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

Electronic Components KEMET CHARGED®

## 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

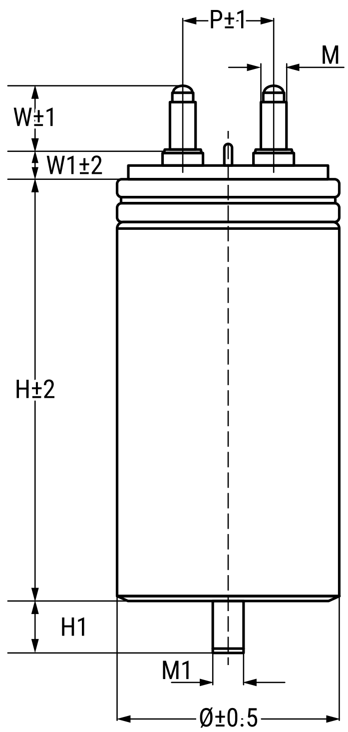
- Overpressure safety device
- High peak current capability
- Long lifetime
- Self-healing

## 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 $V_{rms}$<br>K = 440 $V_{rms}$ | G = Cylindrical aluminum case with M12 bolt | P = M6 Threaded Posts<br>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<br>Z = Special | | | J = 5%<br>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 |

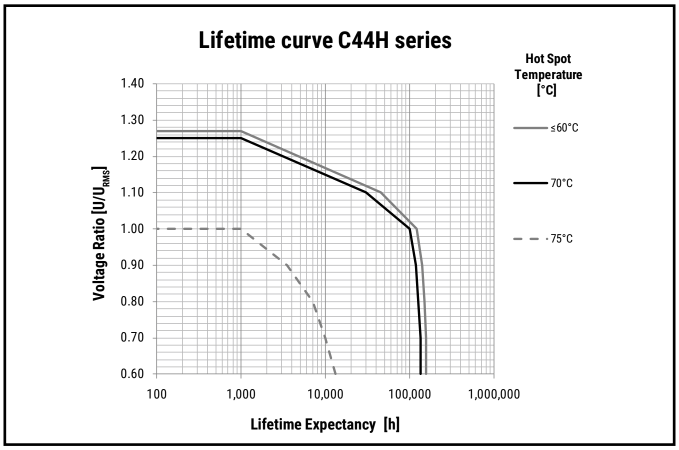
*NOTICE: Care should be taken to ensure that there still is electrical clearance of 15 mm between terminations and other live or earthed parts above the capacitor, in case of safety device activation.*

## Table 1 – Ratings & Part Number Reference

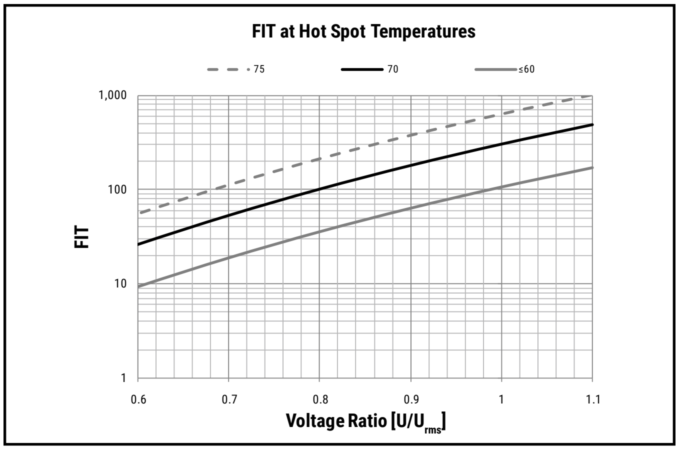
| Cap Value (µF) | $V_{rms}$ VAC | Un VDC | Us VDC | dV/dt (V/µs) | Irms A | ESL < nH | Rs mΩ | Rth hs/amb °C/W | Case Ø | Case H | Part Number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 330 | 700 | 1,050 | 12.5 | 25 | 100 | 3.4 | 8 | 65 | 98 | C44HLGP6100AASJ |
| 200 | 330 | 700 | 1,050 | 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).*

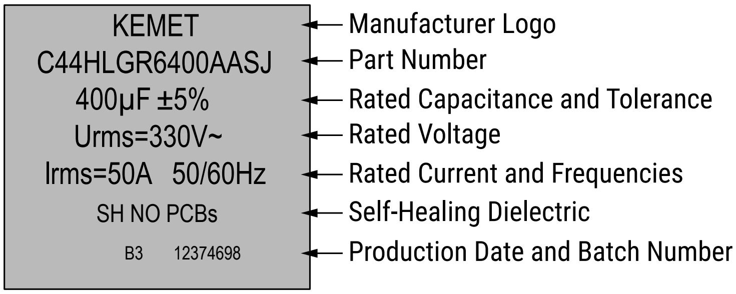
*3. Maximum case temperature ($T_{CASE}$) ≤ 70°C*

## Example of calculation

*Part Number: C44HKGR6100AASJ*
*Rated $V_{RMS}$ = 440 [$V_{RMS}$]*
*Rated $I_{RMS}$ = 30 [A]*
*$R_s$ = 4.1 [mΩ]*
*$R_{th}$ = 5.0 [°C/W]*
*Fundamental Frequency $F_1$ = 50 [Hz]*
*Ripple Frequency $F_2$ = 7000 [Hz]*
*Fundamental Voltage $V_1$ = 440 [V~]*
*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] → OK since hot spot temperature is less than maximum admitted*
*Expected Life at $T_{HS}$ = 70°C → 100,000 hours (see lifetime curve)*
*Expected Life at $T_{HS}$ = 60°C → 140,000 hours (see lifetime curve)*

## Marking




## Environmental Compliance

As a leading global supplier of electronic components and an environmentally conscious company, KEMET continually aspires to improve the environmental effects of our manufacturing processes and our finished electronic components.

In Europe (RoHS Directive) and in some other geographical areas such as China (China RoHS), legislation has been enacted to prevent or otherwise limit the use of certain hazardous materials, including lead (Pb), in electronic equipment. KEMET monitors legislation globally to ensure compliance and endeavors to adjust our manufacturing processes and/or electronic components as may be required by applicable law.

For military, medical, automotive, and some commercial applications, the use of lead (Pb) in the termination is necessary and/or required by design. KEMET is committed to communicating RoHS compliance to our customers. Information related to RoHS compliance will be provided in data sheets and using specific identifiers on the packaging labels.

All KEMET power film capacitors are RoHS compliant.

## Materials & Environment

The selection of raw materials that KEMET uses for the production of its electronic components is the result of extensive experience. KEMET directs specific attention toward environmental protection. KEMET selects its suppliers according to ISO 9001 standards and performs statistical analyses on raw materials before acceptance for use in manufacturing our electronic components. All materials are, to the best of KEMET's knowledge, non-toxic and free from cadmium; mercury; chrome and compounds; polychlorine triphenyl (PCB); bromide and chlorinedioxins bromurate clorurate; CFC and HCFC; and asbestos.

## 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 RI2 losses and eventual failure can result.

**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.

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