C44H Series, 330 – 440 VAC, 700 – 1,000 VDC, for PFC and AC Filter

Overview

The C44H Series are a polypropylene metallized film with cylindrical aluminium can type filled with liquid resin, screw terminals, plastic deck and overpressure safety device.

Applications

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

Benefits

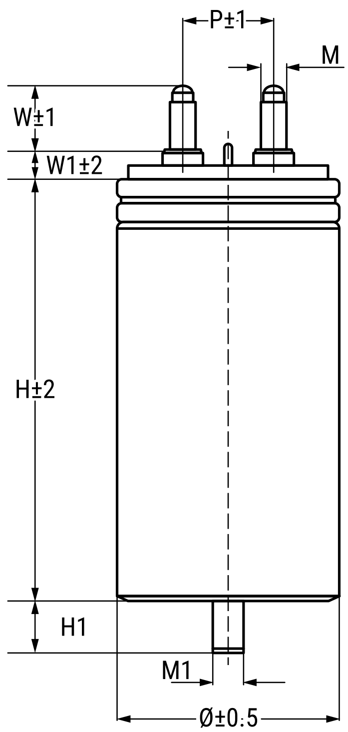
- Overpressure safety device
- High peak current capability
- Long lifetime
- Self-healing

Part Number System

C44H	L	G	P	6100	A	A	S	J
Series	Rated Voltage	Case & 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

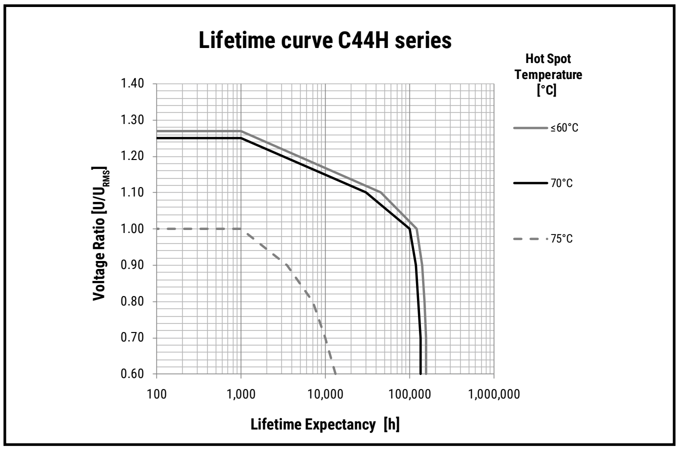
NOTICE: Care should be taken to ensure that there still is electrical clearance of 15 mm between terminations and other live or earthed parts above the capacitor, in case of safety device activation.

Table 1 – Ratings & Part Number Reference

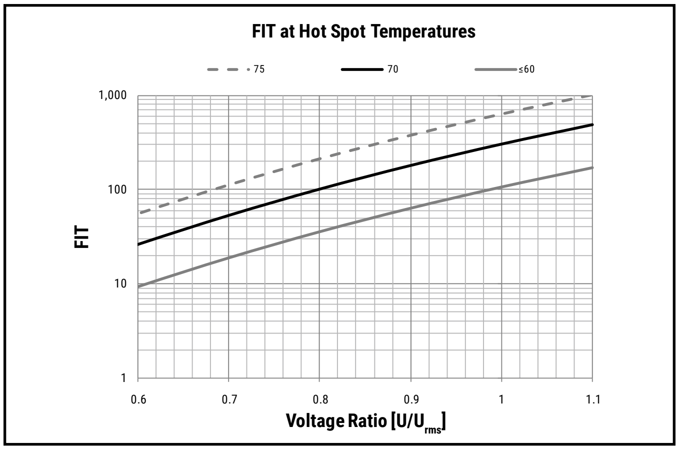
Cap Value (µF)	V_{rms}	Un	Us	dV/dt (V/µs)	Irms	ESL <	Rs	Rth hs/amb °C/W	Case		Part Number
	VAC	VDC	VDC		A	nH	mW		Ø	H	
100	330	700	1,050	12.5	25	100	3.4	8	65	98	C44HLGP6100AASJ
200	330	700	1,050	12.5	40	120	1.7	6.1	75	117	C44HLGR6200AASJ
300	330	700	1,050	12.5	45	160	1.6	3.6	75	194	C44HLGR6300AASJ
400	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. $$\sqrt{\sum_i V(f_i)^2} \leq V_{RMS}$$

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

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

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).*

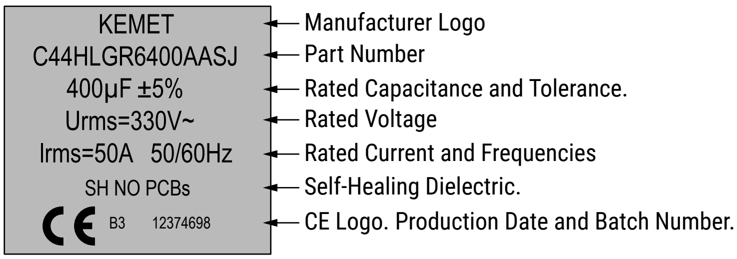
3. Maximum case temperature $(T_{CASE}) \leq 70°C$

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 $I_2 = 27\ [A]$
$T_a = 35°C$
$I_1 = I(50) = 2 * \pi * 50 * 100 * 10^{-6} * 440 = 13.8\ [A]$
$V_2 = V(7000) = [27/(2 * \pi * 7000 * 100 * 10^{-6})] = 6.14\ [V]$

$I_{RMS} = \sqrt{(13.8^2 + 27^2)} = 30 \leq 30 \rightarrow$ *Admitted*
$V_{RMS} = \sqrt{(440^2 + 6.1^2)} = 440 \leq 440 \rightarrow$ *Admitted*
$P_D(50) = 2 * \pi * 50 * 100 * 10^{-6} * 440^2 * 2 * 10^{-4} = 1.22\ [W]$
$P_D(7000) = [27^2/(2 * \pi * 7000 * 100 * 10^{-6})] * 2 * 10^{-4} = 0.03\ [W]$
$P_J(50) = 3.5 * 10^{-3} * [(2 * \pi * 50 * 100 * 10^{-6} * 440)^2] = 0.67\ [W]$
$P_J(7000) = 3.5 * 10^{-3} * 27^2 = 2.55\ [W]$
$P_T = 1.22 + 0.03 + 0.78 + 3 = 5\ [W]$
$\Delta T_{HS} = 5 * 5 = 25\ [°C]$
$T_{HS} = Ta + \Delta T_{HS}$
$T_{HS} = 35 + 25 = 60\ [°C] \rightarrow$ *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



Dissipation Factor

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

Sealing

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

Resin Encased/Wrap & Fill Capacitors
The resin seals on resin encased and wrap and fill capacitors will withstand short-term exposure to high humidity environments without degradation. Resins and plastic tapes will form a pseudo-impervious barrier to humidity and chemicals. These case materials are somewhat porous and through osmosis can cause contaminants to enter the capacitor. The second area of contaminated absorption is the lead-wire/resin interface. Since resins cannot bond 100% to tinned wires, there can be a path formed up to the lead wire into the capacitor section. Aqueous cleaning of circuit boards can aggravate this condition.

Barometric Pressure
The altitude at which hermetically sealed capacitors are operated controls the voltage rating of the capacitor. 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. This can be in the form of capacitance changes or dielectric arc-over as well as low insulation resistance. Heat transfer can also be affected by altitude operation. Heat generated in operation cannot be dissipated properly and can result in high RI2 losses and eventual failure.

Radiation
Radiation capabilities of capacitors must be taken into consideration. Electrical degradation in the form of dielectric embitterment can take place causing shorts or opens.

Environmental Compliance

As an environmentally conscious company, KEMET is working continuously with improvements concerning the environmental effects of both our capacitors and the production of them.

In Europe (RoHS Directive) and in some other geographical areas like China, legislation has been put in place to prevent the use of some hazardous materials, like Lead (Pb), in electronic equipment. All products in this catalog are produced to help our customers' obligations to guarantee their products to fulfill these legislative requirements. The only material of concern in our products has been Lead (Pb), which has been removed from all designs to fulfill the requirement of containing less than 0.1% of lead in any homogeneous material.

KEMET will closely follow any changes in legislation world wide and makes any necessary changes in its products, whenever needed.

Some customer segments like Medical, Military and Automotive Electronics may still require the use of Lead in electrode coatings. To clarify the situation and distinguish products from each other, a special symbol is used on the packaging labels for RoHS compatible and Pb-Free capacitors.

Because of customer requirements, additional markings such as "LF" for lead-free or "LFW" for lead-free wires may appear on the packaging label.

Materials & Environment

The selection of materials used by KEMET for the production of capacitors is the result of extensive experience and constant attention to environmental protection. KEMET selects its suppliers according to ISO 9001 standards and carries out statistical analysis on the materials purchased before acceptance. All materials are, to the company's present knowledge, non-toxic and free from cadmium, mercury, chrome and compounds, polychlorine triphenyl (PCB), bromide and chlorine dioxins bromurate clorurate, CFC and HCFC, and asbestos.

Green Products

All KEMET power film products are ROHS Compliant.

Insulation Resistance

When the capacitor temperature increases, the insulation resistance decreases. This is due to increased electron activity. Low insulation resistance can also be the result of moisture trapped in the windings, caused by a prolonged exposure to excessive humidity.

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Although all product–related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicted or that other measures may not be required.