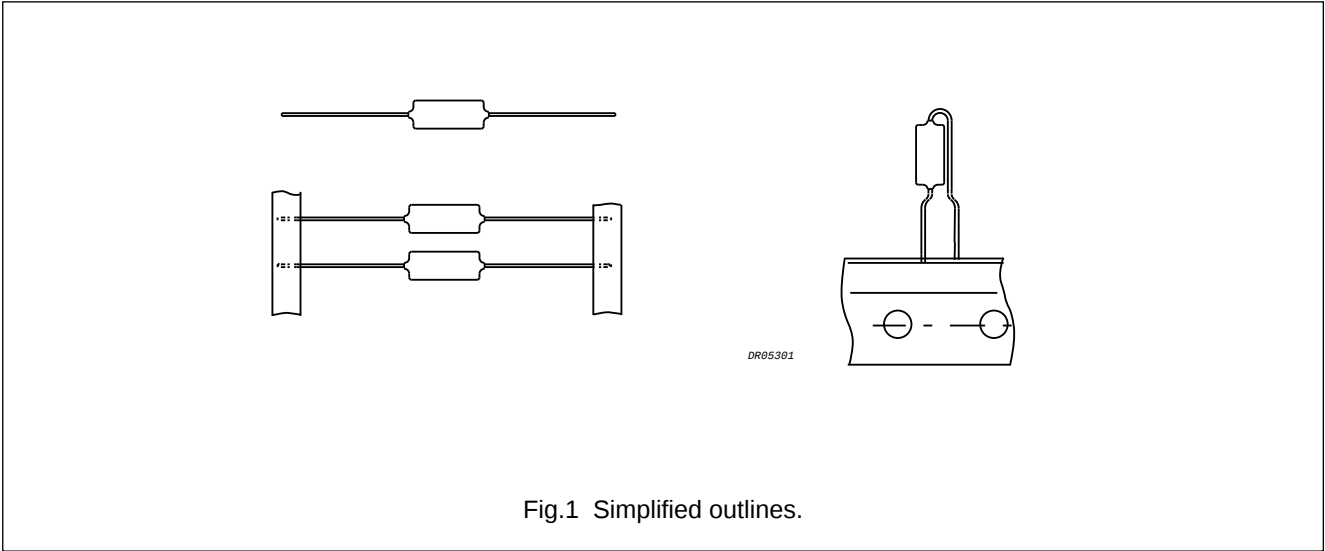


Polypropylene film foil capacitors

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.

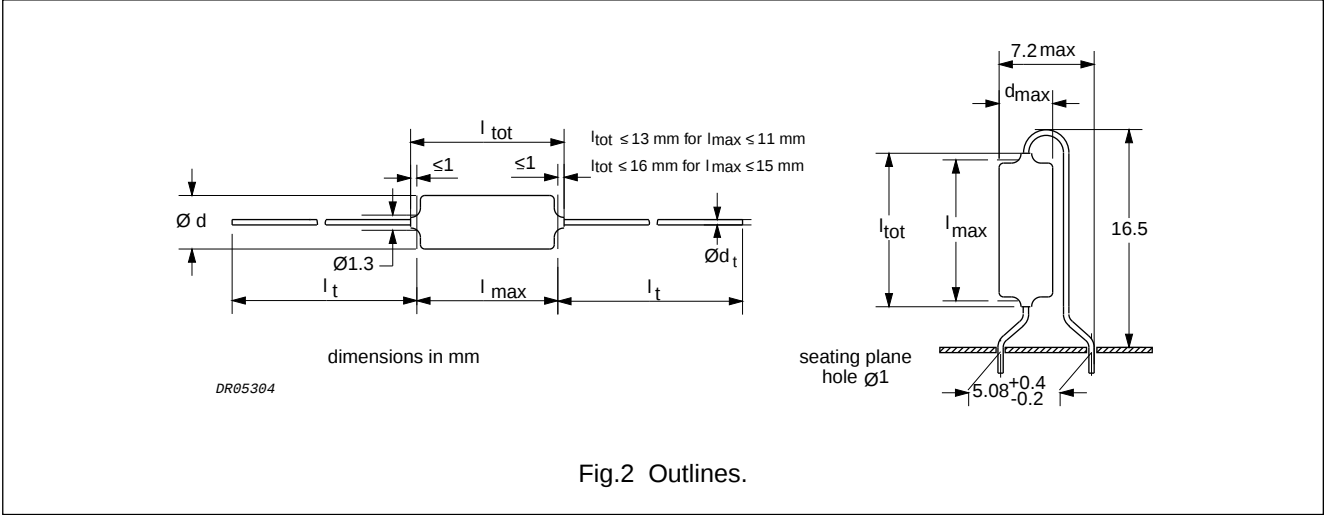
QUICK REFERENCE DATA

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 400, 630 V versions	Class 1 Class 2

Polypropylene film foil capacitors

KP 460

KP 460 GENERAL DATA



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 ⁻⁴	≤15 × 10 ⁻⁴
20000 pF < C ≤ 47000 pF	≤5 × 10 ⁻⁴	≤25 × 10 ⁻⁴
C > 47000 pF	≤5 × 10 ⁻⁴	≤40 × 10 ⁻⁴
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 ammopack	52.5; note 1

Note

1. For detailed specifications refer to this handbook, Chapter “Packaging”.

Polypropylene film foil capacitors

KP 460 to 464

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

loose, taped and unidirectional

C ⁽¹⁾ (E 24) (pF)	DIMENSIONS d _{max} × 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 = ±2%	C-tol = ±1%	SPQ									
			last 5 digits of catalogue number ⁽²⁾																
			C-tol = ±2%	C-tol = ±1%															
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		5.5 × 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							1000	200	—	—	—	
30000 33000 36000	1.1 1.2 1.2		73003 73303 73603	83003 83303 83603	1000	150	—		—										—
39000 43000	1.3 1.4		73903 74303	83903 84303															
47000 51000	1.5 1.6		74703 75103	84703 85103	1000	150	—		—					—					
56000 62000	1.7 1.8		75603 76203	85603 86203											1000	150	—	—	—

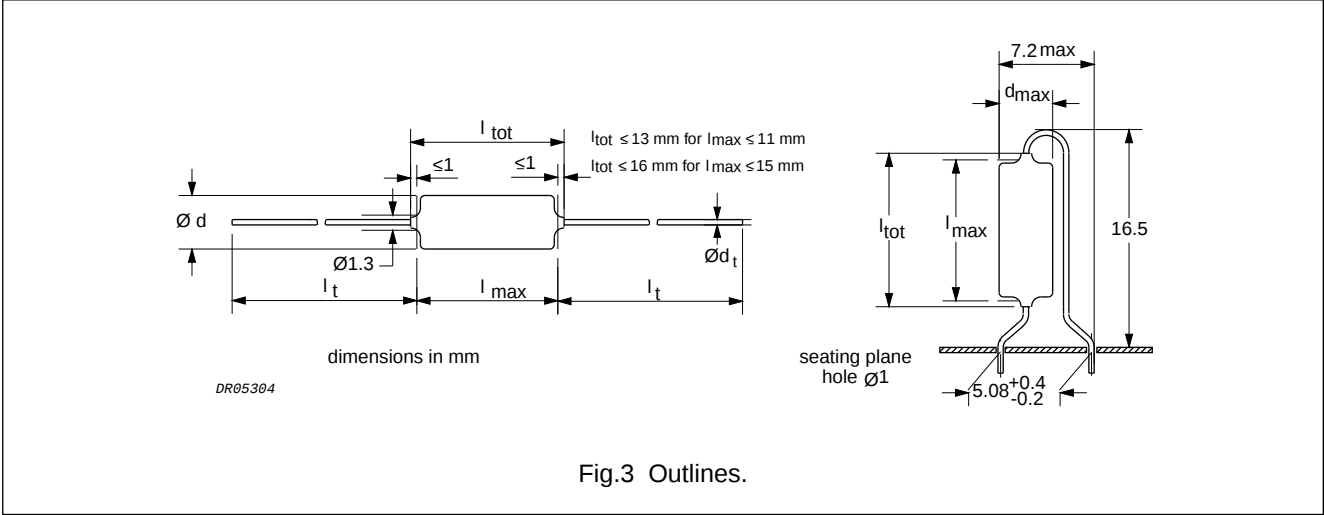
Notes

- 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



Specific reference data for the 160 V DC capacitors

DESCRIPTION	VALUE	
	at 1 kHz	at 100 kHz
Tangent of loss angle:		
1000 pF < C ≤ 5000 pF	≤5 × 10 ⁻⁴	≤10 × 10 ⁻⁴
5000 pF < C ≤ 20000 pF	≤5 × 10 ⁻⁴	≤15 × 10 ⁻⁴
20000 pF < C ≤ 39000 pF	≤5 × 10 ⁻⁴	≤25 × 10 ⁻⁴
R between leads	>100000 MΩ	
R between interconnected leads and case	>100000 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

1. 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 ⁽¹⁾ (E 24) (pF)	DIMENSIONS d _{max} × 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 ⁽²⁾		SPQ	SPQ	C-tol = ±2%	C-tol = ±1%	SPQ
			C-tol = ±2%	C-tol = ±1%					
l _t = 30.0 mm; d _t = 0.60 ±0.06 mm									
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	
l _t = 28.0 mm; d _t = 0.60 ±0.06 mm									
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	6.0 × 15.0	0.8	71303	81303	1500	250	—	—	—
15000		0.8	71503	81503					
16000		0.9	71603	81603					
18000	6.0 × 15.0	0.9	71803	81803	1500	250	—	—	—
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					

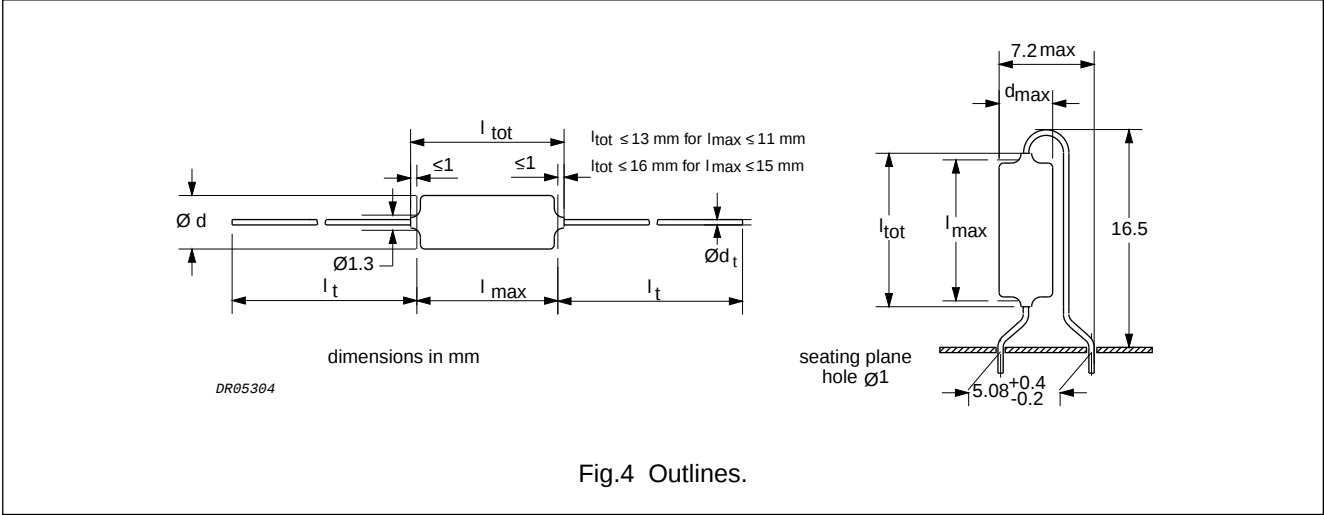
Notes

- 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



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 ⁻⁴	≤10 × 10 ⁻⁴
5 000 pF < C ≤ 20 000 pF	≤5 × 10 ⁻⁴	≤15 × 10 ⁻⁴
20 000 pF < C ≤ 22 000 pF	≤5 × 10 ⁻⁴	≤25 × 10 ⁻⁴
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 ⁽¹⁾ (E 24) (pF)	DIMENSIONS d _{max} × l _{max} (mm)	MASS (g)	CATALOGUE NUMBER 2222 462 AND PACKAGING						
			TAPED ON REEL			LOOSE IN BOX	UNIDIRECTIONAL		
			TAPE DISTANCE 63.5 mm		SPQ				
			last 5 digits of catalogue number ⁽²⁾			SPQ	C-tol = ±2%	C-tol = ±1%	SPQ
			C-tol = ±2%	C-tol = ±1%					
l _t = 30.0 mm; d _t = 0.60 ±0.06 mm									
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	
l _t = 28.0 mm; d _t = 0.60 ±0.06 mm									
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					

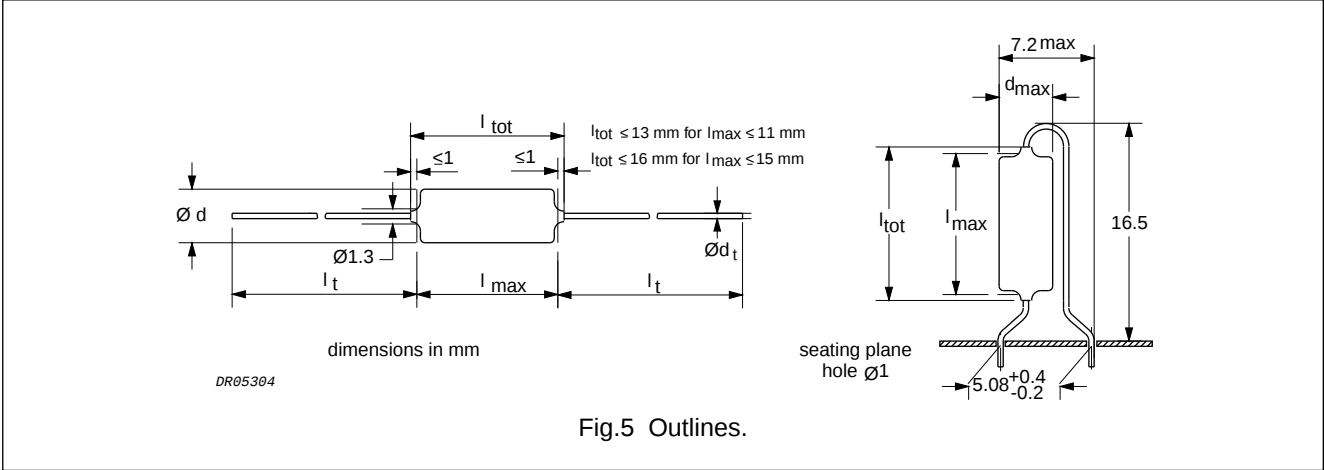
Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of $\pm 2\%$ 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 463

KP463 GENERAL DATA



Specific reference data for the 400 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1 MHz ⁽¹⁾
Tangent of loss angle: C ≤ 1000 pF	≤5 × 10 ⁻⁴	—	≤10 × 10 ⁻⁴
1 000 pF < C ≤ 5000 pF	≤5 × 10 ⁻⁴	≤10 × 10 ⁻⁴	—
R between leads	>100000 MΩ		
R between interconnected leads and case	>100000 MΩ		

Note

1. For unidirectional capacitors ≤13 × 10⁻⁴.

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

1. 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 ⁽¹⁾ (E 24) (pF)	DIMENSIONS d _{max} × l _{max} (mm)	MASS (g)	CATALOGUE NUMBER 2222 463 AND PACKAGING																												
			TAPED ON REEL		LOOSE IN BOX	UNIDIRECTIONAL																									
			TAPE DISTANCE 63.5 mm																												
			last 5 digits of catalogue number ⁽²⁾		SPQ	SPQ	C-tol = ±2%	C-tol = ±1%	SPQ																						
			C-tol = ±2%	C-tol = ±1%																											
l _t = 30.0 mm; d _t = 0.60 ±0.06 mm																															
620 680 750 820 910 1000 1100	5.0 × 11.0	0.5 0.5 0.5 0.5 0.5 0.5 0.5	76201 76801 77501 78201 79101 71002 71102	86201 86801 87501 88201 89101 81002 81102	2500	250	06201 06801 07501 08201 09101 01002 01102	16201 16801 17501 18201 19101 11002 11102	1000																						
l _t = 28.0 mm; d _t = 0.60 ±0.06 mm																															
1200 1300 1500 1600 1800 2000		5.5 × 15.0	0.5 0.5 0.6 0.6 0.6 0.7	71202 71302 71502 71602 71802 72002			81202 81302 81502 81602 81802 82002	1500		250	—	—	—																		
2200 2400 2700 3000			6.0 × 15.0	0.7 0.8 0.8 0.9			72202 72402 72702 73002							82202 82402 82702 83002	1500	250	—	—	—												
3300 3600 3900				6.5 × 15.0			0.9 1.0 1.0							73302 73602 73902						83302 83602 83902	1000	200	—	—	—						
4300 4700 5100							7.0 × 15.0							1.1 1.1 1.2						74302 74702 75102						84302 84702 85102	1000	150	—	—	—
5600 6200														7.5 × 15.0						1.3 1.3						75602 76202					
6800 7500 8200	8.0 × 15.0	1.4 1.5 1.5	76802 77502 78202	86802 87502 88202	1000	150		—	—	—																					

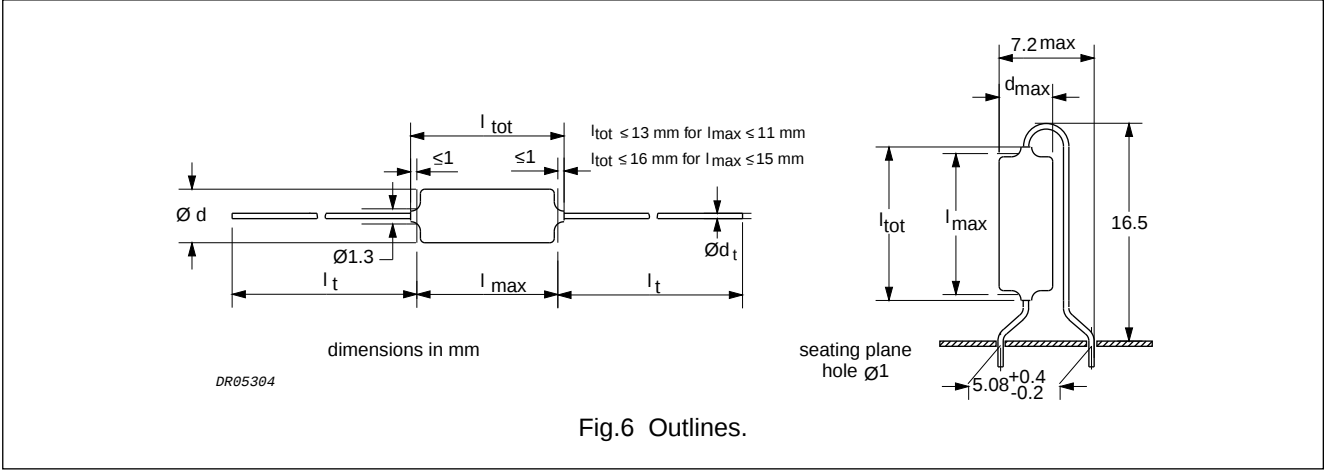
Notes

- 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



Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1 MHz ⁽¹⁾
Tangent of loss angle: C ≤ 1000 pF	≤5 × 10 ⁻⁴	—	≤10 × 10 ⁻⁴
1 000 pF < C ≤ 5000 pF	≤5 × 10 ⁻⁴	≤10 × 10 ⁻⁴	—
R between leads	>100 000 MΩ		
R between interconnected leads and case	>100 000 MΩ		

Note

1. For unidirectional capacitors ≤13 × 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 ammopack	52.5; note 1

Note

1. For detailed specifications refer to this handbook, Chapter “Packaging”.

Polypropylene film foil capacitors

KP 460 to 464

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

loose, taped and unidirectional

C ⁽¹⁾ (E 24) (pF)	DIMENSIONS d _{max} × l _{max} (mm)	MASS (g)	CATALOGUE NUMBER 2222 464x 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 ⁽²⁾						
			C-tol = ±2%	C-tol = ±1%					
l _t = 30.0 mm; d _t = 0.60 ±0.06 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	

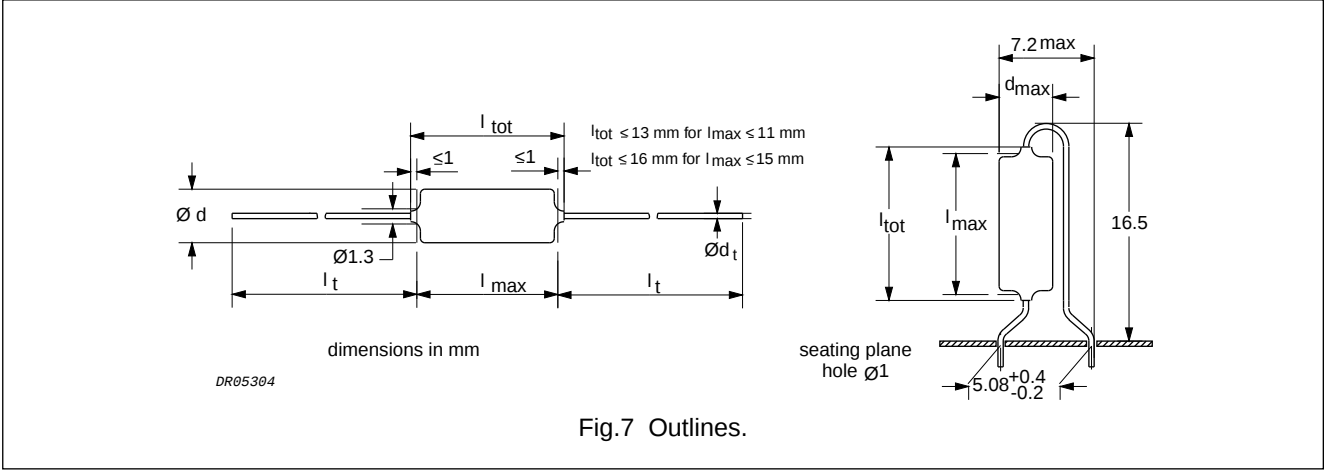
Notes

- In addition to the values of the E24 series as quoted, intermediate values are available of the E48 series (with a tolerance of $\pm 2\%$ 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



Specific reference data for the 630 V DC capacitors

DESCRIPTION	VALUE		
	at 1 kHz	at 100 kHz	at 1 MHz ⁽¹⁾
Tangent of loss angle: C ≤ 1000 pF	≤5 × 10 ⁻⁴	—	≤10 × 10 ⁻⁴
1 000 pF < C ≤ 5000 pF	≤5 × 10 ⁻⁴	≤10 × 10 ⁻⁴	—
R between leads	>100 000 MΩ		
R between interconnected leads and case	>100 000 MΩ		

Note

1. For unidirectional capacitors ≤13 × 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

1. 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 ⁽¹⁾ (E 24) (pF)	DIMENSIONS d _{max} × l _{max} (mm)	MASS (g)	CATALOGUE NUMBER 2222 464 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 ⁽²⁾						
			C-tol = ±2%	C-tol = ±1%					
l _t = 28.0 mm; d _t = 0.60 ±0.06 mm									
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.

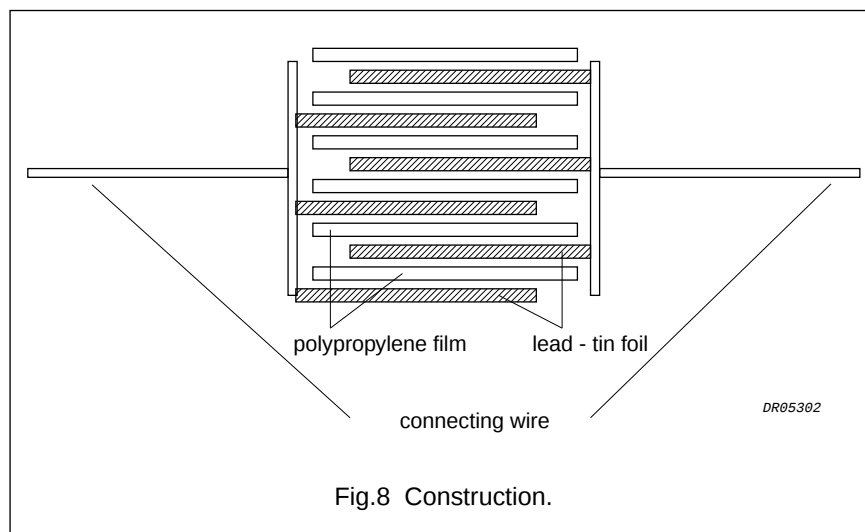


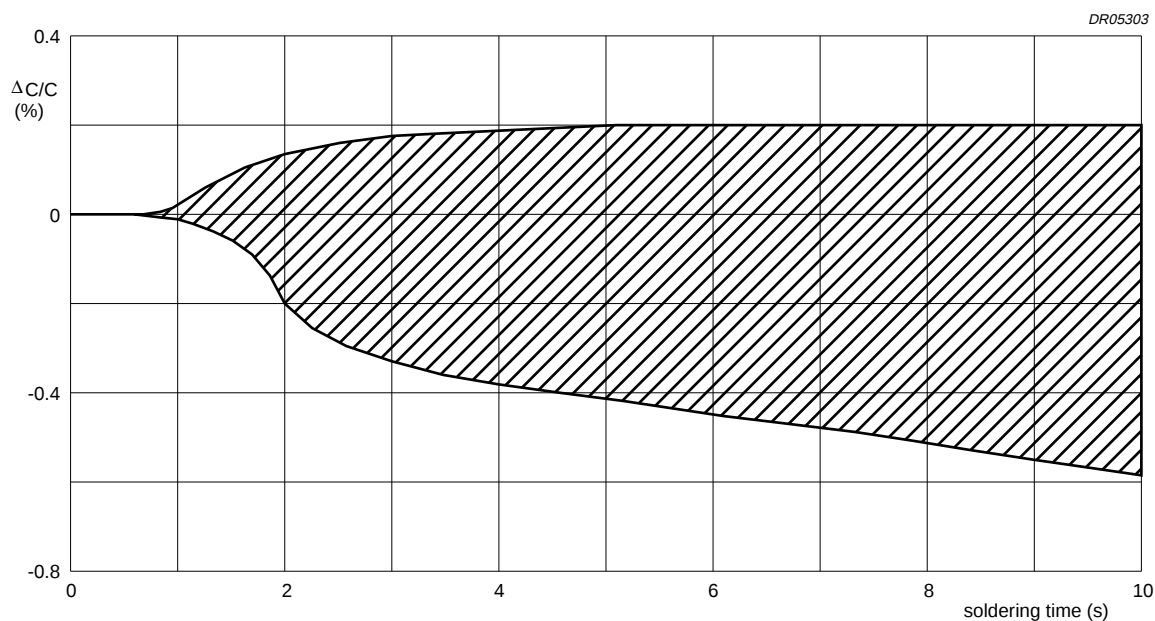
Fig.8 Construction.

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.

Fig.9 $\Delta C/C$ as a function of soldering time.

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RATINGS AND CHARACTERISTICS

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 of 96 ± 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: $-(125 \pm 125) \times 10^{-6}/K$.

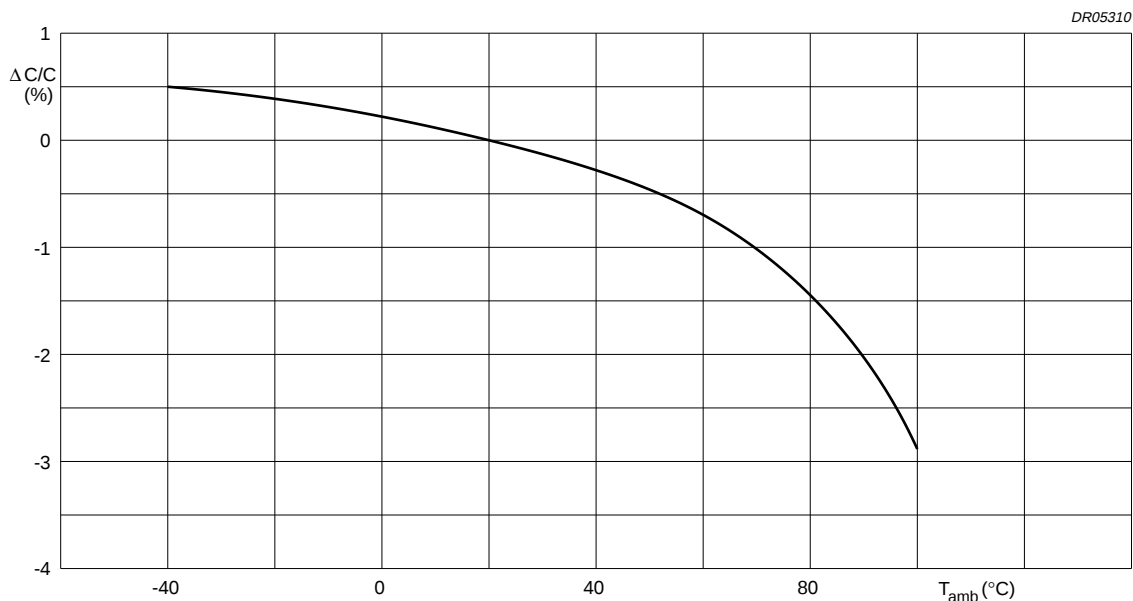


Fig.10 Capacitance as a function of ambient temperature; typical curve.

Temperature

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

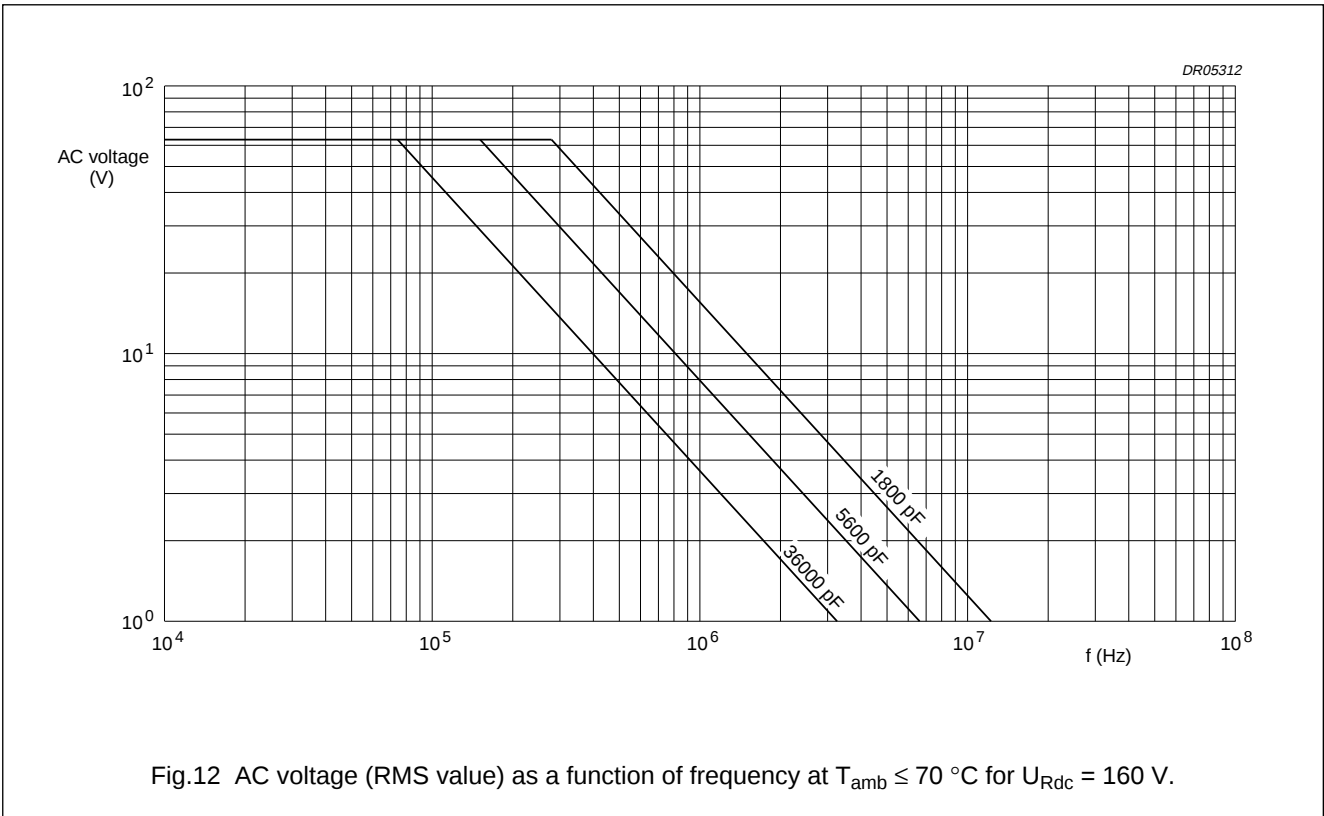
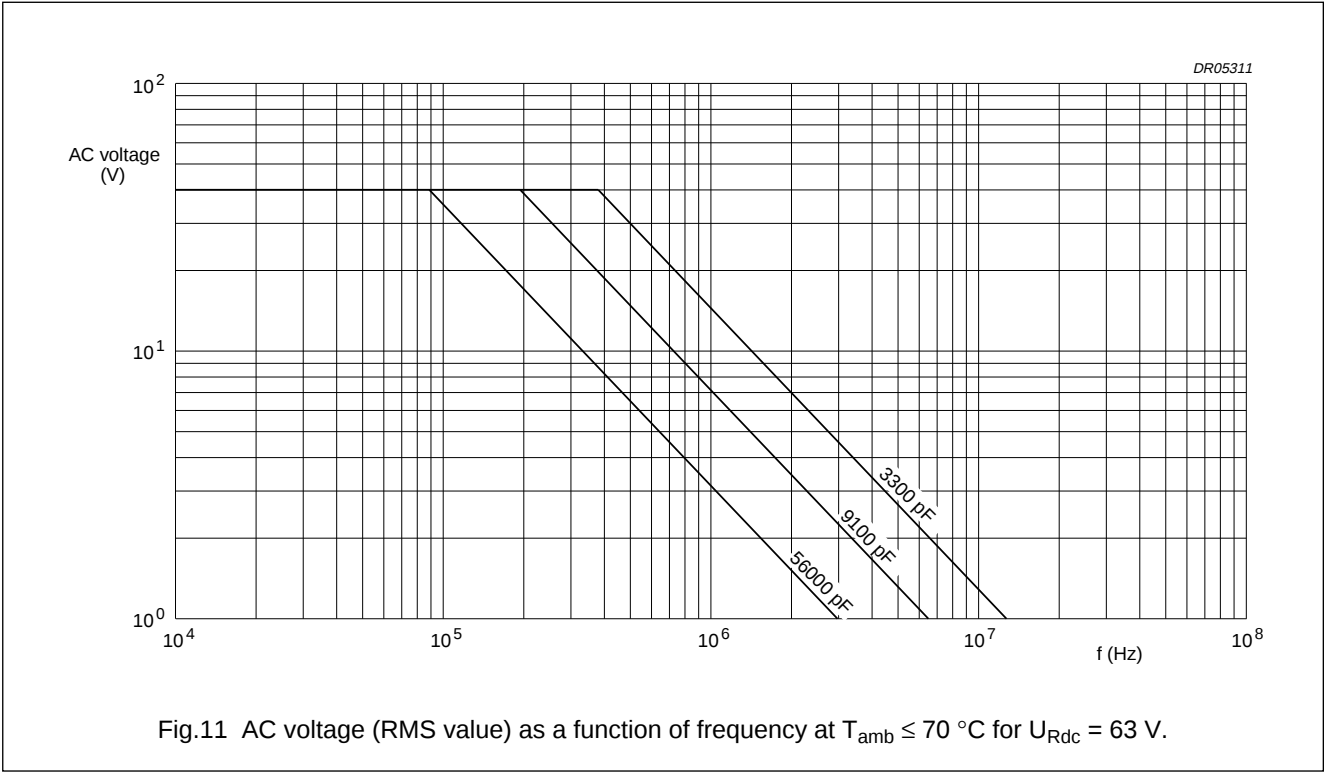
Voltage

- 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

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Maximum RMS voltage (sinewave) as a function of frequency for $T_{amb} \leq 70\text{ }^{\circ}\text{C}$



Polypropylene film foil capacitors

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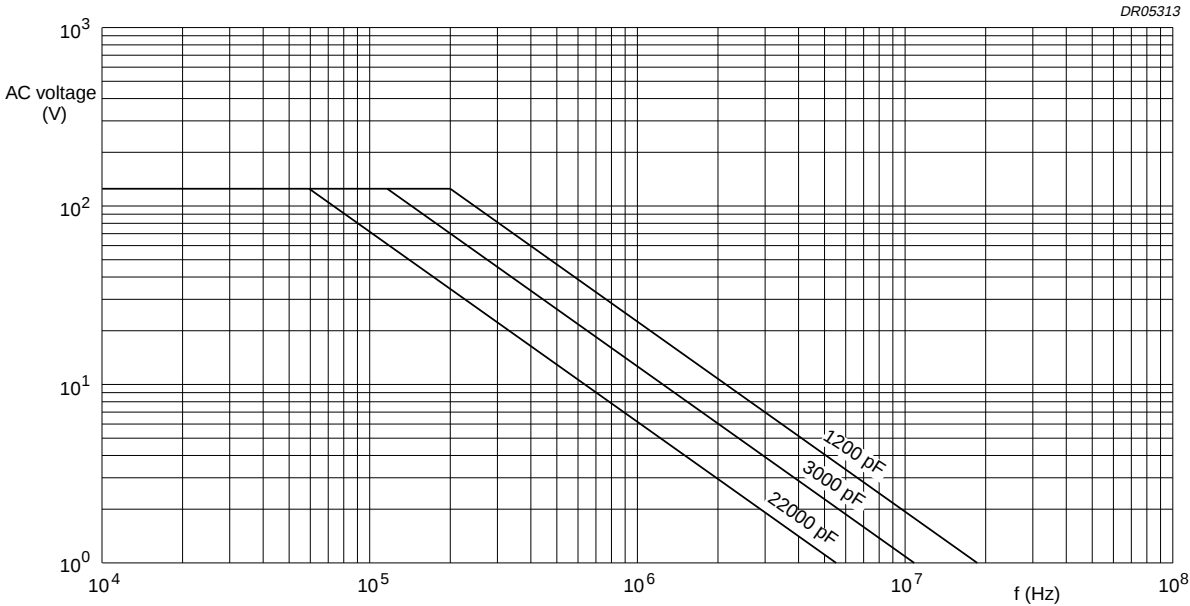


Fig.13 AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 70\text{ }^{\circ}\text{C}$ for $U_{Rdc} = 250\text{ V}$.

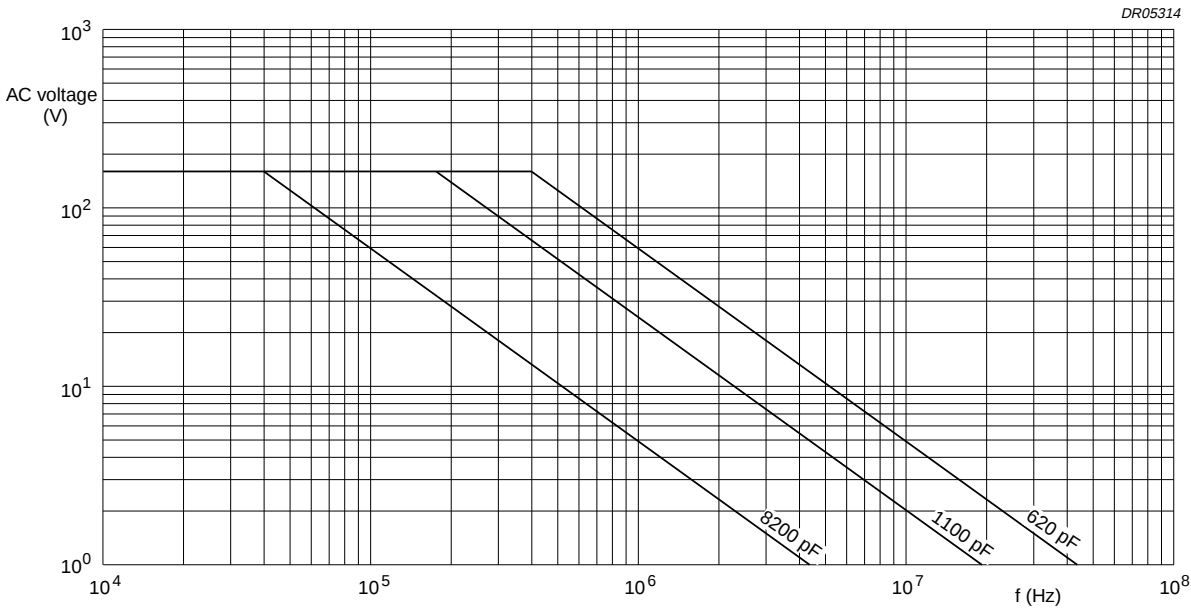


Fig.14 AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 70\text{ }^{\circ}\text{C}$ for $U_{Rdc} = 400\text{ V}$.

Polypropylene film foil capacitors

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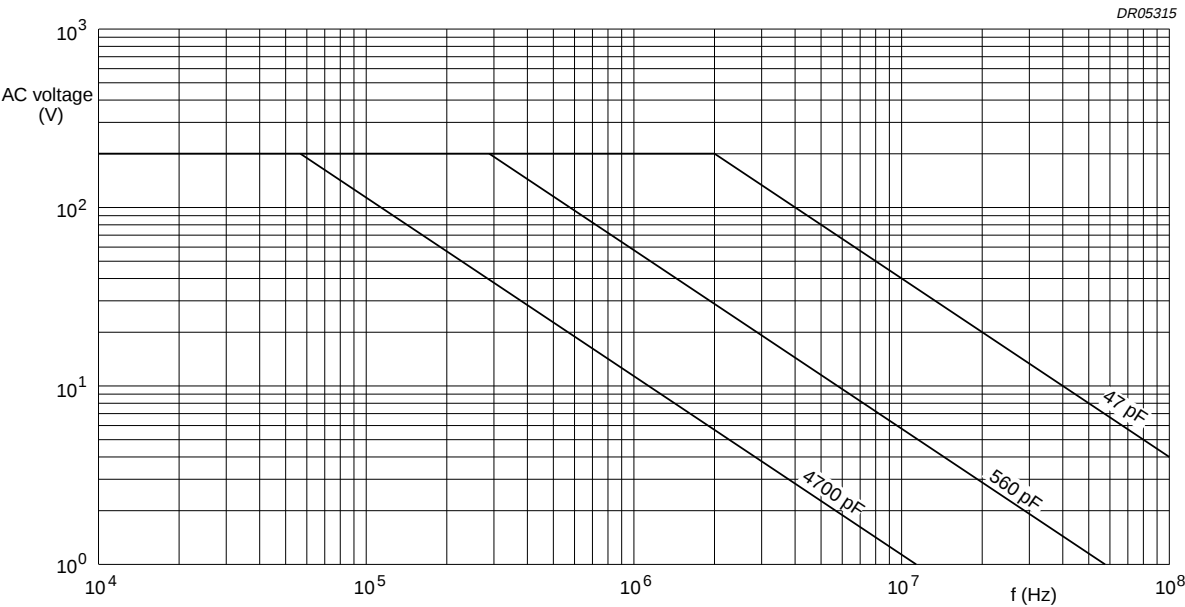


Fig.15 AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 70\text{ }^{\circ}\text{C}$ for $U_{Rdc} = 630\text{ V}$.

Maximum RMS voltage (sinewave) as a function of frequency for $T_{amb} > 70\text{ }^{\circ}\text{C}$

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 Fig.19.

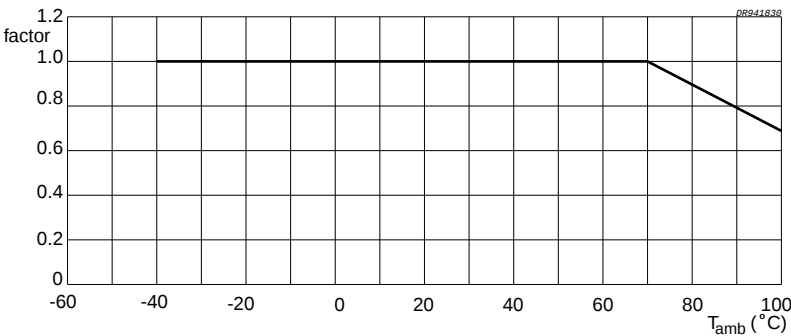


Fig.16 Multiplying factor as a function of temperature.

Polypropylene film foil capacitors

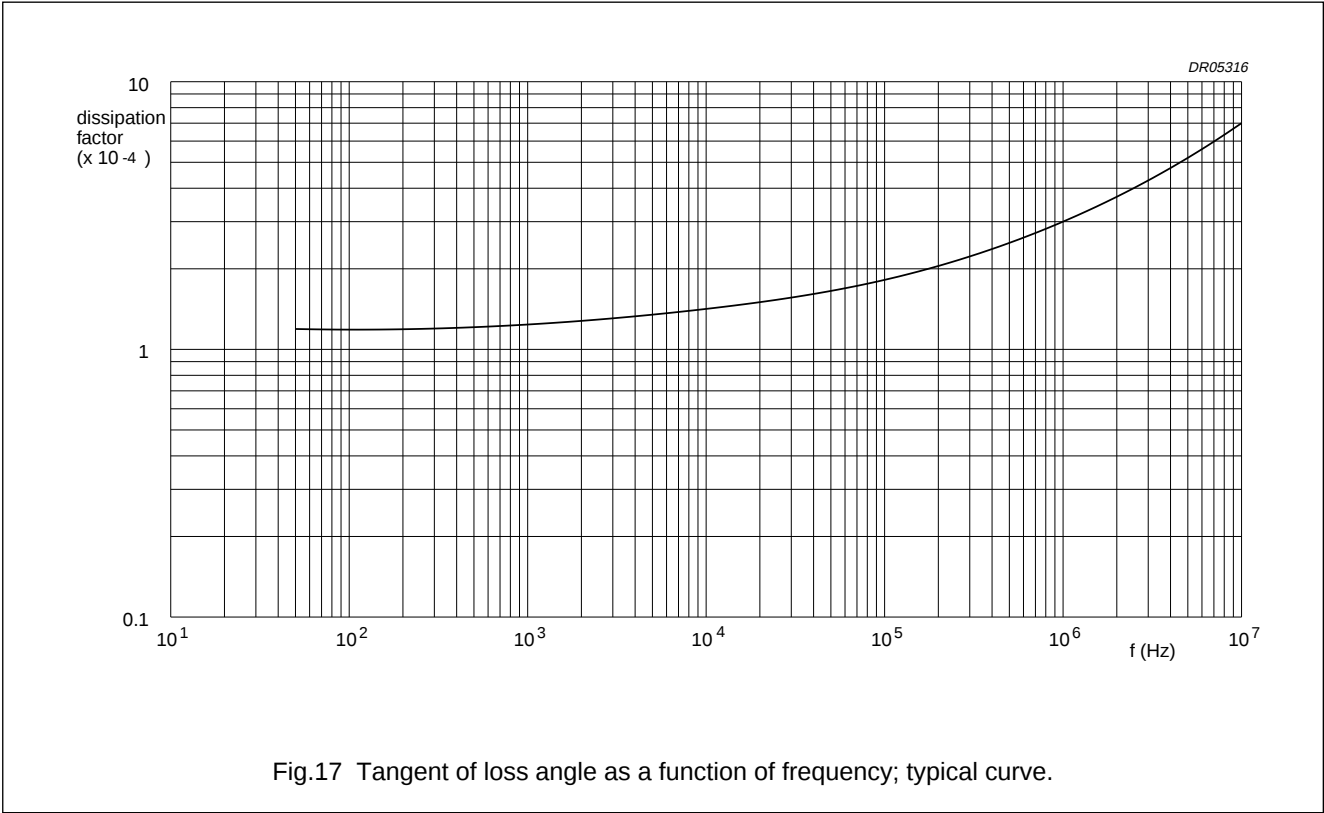
KP 460 to 464

Tangent of loss angle

CAPACITANCE	TANGENT OF LOSS ANGLE		
	at 1 kHz	at 100 kHz	at 1 MHz ⁽¹⁾
C ≤ 1000 pF	≤5 × 10 ⁻⁴	—	≤10 × 10 ⁻⁴
1000 pF < C ≤ 5000 pF	≤5 × 10 ⁻⁴	≤10 × 10 ⁻⁴	—
5000 pF < C ≤ 20000 pF	≤5 × 10 ⁻⁴	≤15 × 10 ⁻⁴	—
20000 pF < C ≤ 47000 pF	≤5 × 10 ⁻⁴	≤25 × 10 ⁻⁴	—
C > 47000 pF	≤5 × 10 ⁻⁴	≤40 × 10 ⁻⁴	—

Note

1. For unidirectional capacitors ≤13 × 10⁻⁴.



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Insulation resistance

The insulation resistance is measured after a voltage has been applied for 1 minute ± 5 seconds, the voltage being 10 ± 1 V for the 63 V version, 100 ± 15 V for the 160, 250 and 400 V versions and 500 ± 50 V for the 630 V version:

- R between leads: $>100000 \text{ M}\Omega$
- R between interconnected leads and case (foil method): $>100000 \text{ M}\Omega$.

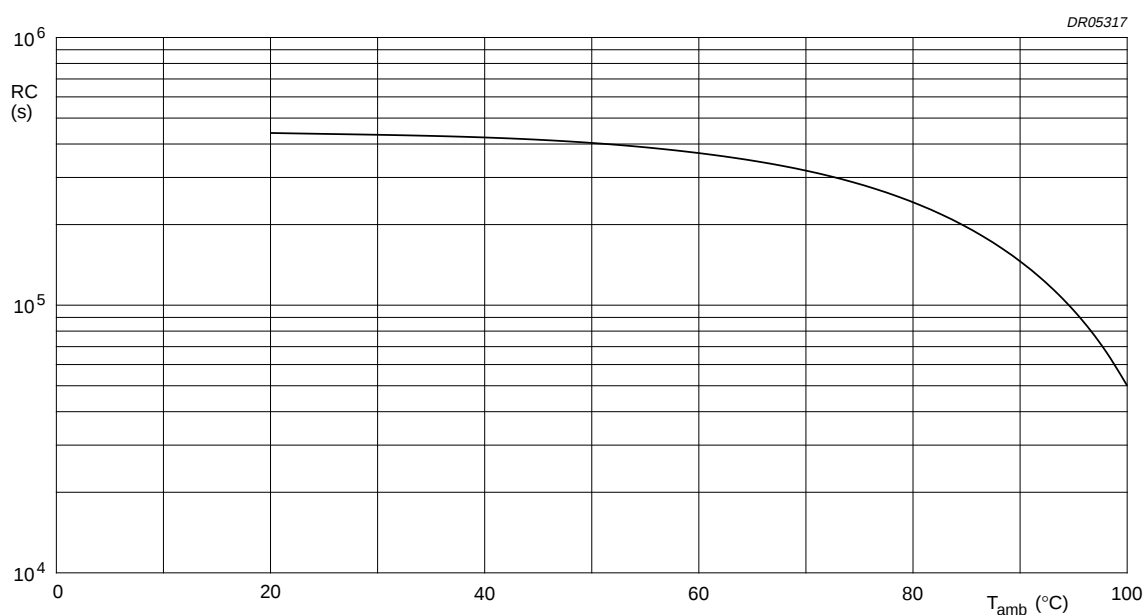


Fig.18 RC product as a function of ambient free air temperature; typical curve.

Inductance

- L dependent on lead and capacitor length: $\leq 10 \text{ nH/cm}$.

Polypropylene film foil capacitors

KP 460 to 464

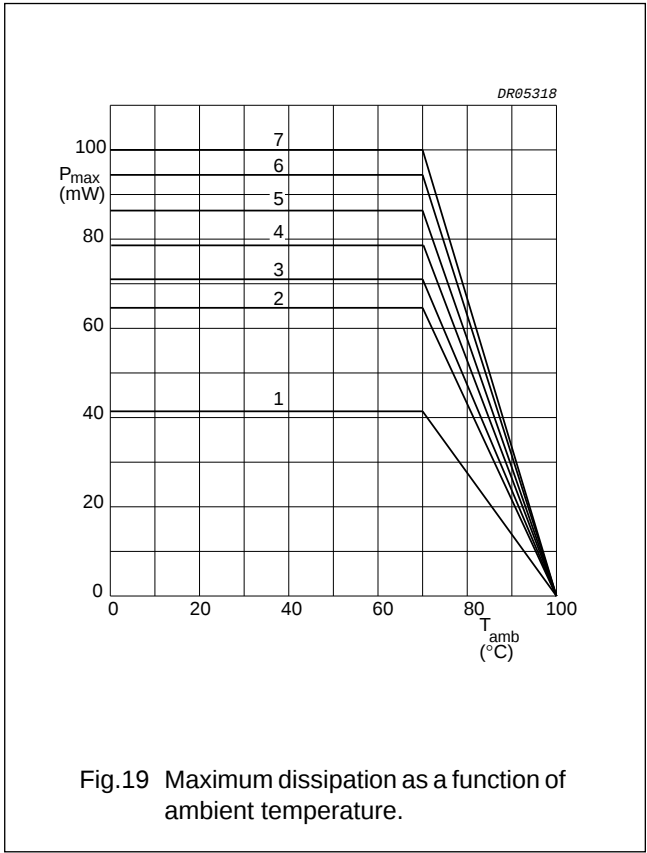
Maximum dissipation

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.



Polypropylene film foil capacitors

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MARKING

Product marking

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

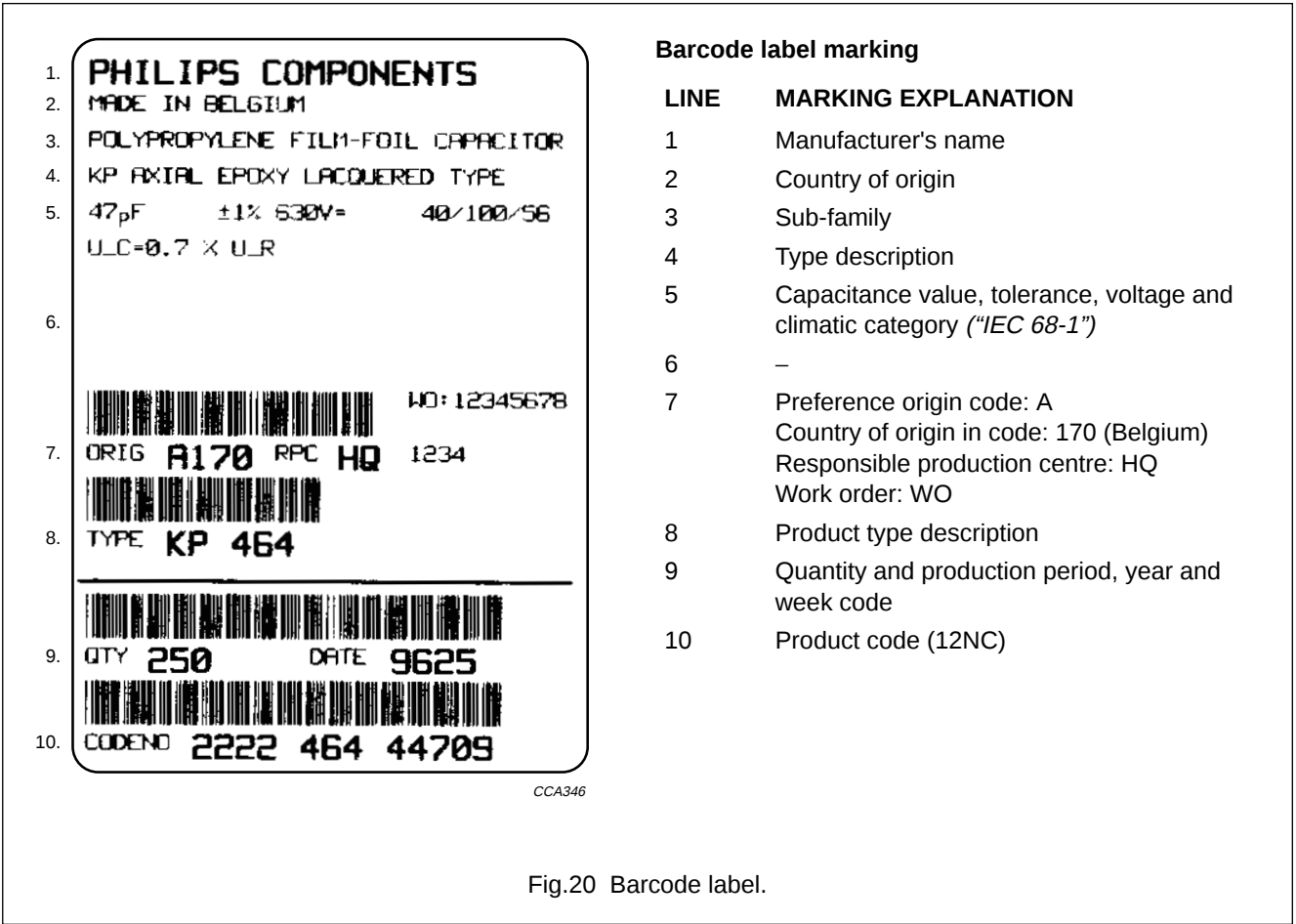
- 1. Rated capacitance code in accordance with “IEC 62”
- 2. Rated voltage (DC) (e.g. 63 V)
- 3. Tolerance on rated capacitance: F = ±1%; G 2%; J = ±5%
- 4. Code for dielectric material (KP)
- 5. Production date code in accordance with “IEC 62, clause 5”
- 6. Manufacturer (PHILIPS).

MARKING EXAMPLE

8n2
G 63
KPD2
PHILIPS.

Package marking

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



Polypropylene film foil capacitors

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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”	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		
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\% + 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 ² ; 11 ms	R _{ins} ≥ 50% of specified value
Climatic sequence		
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 _{ins} ≥ 50% of specified value
Cold: “IEC 68-2-1”		
Damp heat, cyclic, test Db, remaining cycles: “IEC 68-2-30”		
Other applicable tests		
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 _{ins} ≥ 50% of specified value
Endurance (DC): “IEC 384-13”	1000 hours; 1.5 × U _{Rdc} ; 85 °C 1.5 × U _{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 _{ins} ≥ 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 _{ins} ≥ 10000 MΩ
Heat storage: “IEC 384-13”	1000 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".