Трубчатые и корпусные конденсаторы RF

Технические характеристики

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Power Capacitor:

RF Rating & Operating Condit

The electrical performance is determined by the voltage, current and reactive power ratings. For the ideal case of a pure sinusoidal voltage waveform these parameters are related by the following equations:

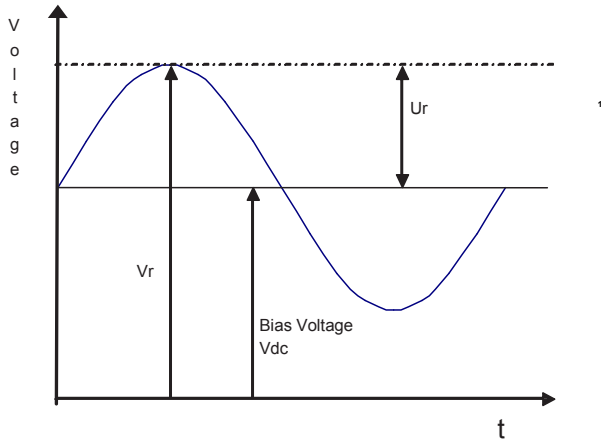
$$W_r = \frac{U_r^2 fC}{318}$$

&

$$W_r = \frac{159 I_r^2}{fC}$$

Where W_r = Rated reactive power (kVA)
U_r = Rated a.c. voltage (kVpk)
I_r = Rated current (amps r.m.s.)
f = frequency (MHz)
C = Capacitance (pF)

V_r is the peak ac + dc voltage (Ur + dc) kVpk for which the capacitor is designed.

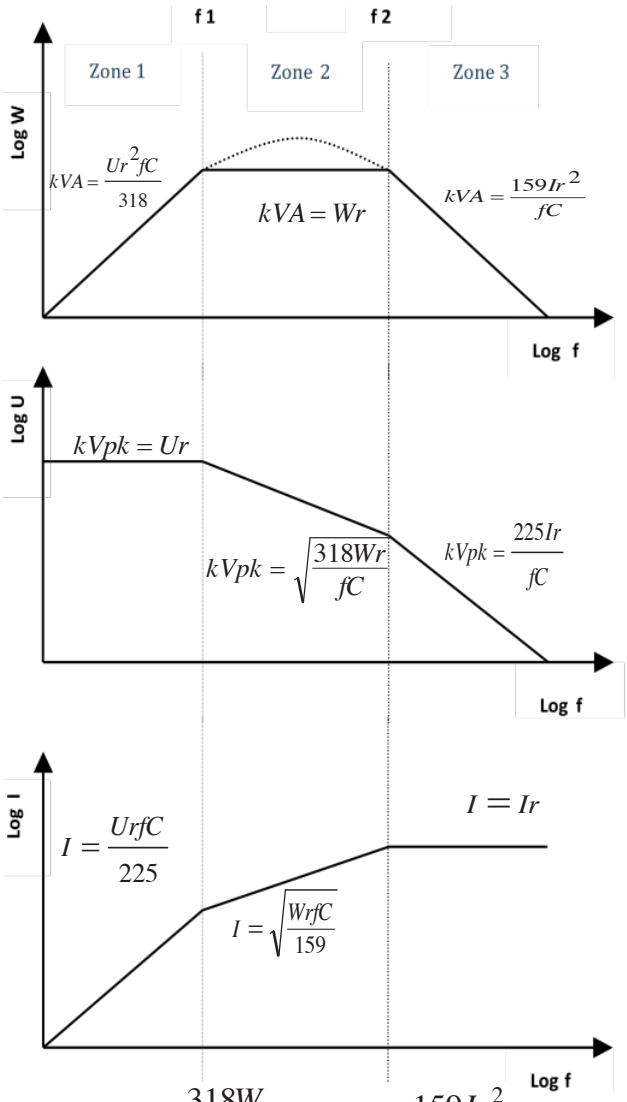


Rated current Ir is the r.m.s. current for which the capacitor is designed

Rated reactive power Wr is such that the capacitor temperature rise shall not exceed 45°C when operated, in still air, at an ambient temperature of 30°C (or as otherwise specified in the datasheet).

Frequency

When a capacitor is subjected to an RF load, heat is generated in the dielectric due to internal losses and in the electrode system due to resistance heating.
The performance is characterized by a typical frequency load curve as shown below:



$$f_1 = \frac{318 W_r}{Ur^2 C} \qquad f_2 = \frac{159 Ir^2}{W_r C}$$

At frequencies below f_1 (Zone1) the capacitor can be operated at it's maximum ac rating U_r.

At frequencies above f_2 (Zone3) the capacitor can be operated at it's maximum current rating I_r.

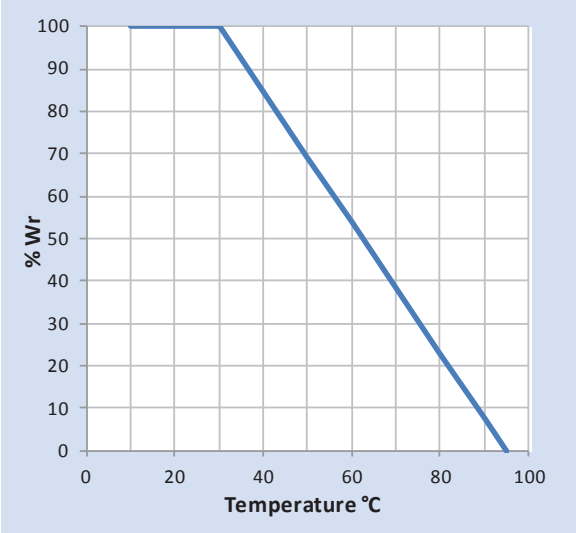
At frequencies between f_1 and f_2 (Zone2) the capacitor can be operated at it's maximum power rating W_r.

Operating Conditions

In certain circumstances such as intermittent operation the reactive power and current ratings can be exceeded but in no case should the maximum body temperature of the capacitor be exceeded, normally 95°C or as otherwise stated in the relevant data sheet.

For guidance short term power and current ratings of 1.5 x are permissible. The voltages must not be exceeded.

If the capacitors are operated in an ambient temperature higher than 30°C then the reactive power loading must be reduced as shown in the graph below:



The user should ensure that the permissible operating conditions for the capacitor are not exceeded.

Care should be taken in the mechanical mounting to ensure that mechanical / thermal stresses are minimised. Vertical mounting is recommended.

The use of forced cooling methods allows higher reactive powers to be applied provided that the maximum body temperature of the capacitor is not exceeded. Methods of cooling commonly used are:

1. Forced Air
2. Water cooled connections
3. Oil immersion

Forced Air Cooling

Where Wr = Rated Reactive Power(kVAr)

$$W_r \text{ (Force Cooled)} = \left(1 + \frac{2V}{3}\right) \times W_r \text{ (naturally cooled)}$$

V = air speed (ms^{-1})

Care should be taken when using forced air cooling to ensure that:

- Maximum body temperature is not exceeded
- Body temperature is even i.e. no 'hot spots'.

Maximum RF Current @ Frequencies > 20MHz

$$I_f = \left(\frac{f}{20}\right)^{-0.25} \times I_{20}$$

where

I_f = Current @ f MHz

I_{20} = Current @ 20MHz

f = frequency (MHz)

e.g. For f = 100 MHz and I_{20} = 25 Amps rms

$$If = \left(\frac{100}{20}\right)^{-0.25} \times 25$$

If = 16.7 Amps

RF Power Capacitor Storage Conditions

- Long term storage : +15°C to + 35°C and 25–75% relative humidity.
- Avoid accumulation of dust / water collection on sheds as this may lead to corona discharge / flashover.
- Avoid transportation of the units mounted as excessive vibration could lead to damage to the ceramic/metalwork joint.
- Avoid subjecting the units to undue shock e.g. dropping them, as this could lead to cracking of the ceramic and ultimate failure of the device.

RF Power Capacitors Class1

10kV Hi-Load: Tag-Screw Mounting

The CeramTec Group is a world leader in the design and manufacture of complex electronic ceramic components and assemblies used in a wide range of applications and cutting edge technologies. CeramTec UK specialises in the development and production of dielectric and ferroelectric materials and components. This range of high voltage RF discs capacitors is fabricated from very low loss CLASS 1 ceramic dielectric materials which permit them to carry very high electrical loads over a wide frequency range.

APPLICATIONS INCLUDE

- Radio Broadcast Transmitters
- Induction and Dielectric Heating Equipment
- HF Filter, By-Pass & Coupling Circuits
- High Power Matching Tuned Circuits
- Antenna Circuits
- Industrial Applications
- High Power matching networks –Plasma Generators
- High quality medical imaging systems (MRI)

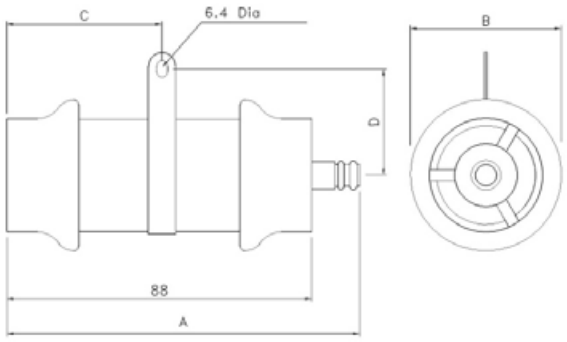
FEATURES

- Low loss Class 1 ceramic dielectric materials with noble metal electrodes resulting in low self heating.
- High Voltage / High Reactive Power Ratings
- Very low NPO capacitance-temperature characteristics available that result in correspondingly low tuned frequency drift.
- Low Inductance construction permitting higher frequency use.
- Low magnetic susceptibility

Material Characteristics						
Dielectric Constant @ 20°C / 1 MHz		15	36	77	90	190
Temperature Coefficient of Capacitance	ppm/°C	+100 ±60	0 ±30	0 ±30	-750 ±80	-1300 ±120
Tan δ 1 MHz (Cap ≤ 1000 pF)	x 10^{-4}	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Tan δ 1 kHz (Cap > 1000 pF)	x 10^{-4}	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Dielectric Strength	$kVmm^{-1}$ dc	22	20	15	10	10
Volume Resistivity	Ωm	10^{13}	10^{13}	10^{13}	10^{13}	10^{13}

Electrical Specification	
Capacitance Range	125 – 2500pF (see table)
Capacitance Tolerance	±20 % ±10 % Consult factory for other tolerances
Rated RF Voltage	10kV pk (see table)
Test Voltage (50 Hz)	√2 x Rated Voltage / 60sec
RF Voltage, Current kVAr & Load v Frequency	See RF rating curves (ref 30°C max ambient temperature)
Operating Temperature Range	-25°C +95°C
Maximum Relative Humidity	75 %

Outline Drawing: Hi-load 10kV Discs. Tag-Screw-Mounting



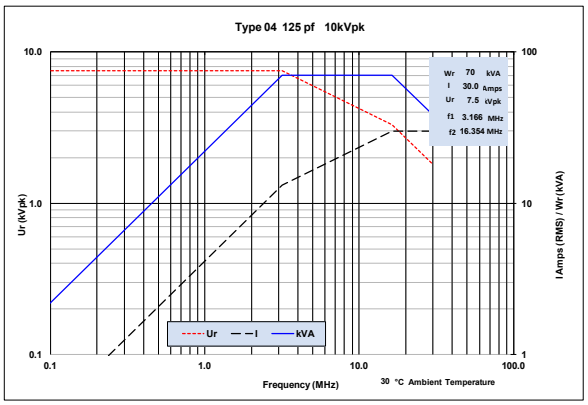
Vertical Mounting
Recommended

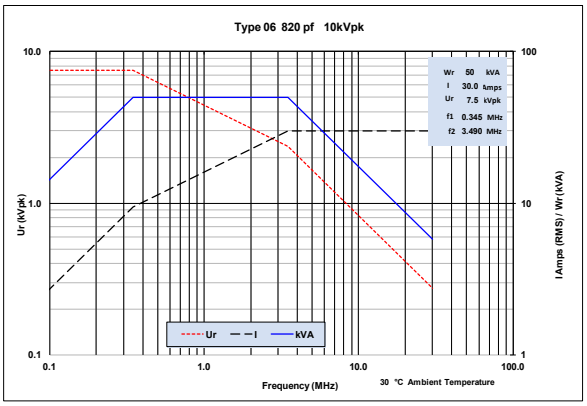
Electrical Characteristics

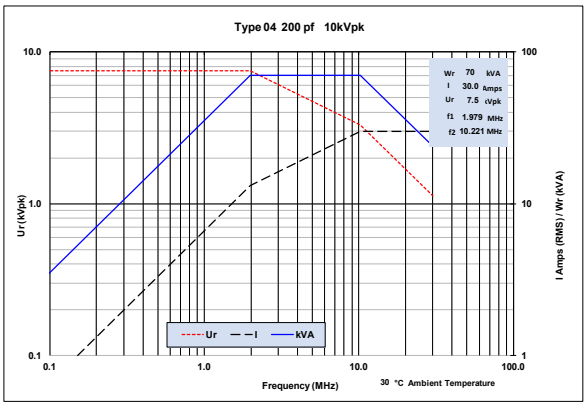
Type No	Cap Value pF	TCC ppm/ °C	Rated (ACpk + DC) kVpk	Rated AC kVpk	Test 50 Hz kVrms	Max POWER Rating (kVAr)	Max Current Rating (A rms)	A nom (mm)	B nom (mm)	C nom (mm)	D nom (mm)	Thread Size (mm)
04	125	+100	10	7.5	10	70	30	120	46	44	38	M6
04	150	+100	10	7.5	10	70	30	120	46	44	38	M6
04	200	+100	10	7.5	10	70	30	120	46	44	38	M6
05	330	0	10	7.5	10	70	30	120	46	44	38	M6
05	430	0	10	7.5	10	70	30	120	46	44	38	M6
05	500	0	10	7.5	10	70	30	120	46	44	38	M6
06	820	-750	10	7.5	10	50	30	120	46	44	38	M6
06	1000	-750	10	7.5	10	50	30	120	46	44	38	M6
06	1250	-750	10	7.5	10	50	30	120	46	44	38	M6
805	1600	-1300	10	7.5	10	50	30	120	46	44	38	M6
805	2000	-1300	10	7.5	10	50	30	120	46	44	38	M6
805	2500	-1300	10	7.5	10	50	30	120	46	44	38	M6

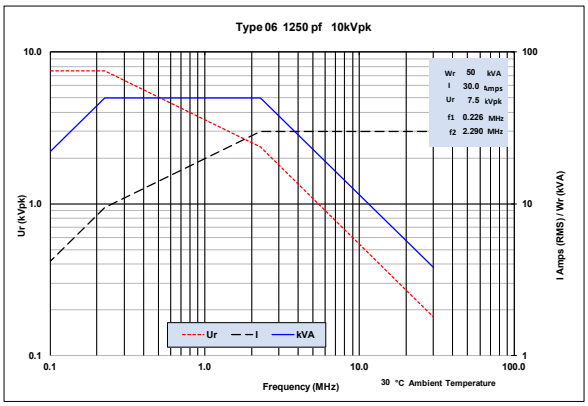
RF Power Capacitors Class1

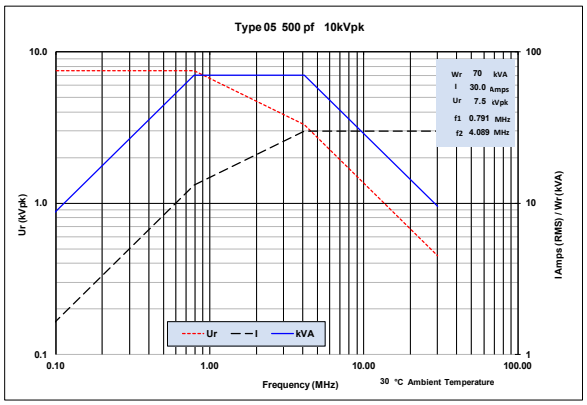
10kV Hi-Load: Tag-Screw Mounting

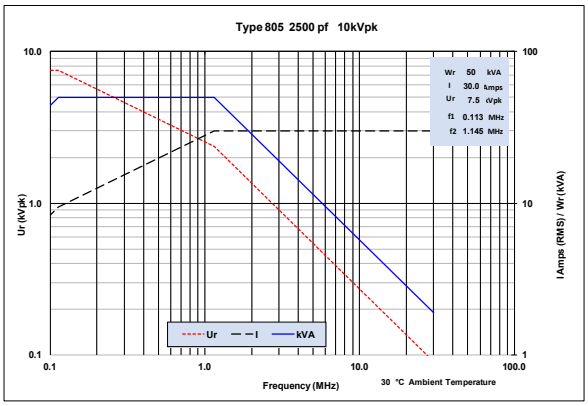












RF Power Capacitors Class1

12-15kV Hi-Load: Band-Screw Mounting

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APPLICATIONS INCLUDE

- Radio Broadcast Transmitters
- Induction and Dielectric Heating Equipment
- HF Filter, By-Pass & Coupling Circuits
- High Power Matching Tuned Circuits
- Antenna Circuits
- Industrial Applications
- High Power matching networks –Plasma Generators
- High quality medical imaging systems (MRI)

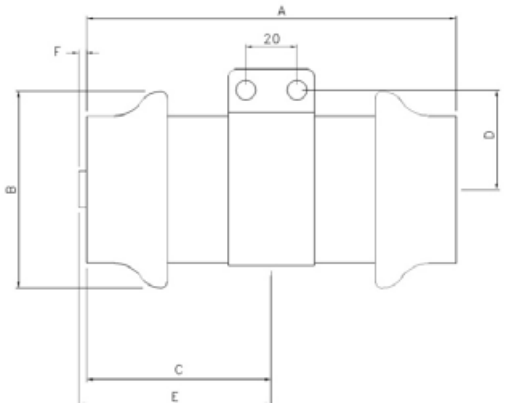
FEATURES

- Low loss Class 1 ceramic dielectric materials with noble metal electrodes resulting in low self heating.
- High Voltage / High Reactive Power Ratings
- Very low NPO capacitance-temperature characteristics available that result in correspondingly low tuned frequency drift.
- Low Inductance construction permitting higher frequency use.
- Low magnetic susceptibility

Material Characteristics						
Dielectric Constant @ 20°C / 1 MHz		15	36	77	90	190
Temperature Coefficient of Capacitance	ppm/°C	+100 ±60	0 ±30	0 ±30	-750 ±80	-1300 ±120
Tan δ 1 MHz (Cap ≤ 1000 pF)	x 10^{-4}	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Tan δ 1 kHz (Cap > 1000 pF)	x 10^{-4}	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Dielectric Strength	kVmm^{-1} dc	22	20	15	10	10
Volume Resistivity	Ωm	10^{13}	10^{13}	10^{13}	10^{13}	10^{13}

Electrical Specification	
Capacitance Range	2000 – 5000pF (see table)
Capacitance Tolerance	±20 % ±10 % Consult factory for other tolerances
Rated RF Voltage	12-15kV pk (see table)
Test Voltage (50 Hz)	√2 x Rated Voltage / 60sec
RF Voltage, Current kVAr & Load v Frequency	See RF rating curves (ref 30°C max ambient temperature)
Operating Temperature Range	-25°C +95°C
Maximum Relative Humidity	75 %

Outline Drawing: Hi-load 12-15kV Discs. Band-Screw-Mounting



Vertical Mounting
Recommended

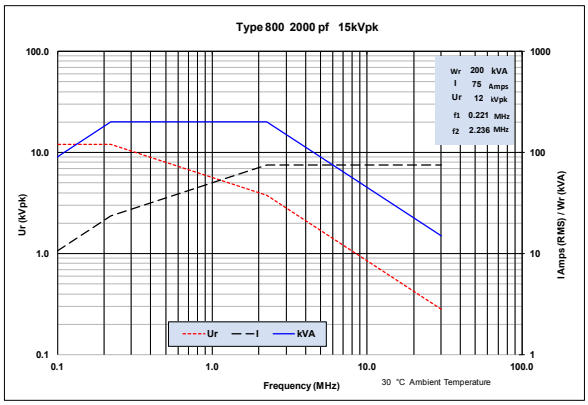
Dim 'F' Type 800
7.15-11.55 mm
Dim 'F' Type 803
4-6 mm

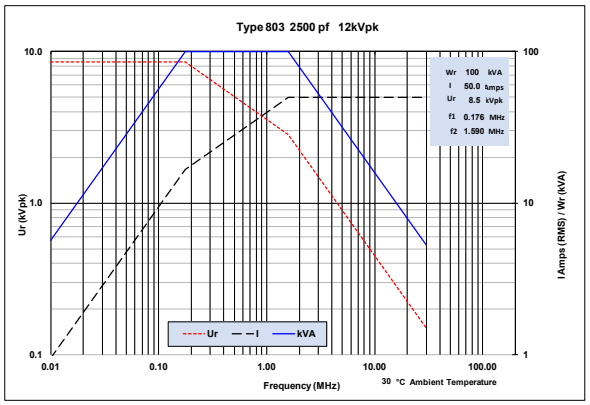
Electrical Characteristics

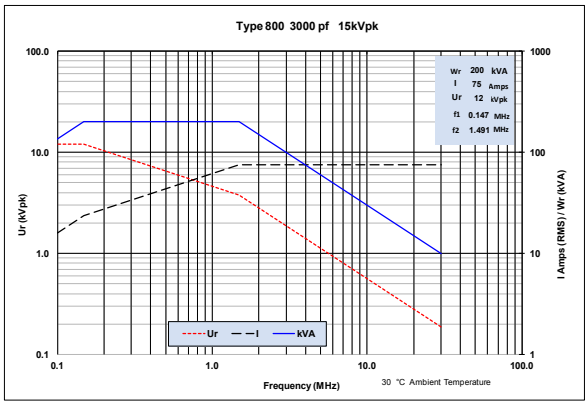
Type No	Cap Value pF	TCC ppm/ °C	Rated (ACpk + DC) kVpk	Rated AC kVpk	Test 50 H kVrms	Max POWE Ratin (kVAr)	Max Current Rati (A rms)	A nom (mm)	B no (mm)	C n (mm)	D n (mm)	E nom (mm)	Thread Size (mm)
800	2000	-1300	15	12	15	200	75	110	76.5	64	38.9		M6
800	3000	-1300	15	12	15	200	75	143	76.5	77	38.9		M6
800	4000	-1300	15	12	15	200	75	165	76.5	91	38.9		M6
803	2500	-1300	12	8.5	12	100	50	100	68		33.9	55	M6
803	3000	-1300	12	8.5	12	100	50	115	68		33.9	62.5	M6
803	3500	-1300	12	8.5	12	100	50	130	68		33.9	70	M6
803	4000	-1300	12	8.5	12	100	50	140	68		33.9	75	M6
803	5000	-1300	12	8.5	12	100	50	150	68		33.9	80	M6

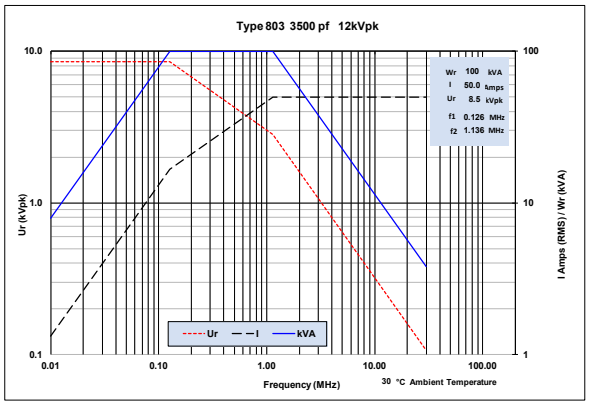
RF Power Capacitors Class1

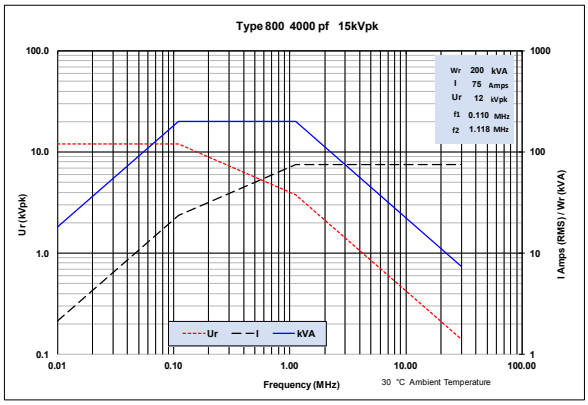
12-15kV Hi-Load: Band-Screw Mounting

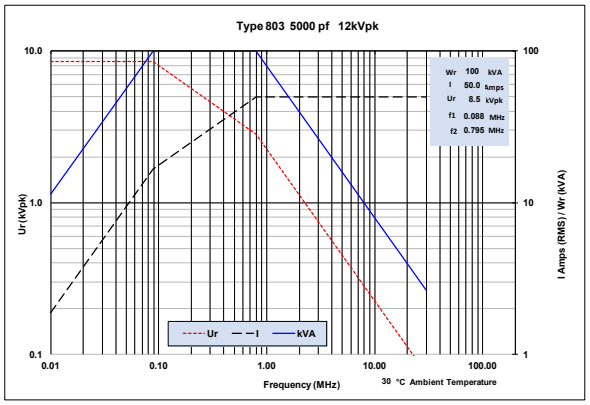












RF Power Capacitors Class1

15kV Hi-Load: Stand-Off Mounting

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FEATURES

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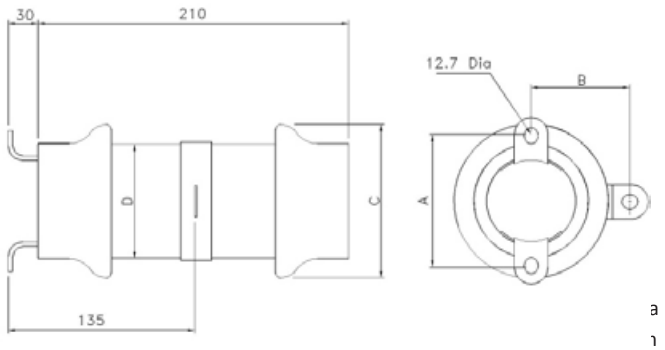
- High Voltage / High Reactive Power Ratings
- Very low NPO capacitance-temperature characteristics available that result in correspondingly low tuned frequency drift.
- Low Inductance construction permitting higher frequency use.
- Low magnetic susceptibility

Material Characteristics						
Dielectric Constant @ 20°C / 1 MHz		15	36	77	90	190
Temperature Coefficient of Capacitance	ppm/°C	+100 ±60	0 ±30	0 ±30	-750 ±80	-1300 ±120
Tan δ 1 MHz (Cap ≤ 1000 pF)	x 10^{-4}	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Tan δ 1 kHz (Cap > 1000 pF)	x 10^{-4}	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Dielectric Strength	kVmm^{-1} dc	22	20	15	10	10
Volume Resistivity	Ωm	10^{13}	10^{13}	10^{13}	10^{13}	10^{13}

Electrical Specification	
Capacitance Range	400 – 4000pF (see table)
Capacitance Tolerance	±20 % ±10 % Consult factory for other tolerances
Rated RF Voltage	12-15kV pk (see table)
Test Voltage (50 Hz)	√2 x Rated Voltage / 60sec
RF Voltage, Current kVAr & Load v Frequency	See RF rating curves (ref 30°C max ambient temperature)
Operating Temperature Range	-25°C +95°C
Maximum Relative Humidity	75 %

Outline Drawing: 15kV Hi-Load. Stand-Off Mounting



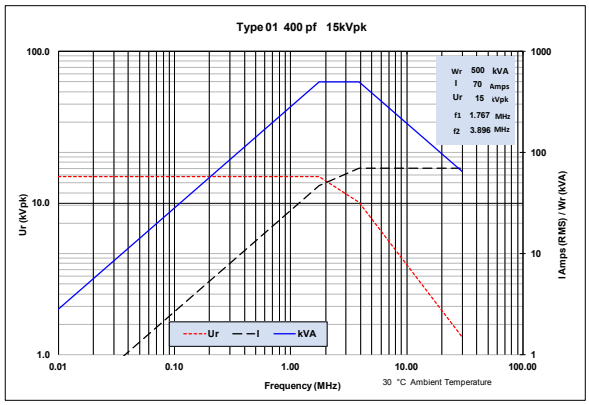
Vertical Mounting
Recommended

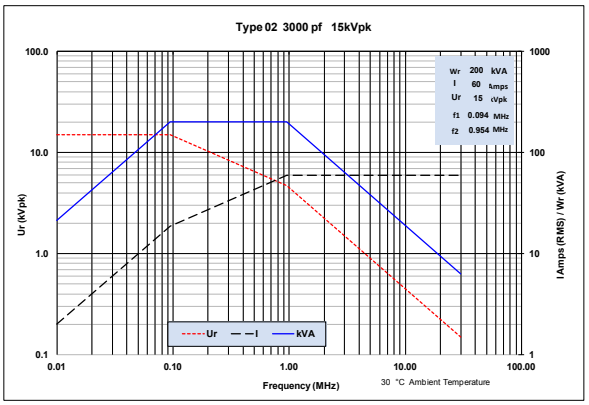
Electrical Characteristics

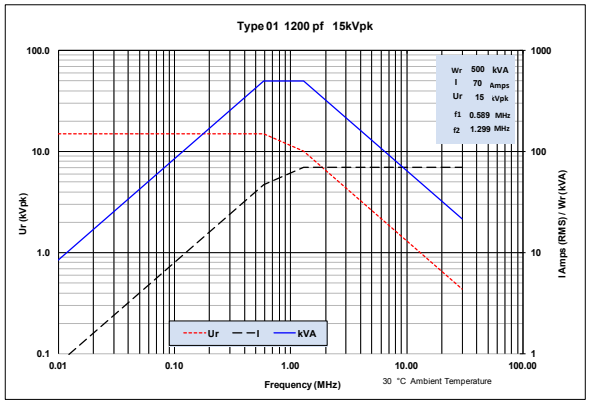
Type No	Cap Value pF	TCC ppm/ °C	Rated (ACpk + DC) kVpk	Rated AC kVpk	Test 50 Hz kVrms	Max POWER Rating (kVAr)	Max Current Rating (A rms)	A nom (mm)	B nom (mm)	C nom (mm)	D nom (mm)
01	400	+100	15	15	15	500	70	100	82	131	100
01	500	+100	15	15	15	500	70	100	82	125	90
01	650	+100	15	15	15	500	70	100	82	118	85
01	1200	+100	15	15	15	500	70	100	77	110	77
02	2000	-750	15	15	15	200	60	85	70	116	85
02	3000	-750	15	15	15	200	60	85	70	107	76
03	3000	-750	15	15	15	275	70	100	82	128	96
03	4000	-750	15	15	15	275	70	100	82	121	90
96120/1	500	+100	18	18	18	500	70	100	82	125	90

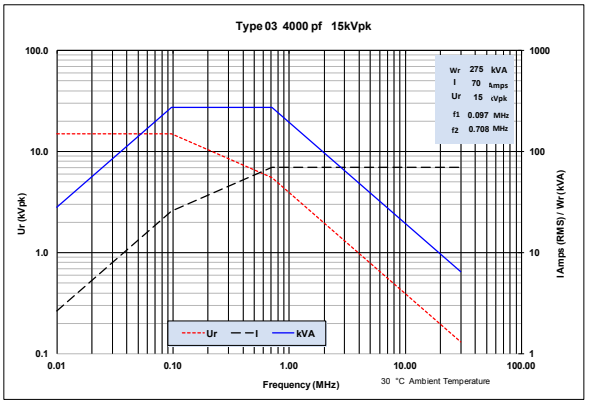
RF Power Capacitors Class1

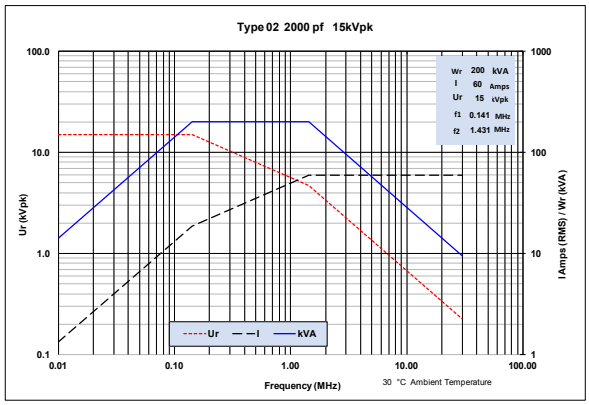
15kV Hi-Load: Stand-Off Mounting

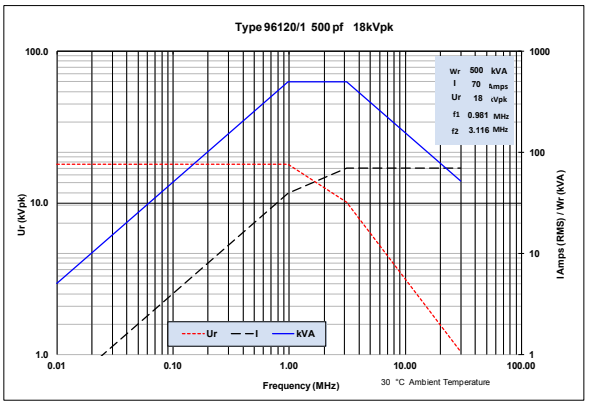












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