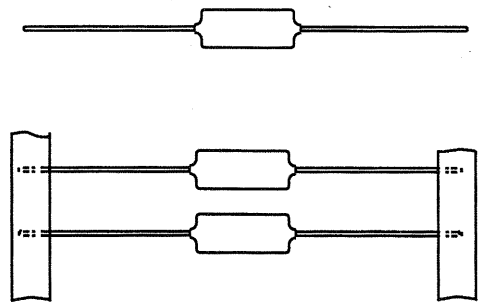
Polystyrene film foil capacitors

KS 424 .. 431

KS AXIAL CAPACITORS



QUICK REFERENCE DATA

Capacitance range	47 to 39 000 pF
Capacitance tolerance	±5%, ±2%, ±1%
Rated voltage (DC)	63 V, 160 V, 250 V, 630 V
Climatic category	40/085/21
Rated temperature	85 °C
Reference specification	IEC 384-7
Stability class	class 3

FEATURES	APPLICATIONS
• Supplied loose in box and taped on reel.	• In circuits where close tolerance, reliability and low losses are of prime importance, for example: tuned circuits, filter and timing networks.

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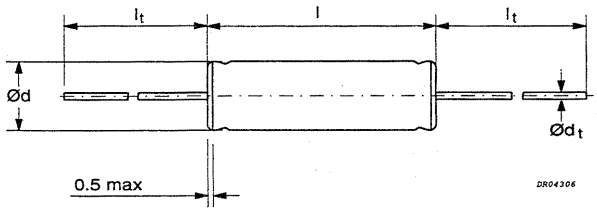
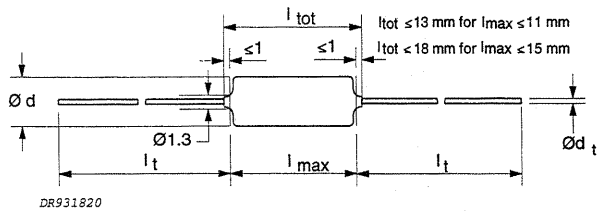
KS 426 / 430



Naked version.



Lacquered version.

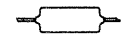
SPECIFIC REFERENCE DATA FOR THE 250 V DC VERSION

Tangent of loss angle	at 1 kHz	at 100 kHz	at 1 MHz
C ≤ 1000 pF	$\leq 5 \times 10^{-4}$	–	$\leq 10 \times 10^{-4}$
1000 pF < C ≤ 10 000 pF	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	–
10 000 pF < C ≤ 20 000 pF	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$	–
R between leads	>100 000 MΩ		

AVAILABLE 250 V VERSIONS

Taped on reel	naked version	C-tol ±1%	catalogue number **2222 430 8....**	preferred
Taped on reel	naked version	C-tol ±2%	catalogue number **2222 430 7....**	preferred
Taped on reel	naked version	C-tol ±5%	catalogue number **2222 430 6....**	on request
Loose in box	naked version	C-tol ±1%	catalogue number **2222 426 4....**	on request
Loose in box	naked version	C-tol ±2%	catalogue number **2222 426 3....**	on request
Loose in box	naked version	C-tol ±5%	catalogue number **2222 426 2....**	on request
Taped on reel	lacquered version	C-tol ±1%	catalogue number **2222 430 4....**	on request
Taped on reel	lacquered version	C-tol ±2%	catalogue number **2222 430 3....**	on request
Taped on reel	lacquered version	C-tol ±5%	catalogue number **2222 430 2....**	on request
Loose in box	lacquered version	C-tol ±1%	catalogue number **2222 426 8....**	on request
Loose in box	lacquered version	C-tol ±2%	catalogue number **2222 426 7....**	on request
Loose in box	lacquered version	C-tol ±5%	catalogue number **2222 426 6....**	on request

Polystyrene film foil capacitors



U_{Rdc} = 250V

U_{Rac} = 125 V

loose and taped

Cap. (E-24) (pF) *	d_{max} ** x l_{max} (mm)	mass (g)	CATALOGUE NUMBER 2222 426 ..... naked vesion taped on reel C-tol ±2% last 5 digits of catalogue number	C-tol ±1% last 5 digits of catalogue number	SPQ (***)	2222 430 ..... loose in box SPQ (***)
		l_t = 30.0 mm	d_t = 0.60 ±0.06 mm			
560	3.8 x 11.0	0.3	75601	85601	3000 (2500)	400 (300)
620		0.3	76201	86201		
680		0.3	76801	86801		
750	4.0 x 11.0	0.3	77501	87501	2500	400 (300)
820		0.4	78201	88201		
910		0.4	79101	89101		
1000		0.4	71002	81002		
1100	4.5 x 11.0	0.4	71102	81102	2500	300 (250)
1200		0.5	71202	81202		
1300		0.5	71302	81302		
1500		0.5	71502	81502		
1600	5.0 x 11.0	0.5	71602	81602	1500	250 (200)
1800		0.5	71802	81802		
2000		0.6	72002	82002		
2200		0.6	72202	82202		
		l_t = 28.0 mm	d_t = 0.60 ±0.06 mm			
2400	5.0 x 15.0	0.6	72402	82402	1500	300 (250)
2700		0.6	72702	82702		
3000		0.6	73002	83002		
3300		0.6	73302	83302		
3600		0.7	73602	83602		
3900		0.7	73902	83902		
4300		0.7	74302	84302		
4700	5.5 x 15.0	0.8	74702	84702	1500	250 (200)
5100		0.8	75102	85102		
5600	6.0 x 15.0	0.9	75602	85602	1500	250 (200)
6200		0.9	76202	86202		
6800	6.5 x 15.0	1.1	76802	86802	1000	200 (150)
7500		1.1	77502	87502		
8200	7.0 x 15.0	1.3	78202	88202	1000	150 (100)
9100		1.3	79102	89102		
10000	7.5 x 15.0	1.5	71003	81003	1000	150 (100)
11000		1.6	71103	81103		

Preferred catalogue numbers

* In addition to the values of the E24-series as quoted, intermediate values of the E48-series (with a tolerance ±2% or ±1%) and of the E96-series (with a tolerance ±1%) are available.
The specifications of these intermediate values are equal to the specifications of the next higher value of the E24-series.

** Diameter d_{max} +0.7 mm for lacquered versions.

*** If different from naked version, SPQ in brackets for lacquered version.

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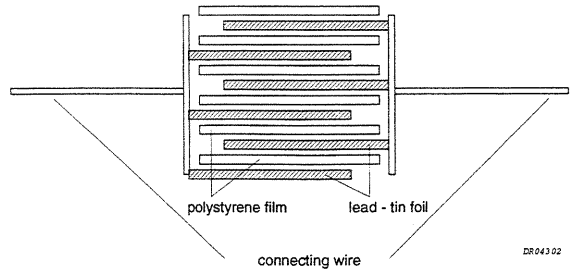
CONSTRUCTION



DESCRIPTION

- Low-inductive wound cell of metal foil and a polystyrene film.
- Axial leads, solder-coated.
- The capacitors are available in a naked version or with a blue epoxy lacquer (on request).

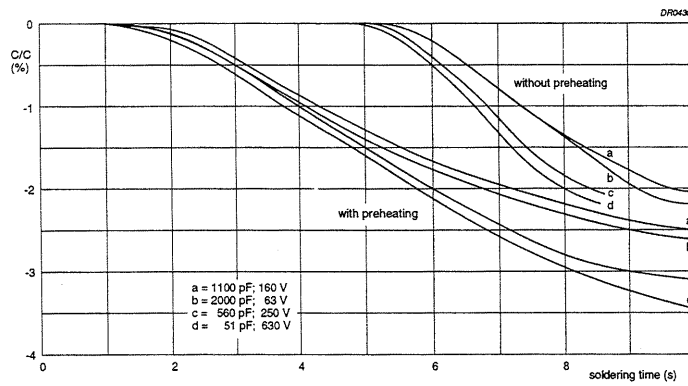
MOUNTING

Normal use

The capacitors are suitable for vertical or horizontal mounting on printed-circuit boards.
The capacitors packed in bandoliers are designed for mounting on printed-circuit boards by means of automatic insertion machines. When soldering, the body temperature shall not exceed 100 °C.

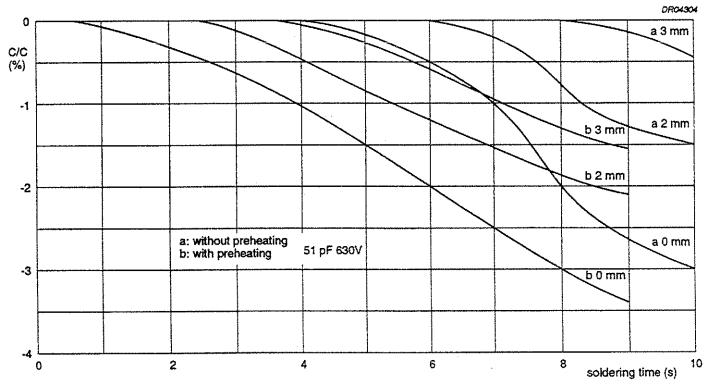
Soldering conditions

The capacitance stability is dependent on the body dimensions as a function of soldering temperature, soldering time, preheating, mounting method, mounting height and mounting pitch.
In all of the following graphs the solder bath temperature is 260 ±5 °C.
The graph below shows the typical behaviour of ΔC/C with and without preheating as a function of soldering time. Preheating temperature is 80 °C (duration 1 hour). Mounting is directly on to the printed-circuit board.
The leads are to be kept as short as possible (shortest pitch).



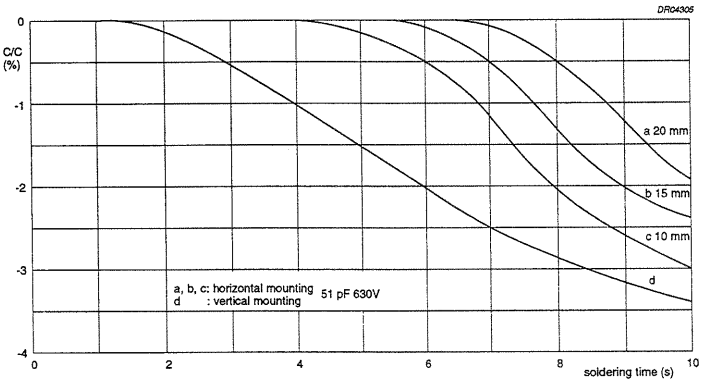
Typical effect on ΔC/C with and without preheating (worst case mounting).

The graph below shows the typical effect of higher mounting and minimum pitch, with and without preheating.



Typical effect of mounting height with and without preheating.

The graph below shows the effect of a wider mounting distance and close mounting on to the printed-circuit board with preheating of the capacitor.



Typical effect of wider mounting distance and preheating.

Specific method of mounting to withstand vibration and shock

The capacitors shall be mechanically fixed by the leads.

Polystyrene film foil capacitors

RATINGS AND CHARACTERISTICS

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 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

- Capacitance tolerance: ±5%, ±2% and ±1% or 1 pF whichever is greater.
- Temperature coefficient: $-(125 \pm 60) \times 10^{-6}/°K$.
- Capacitance dependency on frequency: none between 100 Hz and 1 MHz.

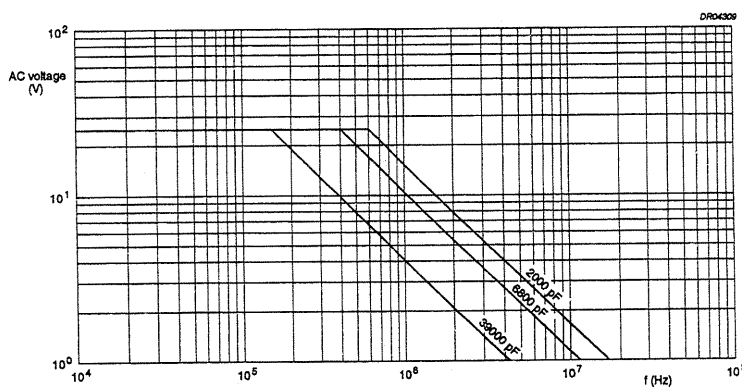
TEMPERATURE

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

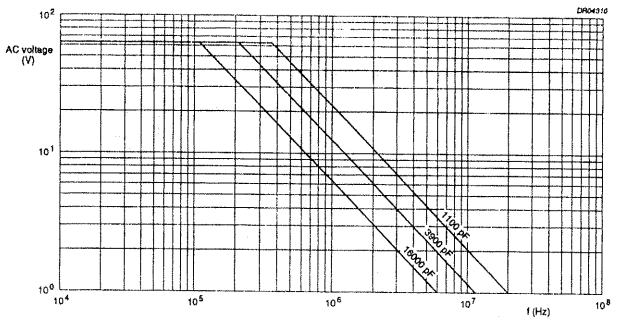
VOLTAGE

- Category voltage: $U_c = U_{Rdc}$.
- Test voltage between terminations: $2 \times U_{Rdc}$.

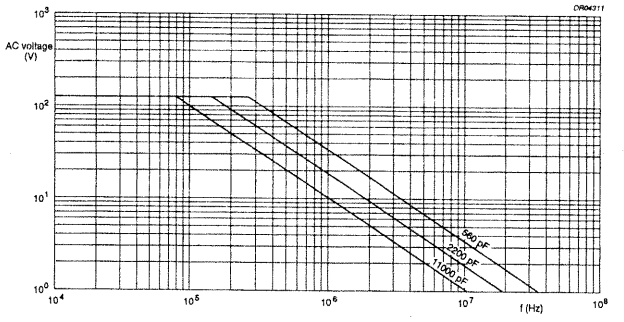
Maximum RMS voltage (sinewave) as a function of frequency for $T_{amb} \leq 70°C$ (see graphs below)



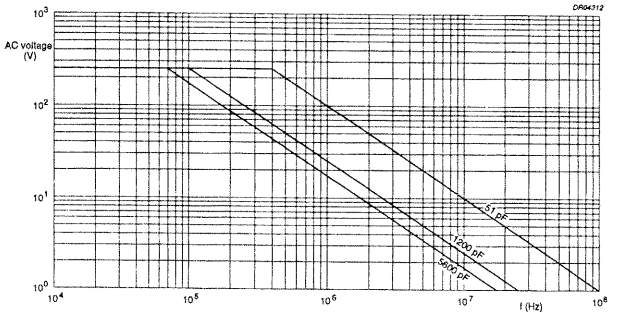
Maximum AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 70$ °C, for 63 V version.



Maximum AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 70$ °C, for 160 V version.



Maximum AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 70$ °C, for 250 V version.

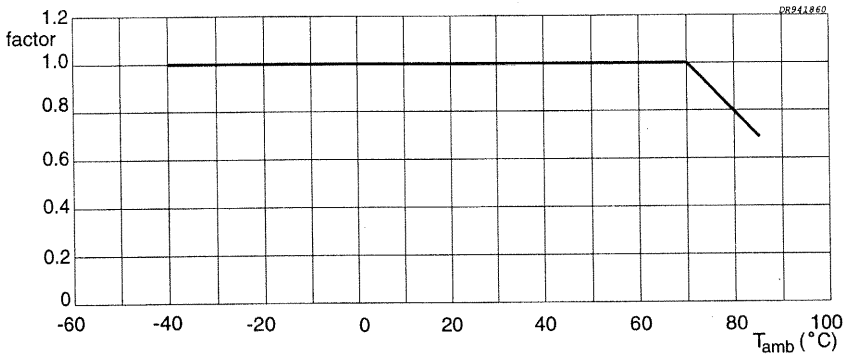


Maximum AC voltage (RMS value) as a function of frequency at $T_{amb} \leq 70$ °C, for 630 V version.

Maximum RMS voltage (sinewave) as a function of frequency for T_{amb} > 70 °C

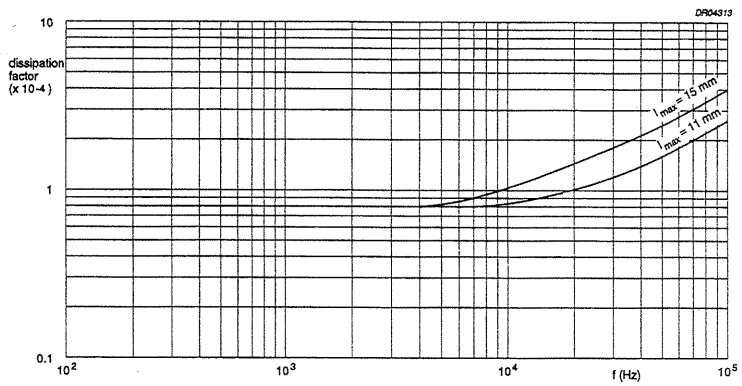
The maximum RMS voltage in graphs above has to be multiplied by a factor (see graph below)

The power dissipation must be checked and should not exceed the maximum allowed power of the graph "Maximum power dissipation as a function of temperature".

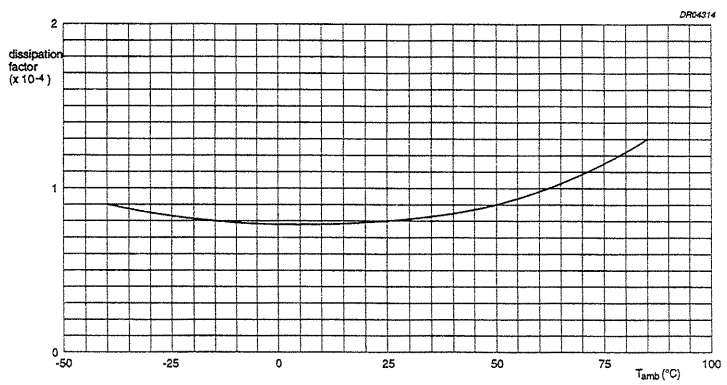


TANGENT OF LOSS ANGLE

CAPACITANCE	TANGENT OF LOSS ANGLE		
	1 kHz	100 kHz	1 MHz
C ≤ 1000 pF	$\leq 5 \times 10^{-4}$	–	$\leq 10 \times 10^{-4}$
1000 pF < C < 10 000 pF	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	–
10 000 pF < C < 20 000 pf	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$	–
C > 20 000 pf	$\leq 5 \times 10^{-4}$	$\leq 25 \times 10^{-4}$	–



Tangent of loss angle as a function of frequency; typical curves.

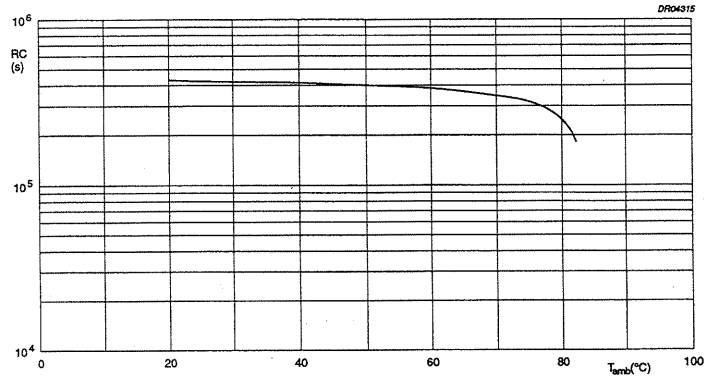


Tangent of loss angle as a function of ambient free air temperature; typical curve.

INSULATION RESISTANCE

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

R between leads: >100 000 MΩ.



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

INDUCTANCE

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

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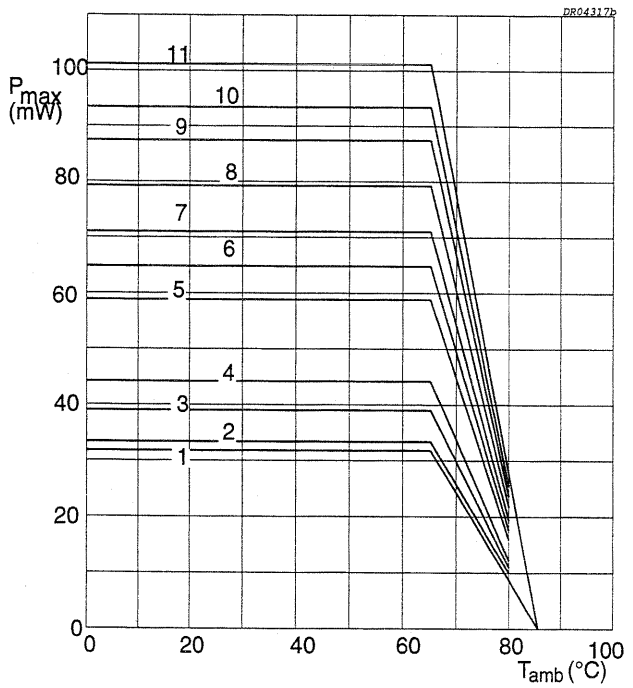
MAXIMUM DISSIPATION

CURVE	DIMENSIONS (mm)
	d_{max} x l_{max}
1	3.8 x 11.0
2	4.0 x 11.0
3	4.5 x 11.0
4	5.0 x 11.0
5	5.0 x 15.0
6	5.5 x 15.0
7	6.0 x 15.0
8	6.5 x 15.0
9	7.0 x 15.0
10	7.5 x 15.0
11	8.0 x 15.0



Maximum permissible power dissipation as a function of ambient free air temperature.

APPLICATION NOTE

To select the capacitor for a certain application, 5 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 x $\sqrt{2}$ 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 graph above.
5. The free air ambient temperature for the capacitor is not exceeding the category temperature.

MARKING

Product marking

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

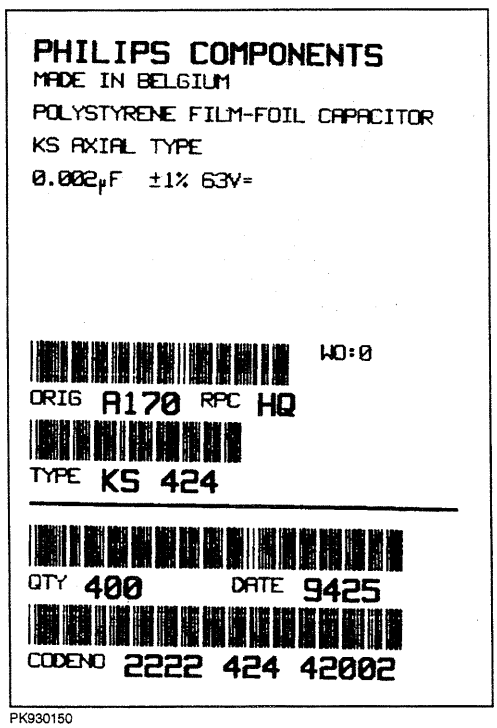
- Rated capacitance code in accordance with IEC 62
- Tolerance on rated capacitance: F = ±1%; G = ±2%; J = ±5%
- Rated (DC) voltage (e.g. 63 V)
- Code for dielectric material (KS)
- Production date code in accordance with IEC 62; clause 5.

EXAMPLE OF MARKING

8n2
G 63
KS D2

Package marking

The package containing the capacitors is marked as shown.



PK930150

LINE	MARKING EXPLANATION
1	Manufacturer's name
2	Country of origin
3	Sub-family
4	Type description
5	Capacitance value, tolerance, voltage and climatic category (IEC)
6	–
7	Preference origin code: A Country of origin in code: 170 (Belgium) Responsible production centre: HQ WO: work order
8	Product type description
9	Quantity and production period, year and week code
10	Product code (12NC)

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QUICK REFERENCE TEST REQUIREMENTS

TEST	PROCEDURE (quick reference)	REQUIREMENTS
Robustness of terminations		
Tensile, bending and torsion		no visible damage legible marking
Resistance to soldering heat	solder bath: 260 °C; 5 s	$\Delta C/C \leq 1\%$ +1 pF ($C \leq 1000$ pF) $\Delta C/C \leq 1\%$ ($C > 1000$ pF)
Robustness of component		
Vibration	10 Hz to 55 Hz; amplitude 0.75 mm or acceleration 98 m/s^2; 6 hours	$\Delta C/C \leq 0.5\%$ +0.5 pF ($C \leq 1000$ pF) $\Delta C/C \leq 0.5\%$ ($C > 1000$ pF)
Shock	half sinewave; 490 m/s^2; 11 ms	
Climatic sequence		
Dry heat Damp heat cyclic, first cycle Cold Damp heat, remaining cycles	16 hours; 85 °C 2 hours; –40 °C	$\Delta C/C \leq 1.2\%$ +1.2 pF ($C \leq 1000$ pF) $\Delta C/C \leq 1.2\%$ ($C > 1000$ pF) $R_{ins} \geq 50\%$ of specified value
Other applicable tests		
Damp heat steady state	21 days; 40 °C; 90 to 95% RH	$\Delta C/C \leq 1\%$ +1 pF ($C \leq 1000$ pF) $\Delta C/C \leq 1\%$ ($C > 1000$ pF) $R_{ins} \geq 50\%$ of specified value
Endurance (DC)	1000 hours; 1.5 x U_{Rdc}; 85 °C	$\Delta C/C \leq 0.75\%$ +0.75 pF ($C \leq 1000$ pF) $\Delta C/C \leq 0.75\%$ ($C > 1000$ pF) $R_{ins} \geq 100\%$ of specified value
Heat storage	1000 hours; 85 °C	$\Delta C/C \leq 0.75\%$ +0.75 pF ($C \leq 1000$ pF) $\Delta C/C \leq 0.75\%$ ($C > 1000$ pF)
Variation of capacitance with temperature	static method; one cycle	$\Delta C/C \leq 0.5\%$ +0.5 pF ($C \leq 1000$ pF) $\Delta C/C \leq 0.5\%$ ($C > 1000$ pF) $R_{ins} > 10\ 000$ MΩ
Resistance to soldering heat with preheating		see soldering conditions in Chapter "GENERAL DATA"