Aluminum Can Power Film Capacitors

C44H, 330 – 440 VAC/700 – 1,000 VDC, for PFC & AC Filter

Overview

The C44H capacitor is a polypropylene metallized film capacitor with a cylindrical, aluminium can-type design filled with liquid resin. It uses screw terminals, a plastic deck, and an overpressure safety device.

Applications

Typical applications include commutation, power factor correction and AC harmonic filtering.

Benefits

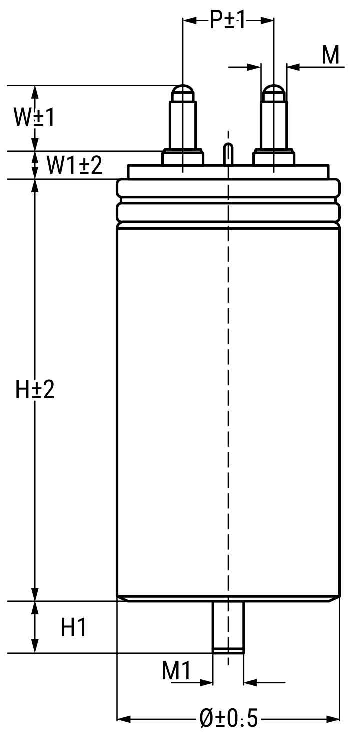
- Overpressure safety device
- High peak current capability
- Long lifetime
- Self-healing

Part Number System

C44H	L	G	P	6100	A	A	S	J
Series	Rated Voltage	Case and Fixing Bolt Code	Terminal Style	Capacitance Code (pF)	Internal Code	Internal Code		Tolerance
C44H = MKP Capacitors for AC filtering	L = 330 V_{rms} K = 440 V_{rms}	G = Cylindrical aluminum case with M12 bolt	P = M6 Threaded Posts R = M10 Threaded Posts	Digits 9 – 11 indicate the first three digits of the capacitance value. Digit 8 indicates the number of zeros to be added.	A = Standard Z = Special			J = 5% K = 10%

It is not possible to manufacture every part number which could be created from coding description. Please refer to table of standard part numbers and ask KEMET for other possibilities.

Dimensions – Millimeters



Diameter	P	M	W	W1	M1	H1
Ø = 65	22.5	6	13	5	12	12.5
Ø ≥ 75	35	10	25	10	12	16
All dimensions are in mm						

Maximum Driving Torque	
Terminals M6	5 [N*m]
Terminals M10	8 [N*m]
Bolt M12	12 [N*m]

General Technical Data

Reference Standards	IEC 61071	
Dielectric	Polypropylene film	
	Non-inductive type winding	
Climatic Category	25/70/56 – IEC 60068–1	
Maximum hot spot temperature	+75°C	
Endurance Test IEC 61071	+65°C at Case Temperature	
Installation	Whatever position	
Self extinguishing UL94 V0 plastic deck		

Electrical Characteristics

Rated Voltage	U_{rms} = (see table) VAC
Surge Voltage	Us = (see table) VDC
Capacitance Tolerance	±5% or ±10%
Dissipation Factor PP typical (tgδ0)	≤ 0.0002 at 25°C
Relative Humidity	Annual average ≤ 80% at 24°C
	On 30 days/year permanently 100%. On other days occasionally 90%.
	Dewing not admitted
Capacitance deviation in temperature range (-40 +50°C)	±1.5% maximum on capacitance value at 20°C

Life Expectancy

Life Expectancy	100,000 hours at V_{RMS} with T_{HS} ≤ 70°C
Capacitance drop at end of life	–5% (typical)
Failure Rate IEC 61709	See FIT Graph

Test Methods

Test voltage term to term (Utt)	1.5 x V_{RMS} for 10 seconds at 25°C
Test voltage term to case (Utc)	3,600 V ~ 50 Hz for 10 seconds
Damp Heat	IEC 60068–2–78
Change of Temperature	IEC 60068–2–14
Vibration Strength	IEC 60068–2–6

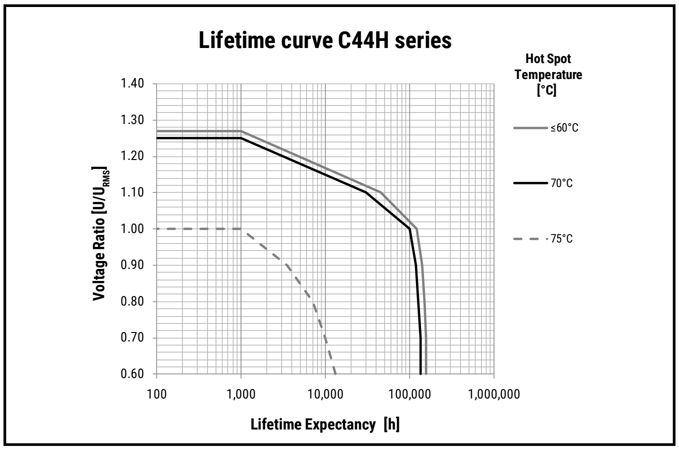
NOTICE: Care should be taken to ensure that there still is electrical clearance of 15 mm between terminations and other live or earthed parts above the capacitor, in case of safety device activation.

Table 1 – Ratings & Part Number Reference

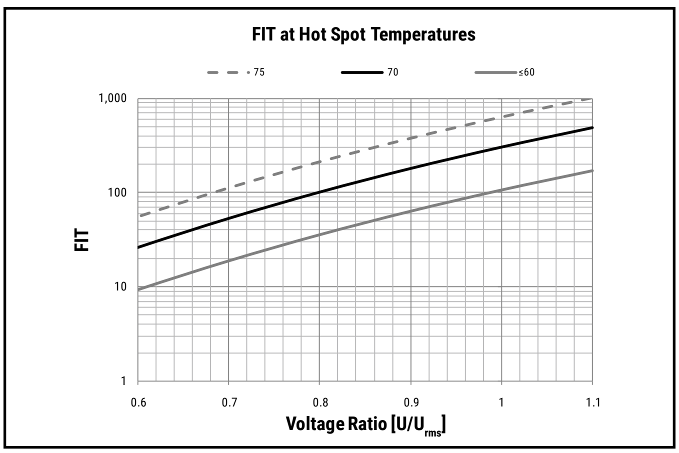
Cap Value (µF)	V_{rms}	Un	Us	dV/dt (V/µs)	Irms	ESL <	Rs	Rth hs/amb °C/W	Case		Part Number
	VAC	VDC	VDC		A	nH	mΩ		Ø	H	
100	330	700	1,050	12.5	25	100	3.4	8	65	98	C44HLGP6100AASJ
200	330	700	1,050	12.5	40	120	1.7	6.1	75	117	C44HLGR6200AASJ
300	330	700	1,050	12.5	45	160	1.6	3.6	75	194	C44HLGR6300AASJ
400	330	700	1,050	12.5	50	160	2.3	3	75	242	C44HLGR6400AASJ
500	330	700	1,050	12.5	55	170	2.1	2.7	75	242	C44HLGR6500AASJ
600	330	700	1,050	12.5	65	180	1.9	2.6	85	242	C44HLGR6600AASJ
100	440	1,000	1,500	20	30	145	4.1	5	75	142	C44HKGR6100AASJ
133	440	1,000	1,500	20	35	155	3.3	4.5	85	142	C44HKGR6133AASJ
133	440	1,000	1,500	20	40	170	1.9	4	75	194	C44HKGR6133ZASJ
150	440	1,000	1,500	20	45	160	1.8	3.8	75	194	C44HKGR6150AASJ
200	440	1,000	1,500	20	50	175	2.7	3	75	242	C44HKGR6200AASJ
250	440	1,000	1,500	20	55	190	2.4	2.8	85	242	C44HKGR6250AASJ
Cap Value	VAC	VDC	VDC	dV/dt (V/µs)	Irms	ESL	Rs	Rth hs/amb °C/W	Case		Part Number

[1] *Maximum admissible RMS current $T_{HS} \leq 70°C$.*

Lifetime Expectancy/Failure Quota Graphs



V = Operating Voltage [VAC]
V_{rms} = Rated Voltage [VAC]



Power Losses and Hot Spot Temperature Calculation

At each frequency, the Power Losses are the sum of:

1. Dielectric Power Losses

$P_D(f_i) = 2 * \pi * f_i * C * V(f_i)^2 * tg\delta_0$

which can be alternatively calculated as

$$P_D(f_i) = \frac{I(f_i)^2}{2 * \pi * f_i * C} * tg\delta_0$$

where: $tg\delta_0 = 2 * 10^{-4}$

2. Joule Power Losses:

$P_J(f_i) = Rs * I(f_i)^2$

The Total Power Losses are the sum of the components at each frequency:

$$P_T = \sum_i [P_D(f_i) + P_J(f_i)]$$

The Thermal Jump in the Hot Spot is:

$\Delta T_{HS} = P_T * R_{th\text{-}hs}$

The Hot Spot Temperature is:

$T_{HS} = T_a + \Delta T_{HS}$

Limits for the formulas

The limits listed below should not be exceeded:

1. $$\sqrt{\sum_i V(f_i)^2} \le V_{RMS}$$

2. $$\sqrt{\sum_i I(f_i)^2} \le I_{RMS}$$

$T_{HS} = T_a + \Delta T_{HS} \le (T_{HS})_{MAX}$

Where T_a *is the ambient temperature (steady state temperature of the cooling air flowing around the capacitor, measured at 100 mm of distance from the capacitor and at a height of 2/3 height of the capacitor).*

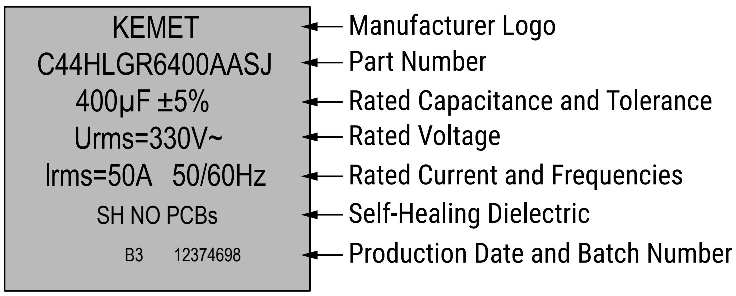
3. Maximum case temperature $(T_{CASE}) \le 70°C$

Example of calculation

Part Number: C44HKGR6100AASJ
Rated $V_{RMS} = 440\ [V_{RMS}]$
Rated $I_{RMS} = 30\ [A]$
$R_s = 4.1\ [m\Omega]$
$R_{th} = 5.0\ [°C/W]$
Fundamental Frequency $F_1 = 50\ [Hz]$
Ripple Frequency $F_2 = 7000\ [Hz]$
Fundamental Voltage $V_1 = 440\ [V\sim]$
Ripple Current $I_2 = 27\ [A]$
$T_a = 35°C$
$I_1 = I(50) = 2 * \pi * 50 * 100 * 10^{-6} * 440 = 13.8\ [A]$
$V_2 = V(7000) = [27/(2 * \pi * 7000 * 100 * 10^{-6})] = 6.14\ [V]$

$I_{RMS} = \sqrt{(13.8^2 + 27^2)} = 30 \le 30 \rightarrow$ *Admitted*
$V_{RMS} = \sqrt{(440^2 + 6.1^2)} = 440 \le 440 \rightarrow$ *Admitted*
$P_D(50) = 2 * \pi * 50 * 100 * 10^{-6} * 440^2 * 2 * 10^{-4} = 1.22\ [W]$
$P_D(7000) = [27^2/(2 * \pi * 7000 * 100 * 10^{-6})] * 2 * 10^{-4} = 0.03\ [W]$
$P_J(50) = 4.1 * 10^{-3} * [(2 * \pi * 50 * 100 * 10^{-6} * 440)^2] = 0.78\ [W]$
$P_J(7000) = 4.1 * 10^{-3} * 27^2 = 3\ [W]$
$P_T = 1.22 + 0.03 + 0.78 + 3 = 5\ [W]$
$\Delta T_{HS} = 5 * 5 = 25\ [°C]$
$T_{HS} = Ta + \Delta T_{HS}$
$T_{HS} = 35 + 25 = 60\ [°C] \rightarrow$ *OK since hot spot temperature is less than maximum admitted*
Expected Life at $T_{HS} = 70°C \rightarrow$ *100,000 hours (see lifetime curve)*
Expected Life at $T_{HS} = 60°C \rightarrow$ *140,000 hours (see lifetime curve)*

Marking



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Dissipation Factor

Dissipation factor is a complex function involved with capacitor inefficiency. The tgδ may vary up and down with increased temperature. For more information, refer to Performance Characteristics.

Sealing

Hermetically Sealed Capacitors
As the temperature increases, the pressure inside the capacitor increases. If the internal pressure is high enough, it can cause a breach in the capacitor. Such a breach can result in leakage, impregnation, filling fluid, or moisture susceptibility.

Barometric Pressure
The altitude at which hermetically sealed capacitors are operated controls the capacitor's voltage rating. As the barometric pressure decreases, the susceptibility to terminal arc-over increases. Non-hermetic capacitors can be affected by internal stresses due to pressure changes. These effects can be in the form of capacitance changes, dielectric arc-over, and/or low insulation resistance. Altitude can also affect heat transfer. Heat that is generated in an operation cannot be dissipated properly, and high RI^2 losses and eventual failure can result.

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