2222 464 1....	on request
	$\pm 2\%$	2222 464 0....	on request

Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammopack	52.5
	63.5
Taped on reel	52.5

Polypropylene film foil capacitors

KP 464

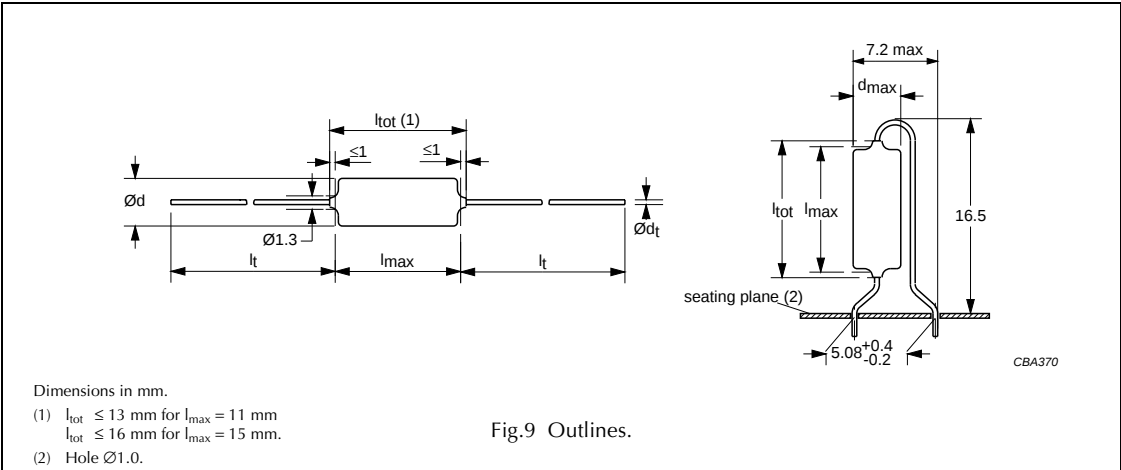
 $U_{Rdc} = 630 \text{ V}; U_{Rac} = 200 \text{ V}$

C (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						
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ	SPQ	C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ
			last 5 digits of catalogue number				last 5 digits of catalogue number		
$l_t = 30.0 \text{ mm}; d_t = 0.60 \pm 0.06 \text{ mm}$									
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	

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
Tangent of loss angle:			
$C \leq 1\,000 \text{ pF}$	$\leq 5 \times 10^{-4}$	–	$\leq 10 \times 10^{-4}$
$1\,000 \text{ pF} < C \leq 4\,700 \text{ pF}$	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$	–
Rated voltage pulse slope $(dU/dt)R$ at 630 V (DC)	10000 V/ μ s		
R between leads; at 500 V; 1 minute	$>100\,000 \text{ M}\Omega$		
R between interconnected leads and case; 500 V; 1 minute	$>100\,000 \text{ M}\Omega$		
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	1260 V; 1 minute		
Withstanding (DC) voltage between leads and case	1260 V; 1 minute		

Available 630 V DC versions

PACKAGING	C-tol	FIRST 8 DIGITS OF CATALOGUE NUMBER	ORDERING
Taped on reel	$\pm 1\%$	2222 464 8....	preferred
	$\pm 2\%$	2222 464 7....	preferred
	$\pm 5\%$	2222 464 6....	on request
Loose in box	$\pm 1\%$	2222 464 4....	on request
	$\pm 2\%$	2222 464 3....	on request
	$\pm 5\%$	2222 464 2....	on request
Unidirectional	$\pm 1\%$	2222 464 1....	on request
	$\pm 2\%$	2222 464 0....	on request

Available on request

PACKAGING	TAPE DISTANCE (mm)
Taped in ammopack	52.5
	63.5
Taped on reel	52.5

Polypropylene film foil capacitors

KP 460 to 464

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

C (E 24) (pF)	DIMENSIONS $d_{\max} \times l_{\max}$ (mm)	MASS (g)	CATALOGUE NUMBER 2222 464 AND PACKAGING			
			TAPED ON REEL			LOOSE IN BOX
			TAPE DISTANCE 63.5 mm			
			C-tol = $\pm 2\%$	C-tol = $\pm 1\%$	SPQ	SPQ
			last 5 digits of catalogue number			
$l_t = 28.0 \text{ mm}; d_t = 0.60 \pm 0.06 \text{ mm}$						
620	6.0×15.0	0.5	76201	86201	1500	250
680		0.5	76801	86801		
750		0.5	77501	87501		
820		0.5	78201	88201		
910		0.5	79101	89101		
1000		0.5	71002	81002		
1100		0.5	71102	81102		
1200		0.5	71202	81202		
1300	6.5×15.0	0.6	71302	81302	1500	250
1500		0.6	71502	81502		
1600		0.7	71602	81602		
1800		0.7	71802	81802		
2000	7.0×15.0	0.8	72002	82002	1000	200
2200		0.9	72202	82202		
2400		0.9	72402	82402		
2700	7.5×15.0	0.9	72702	82702	1000	150
3000		1.0	73002	83002		
3300	8.0×15.0	1.1	73302	83302	1000	150
3600		1.2	73602	83602		
3900		1.3	73902	83902		
4300	8.5×15.0	1.4	74302	84302	1000	125
4700		1.5	74702	84702		

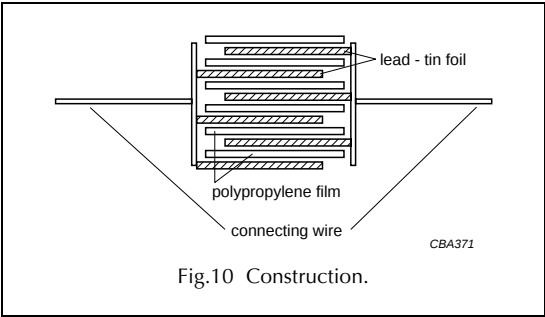
Polypropylene film foil capacitors

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 11 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.

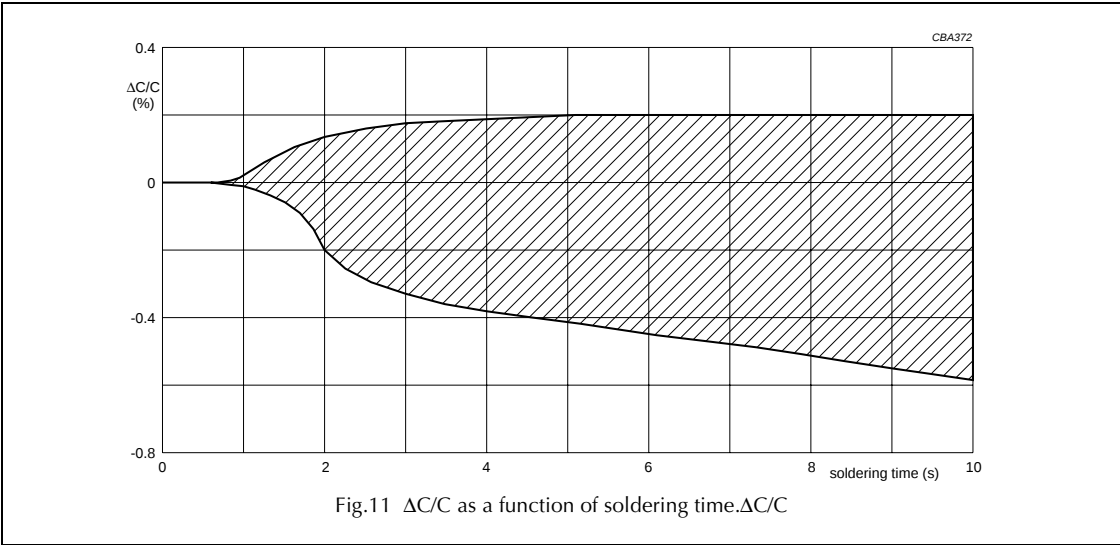
Storage temperature

- 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 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 over 96 ± 4 hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.



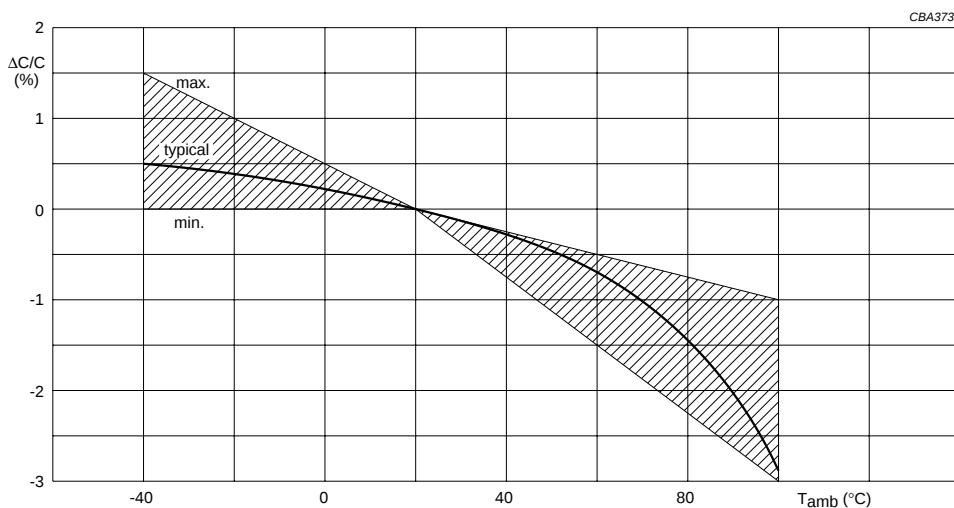
Polypropylene film foil capacitors

KP 460 to 464

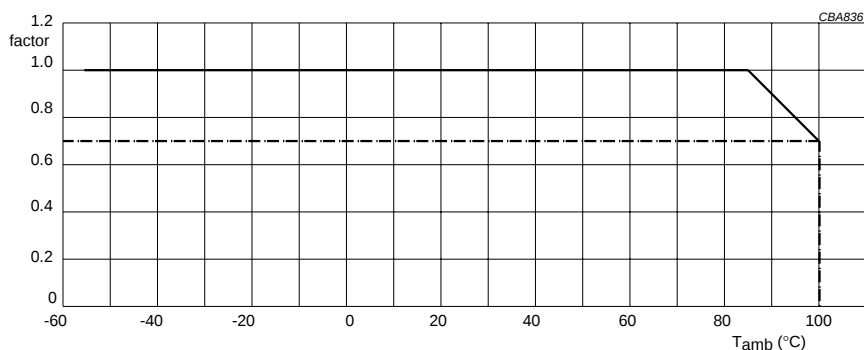
CHARACTERISTICS

Capacitance

- 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: $-(250 \pm 120) \times 10^{-6}/K$.



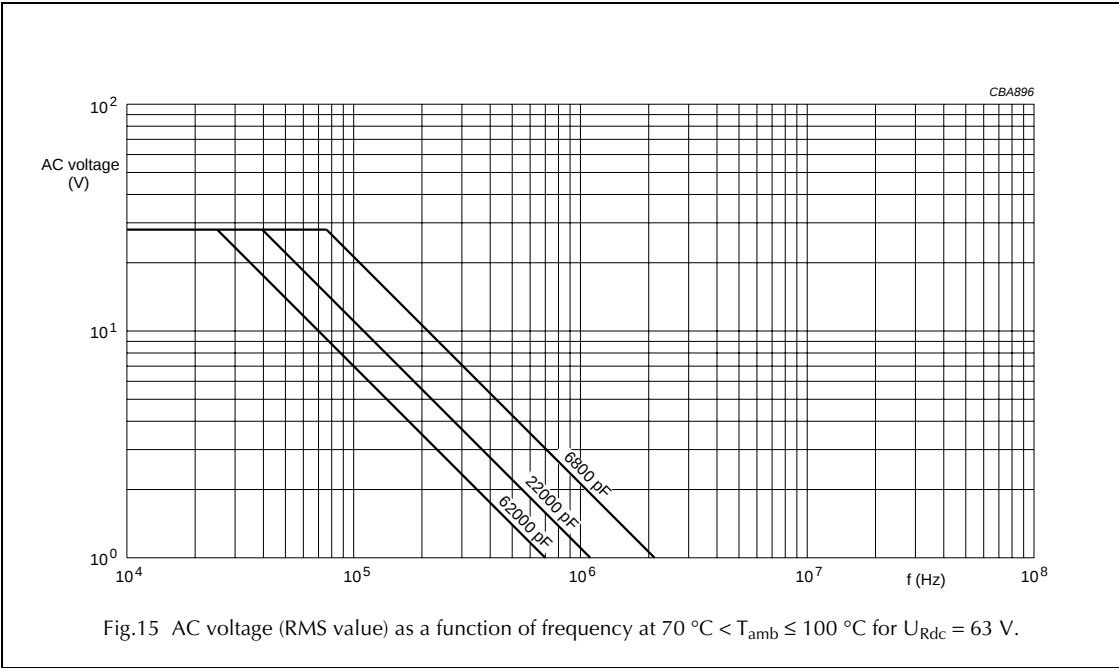
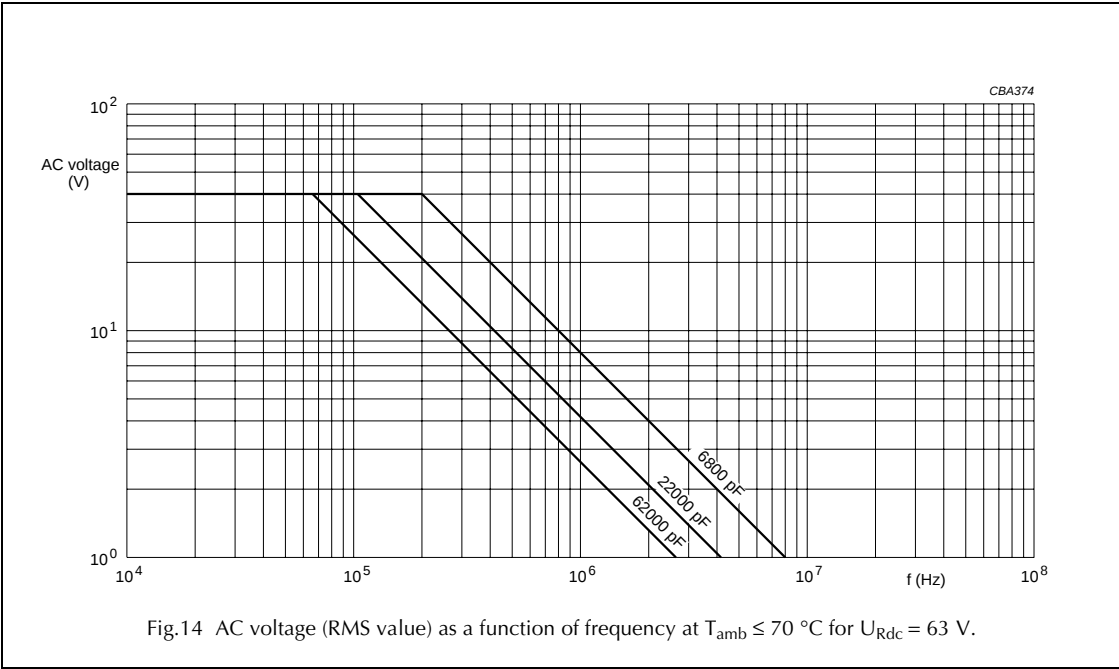
Maximum DC voltage as a function of temperature



Polypropylene film foil capacitors

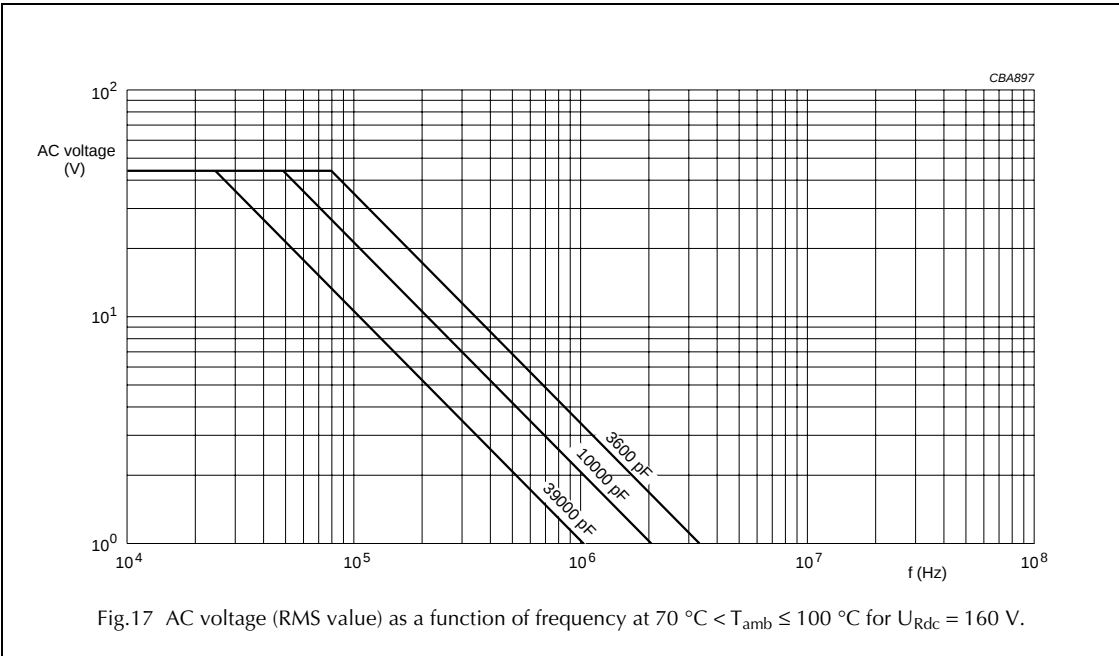
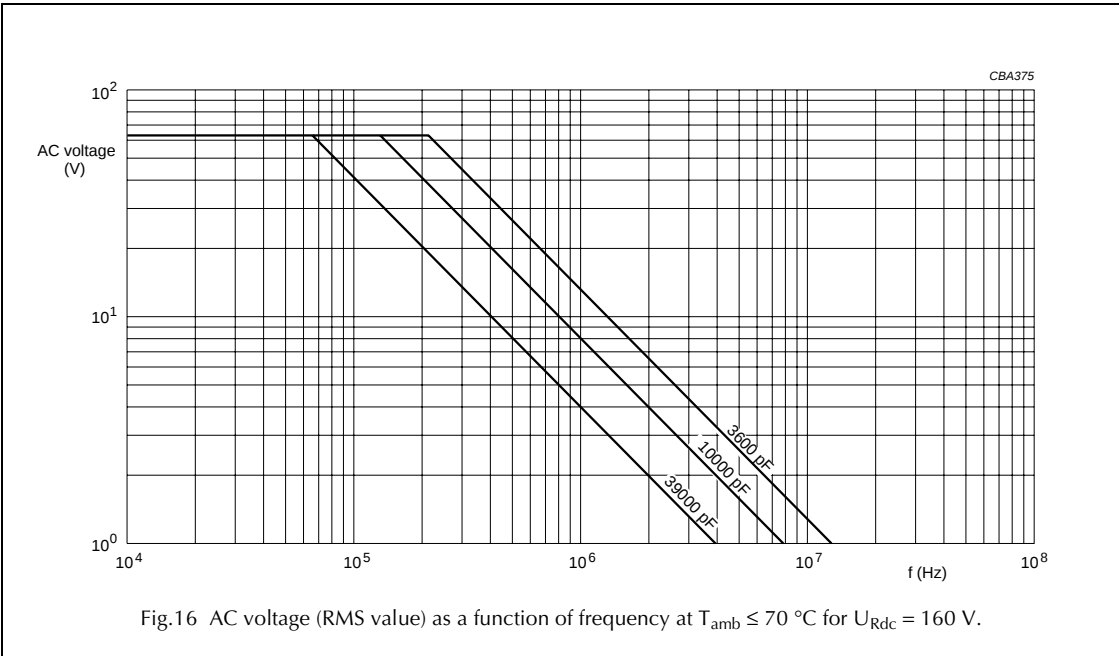
KP 460 to 464

Maximum RMS voltage (sinewave) as a function of frequency



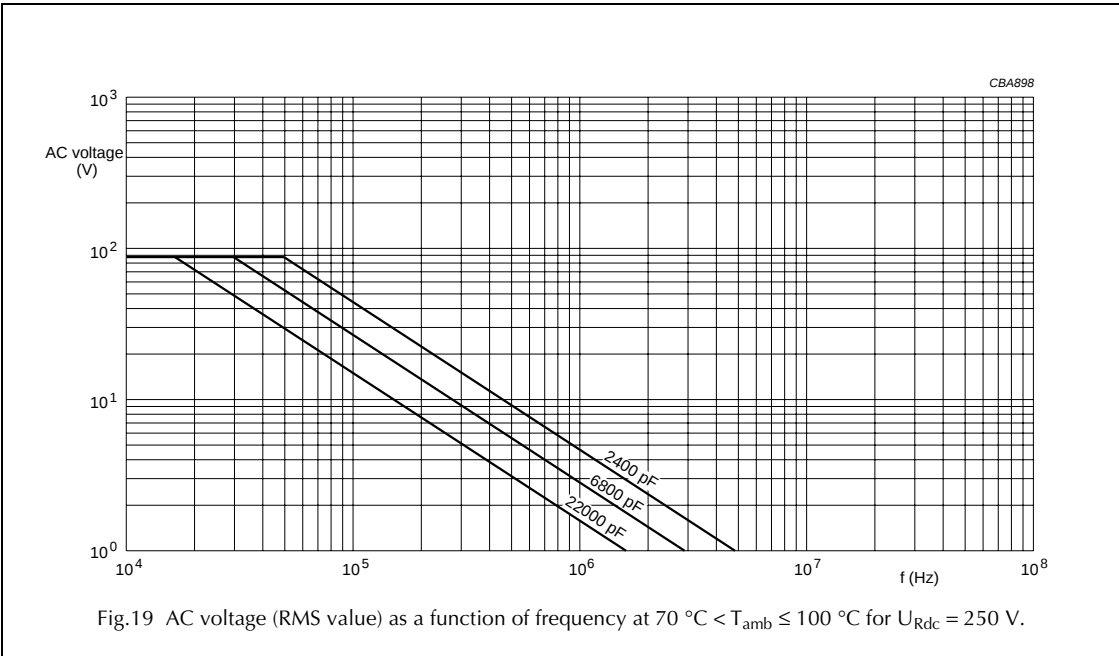
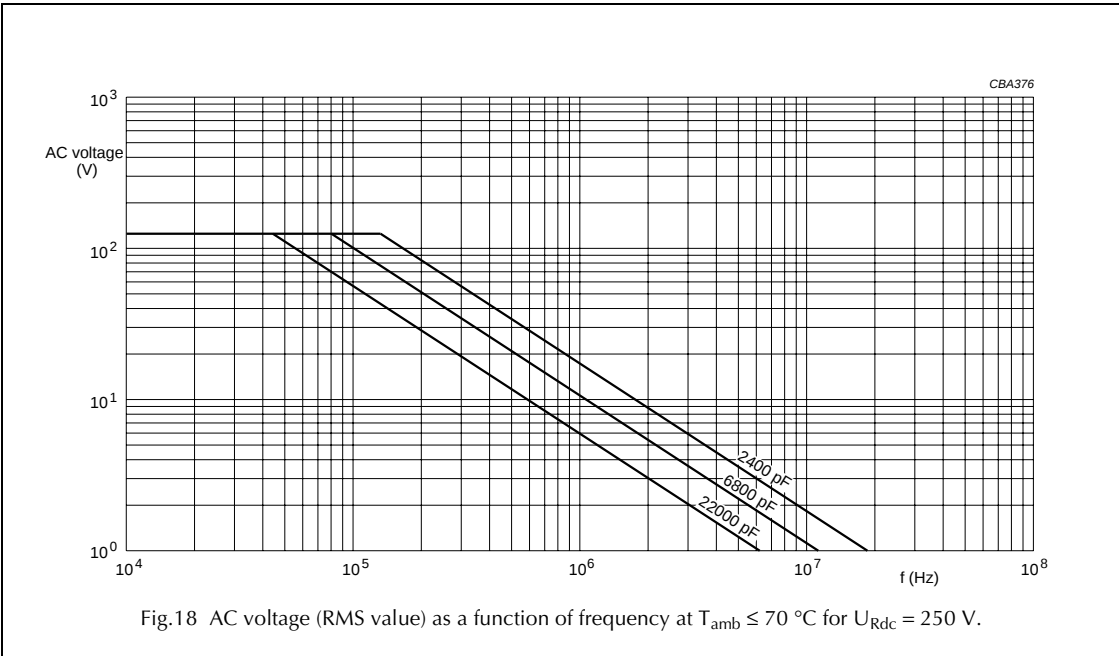
Polypropylene film foil capacitors

KP 460 to 464



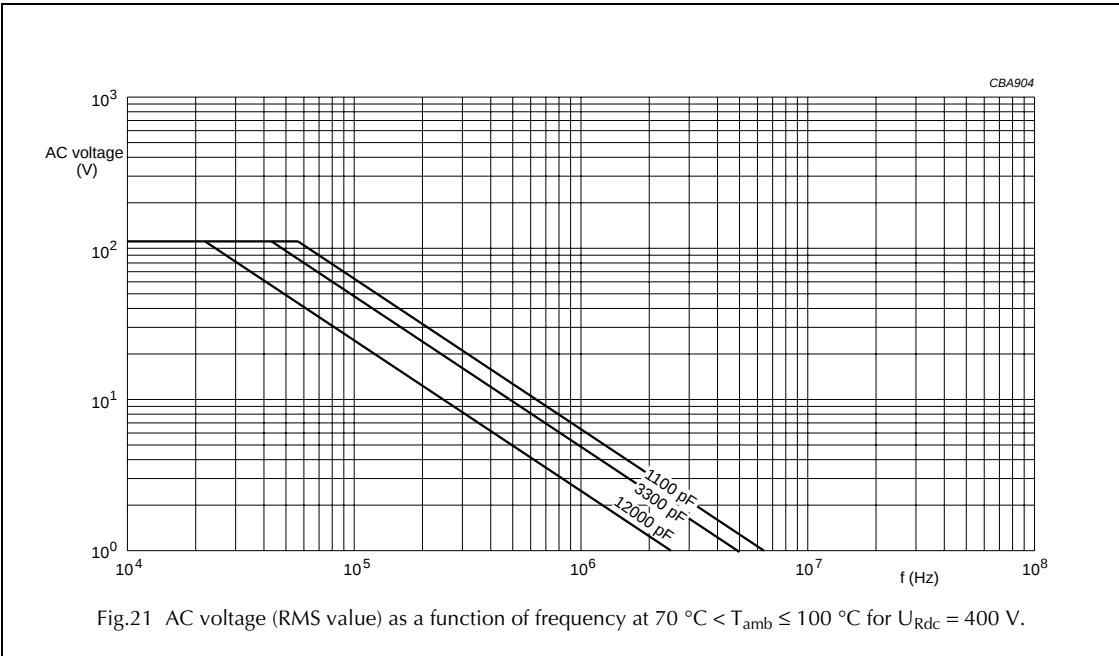
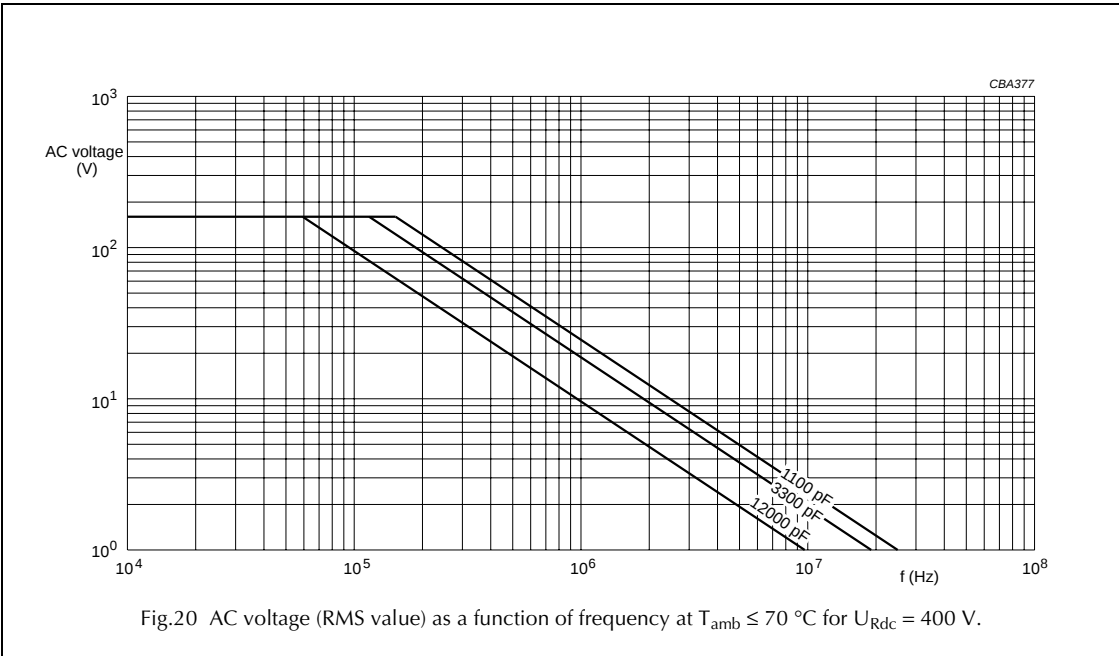
Polypropylene film foil capacitors

KP 460 to 464



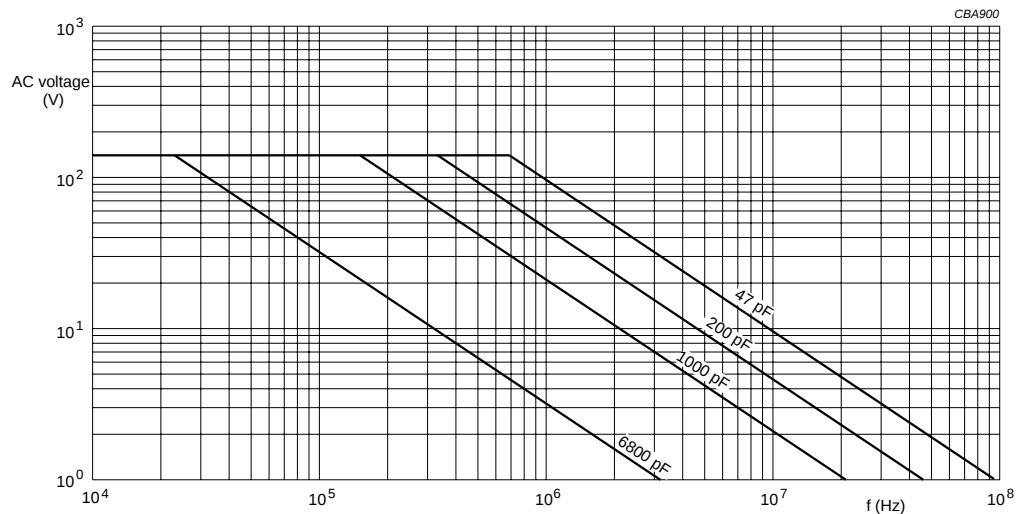
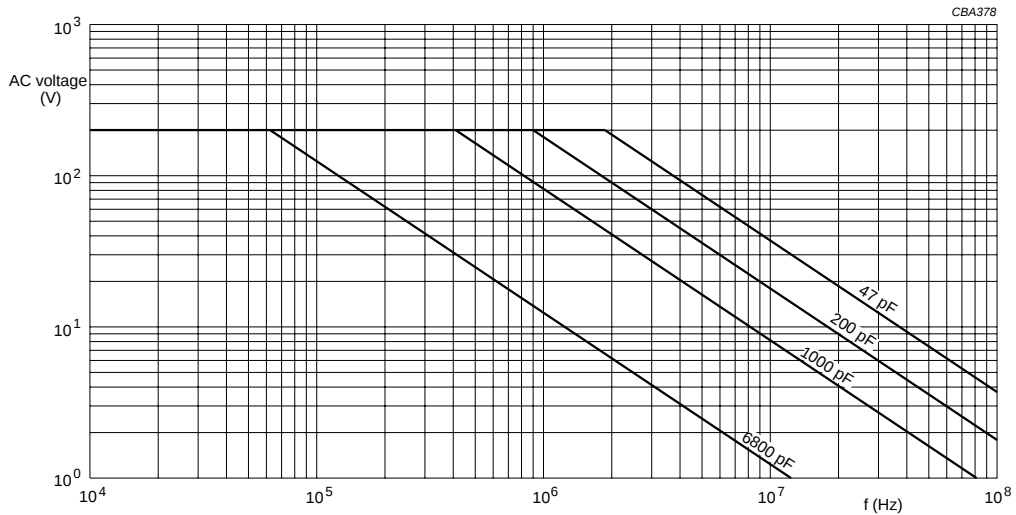
Polypropylene film foil capacitors

KP 460 to 464



Polypropylene film foil capacitors

KP 460 to 464



Maximum RMS current (sinewave) as a function of frequency

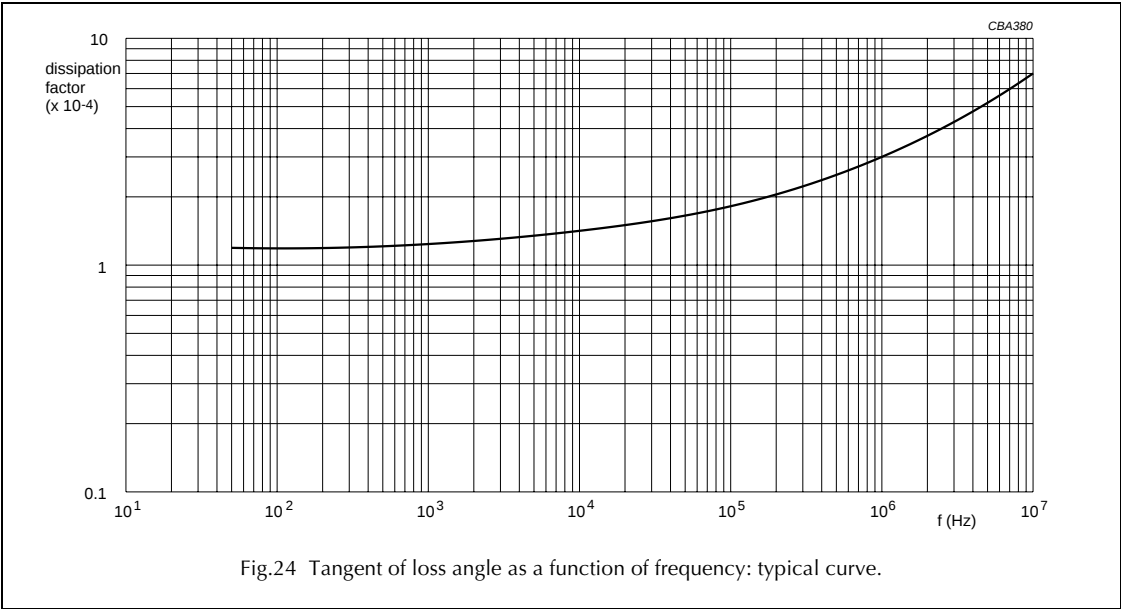
The maximum RMS current is defined by $I_{ac} = \omega \times C \times U_{ac}$.

U_{ac} is the maximum AC voltage depending on the ambient temperature in Figs 14 to 23.

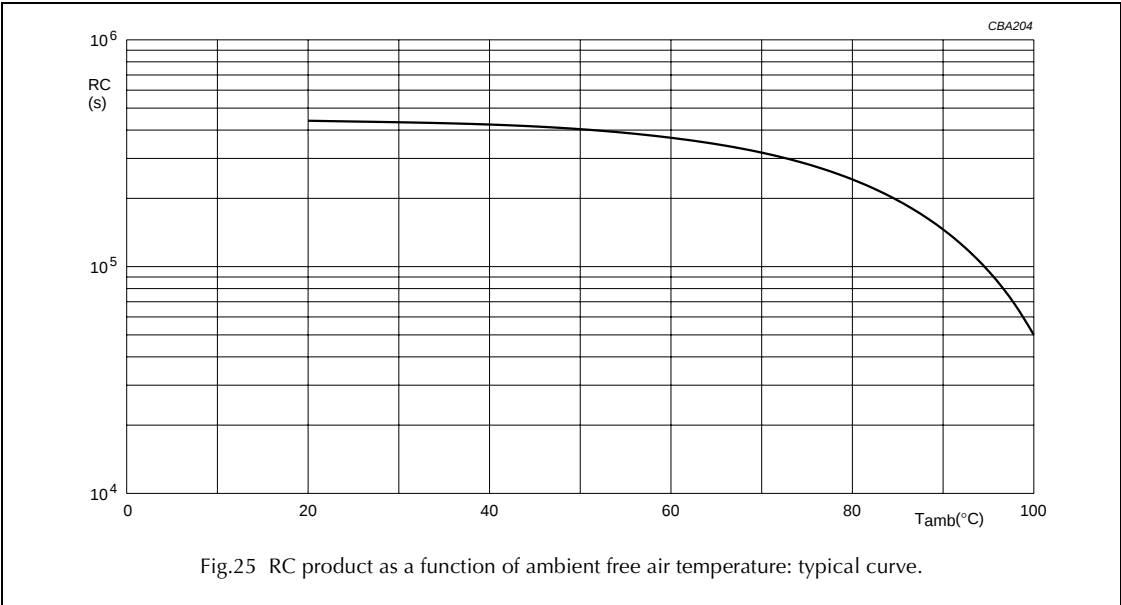
Polypropylene film foil capacitors

KP 460 to 464

Tangent of loss angle



Insulation resistance



Inductance

- L dependent on lead and capacitor length: ≤10 nH/cm.

Polypropylene film foil capacitors

KP 460 to 464

Maximum allowed component temperature rise (ΔT) as a function of the ambient temperature (T_{amb})

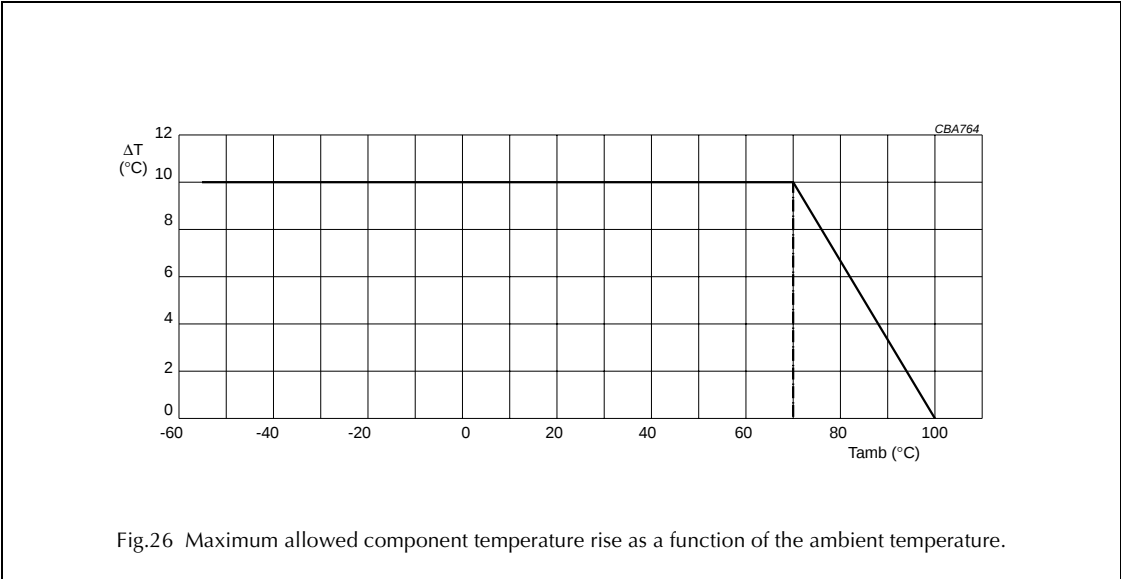


Fig.26 Maximum allowed component temperature rise as a function of the ambient temperature.

Heat conductivity (G) as a function of body dimensions in mW/°C

Table 1 Heat conductivity

$d_{max} \times l_{max}$ (mm)	G (mW/°C)
5.0×11.0	2.7
5.5×15.0	4.3
6.0×15.0	4.7
7.0×15.0	5.3
7.5×15.0	5.7
8.0×15.0	6.3
8.5×15.0	6.7

Power dissipation and maximum component temperature rise

The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free air ambient temperature.

The power dissipation can be calculated according chapter “Introduction”, section “Maximum power dissipation”.

The component temperature rise (ΔT) can be measured (see section “Measuring the component temperature” for more details) or calculated by $\Delta T = P/G$:

- ΔT = component temperature rise (°C).
- P = power dissipation of the component (mW).
- G = heat conductivity of the component (mW/°C).

Polypropylene film foil capacitors

KP 460 to 464

Measuring the component temperature

A thermocouple must be attached to the capacitor body as in Fig.27.

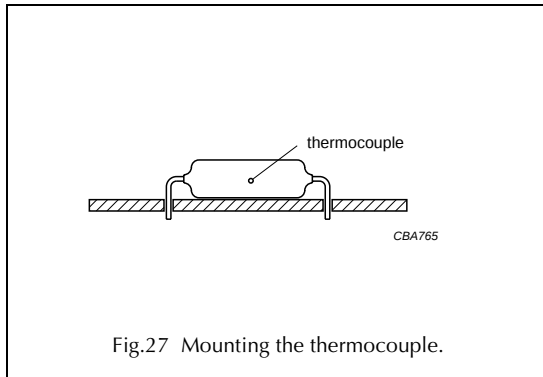


Fig.27 Mounting the thermocouple.

The temperature is measured in unloaded (T_{amb}) and maximum loaded condition (T_c).

The temperature rise is given by $\Delta T = T_c - T_{amb}$.

To avoid radiation or convection, the capacitor should be tested in a wind-free box.

Application note and limiting conditions

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 the maximum U_{p-p} to avoid the ionisation inception level.
3. The voltage pulse slope (dU/dt) shall not exceed the rated voltage pulse slope in an RC-circuit at rated voltage and without ringing. If the pulse voltage is lower than the rated DC voltage, the rated voltage pulse slope may be multiplied by U_{Rdc} and divided by the applied voltage.

For all other pulses following equation must be fulfilled:

$$2 \times \int_0^T \left(\frac{dU}{dt} \right)^2 \times dt < U_{Rdc} \times \left(\frac{dU}{dt} \right)_{rated}$$

T is the pulse duration.

4. The maximum component surface temperature rise must be lower than the limits in Fig.26.
5. The maximum component surface temperature must be lower than 100 °C.
6. The capacitance drift is influenced by the soldering conditions (see section "Soldering conditions" for more details).

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 60062”
2. Tolerance on rated capacitance: F = ±1%; G ±2%; J = ±5%
3. Rated (DC) voltage (e.g. 63 V)
4. Code for dielectric material (KP)
5. Production date code in accordance with “IEC 60062; clause 5”
6. Manufacturer.

MARKING EXAMPLE

8n2
G 63
KPK2 (see Table 2)
BC.

Table 2 Letter codes for year and numbers for month of production

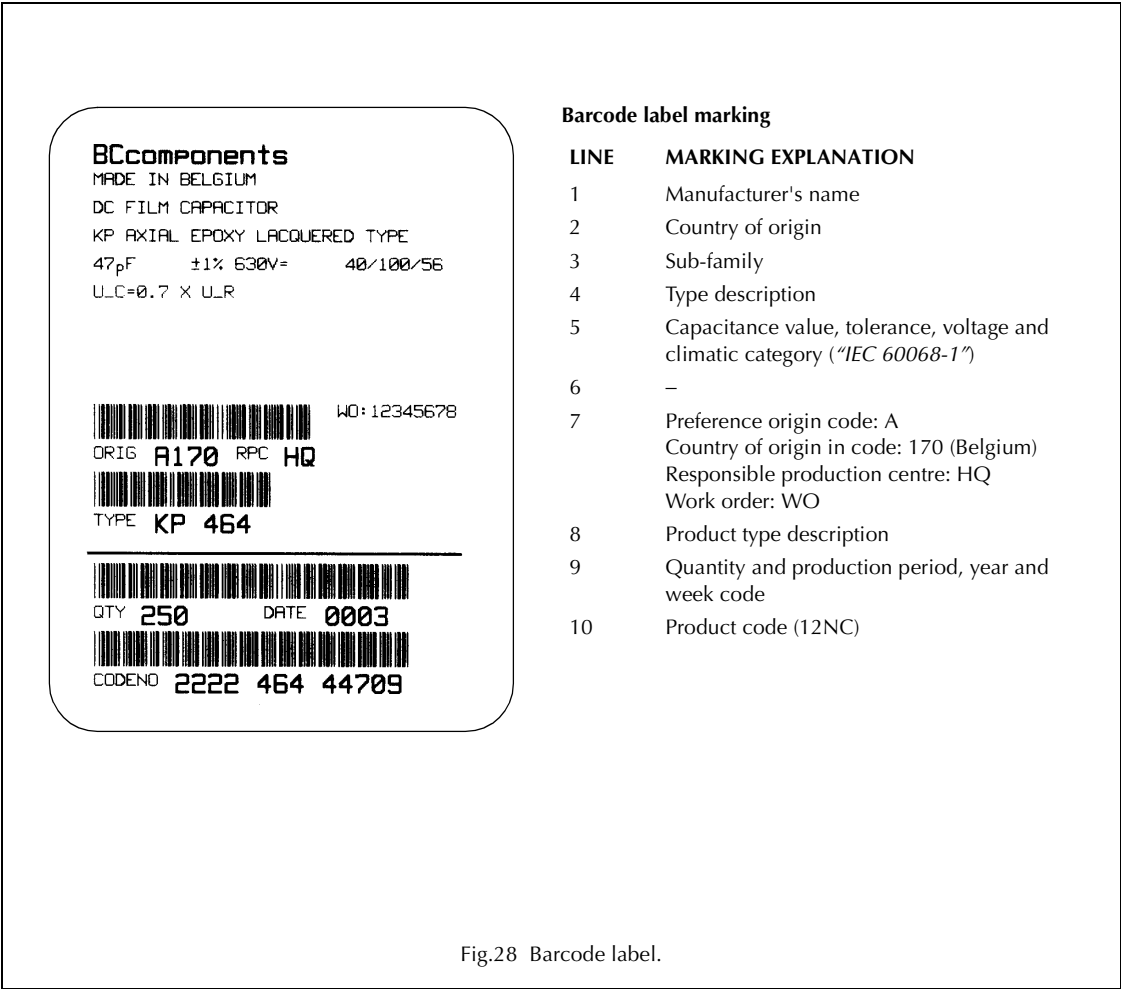
YEAR	LETTER CODE	MONTH	CODE
1998	K	January	1
1999	L	February	2
2000	M	March	3
2001	N	April	4
2002	P	May	5
2003	R	June	6
2004	S	July	7
2005	T	August	8
2006	U	September	9
2007	V	October	O
2008	W	November	N
2009	X	December	D

Polypropylene film foil capacitors

KP 460 to 464

Package marking

The package containing the capacitors is marked as shown in Fig.28.



Polypropylene film foil capacitors

KP 460 to 464

QUICK REFERENCE TEST REQUIREMENTS

TEST	PROCEDURE (quick reference)	REQUIREMENTS
Robustness of leads		
Tensile: "IEC 60068-2-21"	load 10 N; 10 s	no visible damage legible marking $ \Delta C/C \leq 2\% +1 \text{ pF}$ ($C \leq 1\,100 \text{ pF}$) $ \Delta C/C \leq 1\%$ ($C > 1\,100 \text{ pF}$)
Bending: "IEC 60068-2-21"	load 5 N; $4 \times 90^\circ$	
Torsion:	$2 \times 180^\circ$	
Resistance to soldering heat: "IEC 60068-2-20"	solder bath: 260 °C; 5 s	
Component solvent resistance	isopropyl alcohol; 23 °C; 5 minutes	
Robustness of component		
Vibration: "IEC 60068-2-6"	10 to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s ² ; 6 hours	$ \Delta C/C \leq 2\% +1 \text{ pF}$ ($C \leq 1\,100 \text{ pF}$) $ \Delta C/C \leq 1\%$ ($C > 1\,100 \text{ pF}$) $R_{\text{ins}} \geq 50\%$ of specified value
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	$ \Delta C/C \leq 1\% +1 \text{ pF}$ ($C \leq 1\,100 \text{ pF}$) $ \Delta C/C \leq 1\%$ ($C > 1\,100 \text{ pF}$) $R_{\text{ins}} \geq 50\%$ of specified value
Damp heat, cyclic, test Db, first cycle: "IEC 60068-2-30"		
Cold: "IEC 60068-2-1"	2 hours; −40 °C	
Damp heat, cyclic, test Db, remaining cycles: "IEC 60068-2-30"		
Other applicable tests		
Damp heat, steady state: "IEC 60068-2-3"	56 days; 40 °C; 90 to 95% RH	$ \Delta C/C \leq 1\% +1 \text{ pF}$ ($C \leq 1\,100 \text{ pF}$) $ \Delta C/C \leq 1\%$ ($C > 1\,100 \text{ pF}$) $R_{\text{ins}} \geq 50\%$ of specified value
Endurance (DC): "IEC 60384-13"	1 000 hours; $1.5 \times U_{\text{Rdc}}$; 85 °C $1.05 \times U_{\text{Rdc}}$; 100 °C	
Variation of capacitance with temperature: "IEC 60384-13"	static method; one cycle	$ \Delta C/C \leq 2\% +1 \text{ pF}$ ($C \leq 1\,100 \text{ pF}$) $ \Delta C/C \leq 1\%$ ($C > 1\,100 \text{ pF}$) $R_{\text{ins}} \geq 10\,000 \text{ M}\Omega$
Heat storage: "IEC 60384-13"	1 000 hours; 100 °C	
Resistance to soldering heat with preheating: "IEC 60384-13"	body temperature: 100 °C; bath temperature: 260 °C; dwell time: 5 s	$ \Delta C/C \leq 2\% +1 \text{ pF}$ ($C \leq 1\,100 \text{ pF}$) $ \Delta C/C \leq 1\%$ ($C > 1\,100 \text{ pF}$)