C44P/C20A, 330 – 1,000 VAC/700 – 2,300 VDC, for PFC & AC Filter

Electronic Components KEMET CHARGED®

Overview

The C44P/C20A series is a polypropylene metallized film capacitor with a cylindrical, aluminium can-type design filled with oil. It uses screw terminals, plastic insulator, and an overpressure safety device.

Applications

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

Benefits

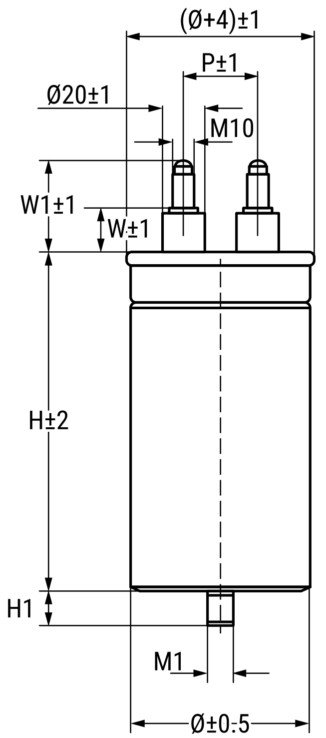
- Overpressure safety device
- High peak current capability
- High torque screw terminals with plastic insulator
- Long lifetime
- Self-healing

Part Number System

C	44	P	L		G	R	6	1	0	0	A	A	S	J
Series		Application	Rated Voltage (VAC)		Case Type	Terminal Style	Capacitance Code (pF)				Internal Code	Internal Codes		Tolerance
MKP Capacitors for Power Applications	44 = 330 – 440 VAC 20 = 550 – 1,000 VAC	AC Filter P = C44 A = C20	For C44P: L = 330 K = 440	For C20A: K = 550 L = 640 Q = 780 Z = 1,000	G = M12 bolt	R = Male M10	Digits nine, ten, and eleven indicate the first three digits of 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	W	W1	M1	H1
Ø = 65	28	18	40	12	16
Ø ≥ 75	35	21	45	12	16
All dimensions are in mm					

Maximum Driving Torque	
Terminals M10	10 [N*m]
Bolt M12	12 [N*m]

General Technical Data

Reference Standards	IEC 61071
	UL810 approved
Dielectric	Polypropylene film
	Non-inductive type winding
Climatic Category	25/70/56 – IEC 60068–1
Maximum hot spot temperature	+80°C
Endurance Test IEC 61071	+70°C at Case Temperature
Installation	Whatever position
Tinned brass deck with self estinguish UL94 V0 plastic insulators	

Electrical Characteristics

Rated Voltage	Urms = (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} ≤ 75°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 (C44P)
	6,000 V ~ 50 Hz for 10 seconds (C20A)
Damp Heat	IEC 60068–2–78
Change of Temperature	IEC 60068–2–14
Vibration Strength	IEC 60068–2–6

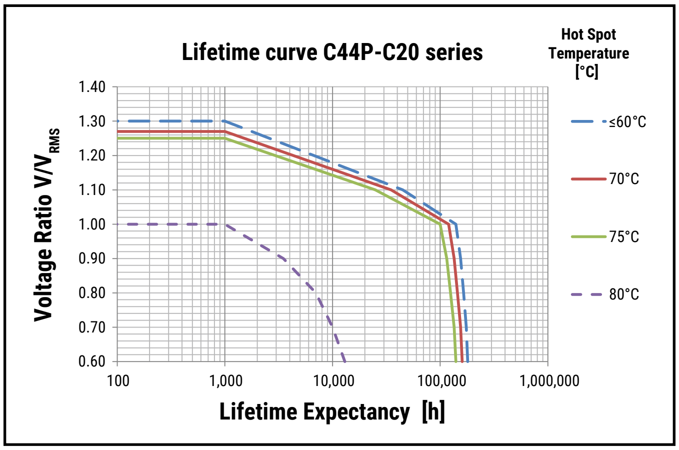
NOTICE: Care should be taken to ensure that there still is electrical clearance of 15 mm between terminations and other live or earthed parts above the capacitor, in case of safety device activation.

Table 1 – Ratings & Part Number Reference

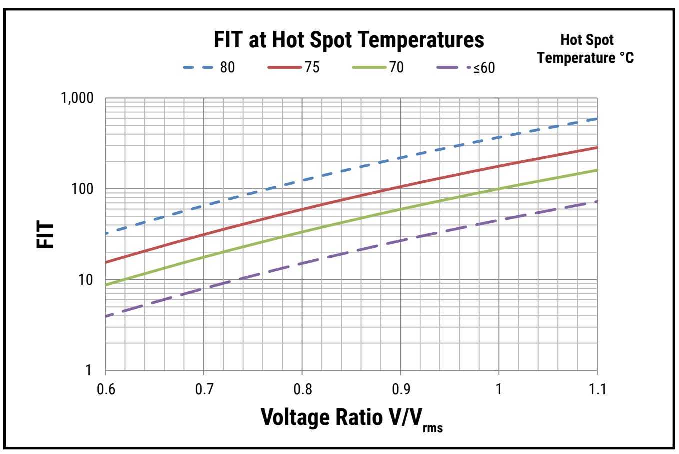
Cap Value (µF)	V_{rms}	Rated Voltage	Surge Voltage	Maximum Dimensions (mm)		Ripple Current	ESR	ESL	Thermal Res	dV/dt (V/µs)	Part Number
	VAC	VDC	VDC	D	H	10 kHz 40°C (A)[1]	10 kHz (mΩ)	(nH)	(°C/W)		
100	330	700	1,050	65	117	25	3.0	115	8.5	12.5	C44PLGR6100AASJ
200	330	700	1,050	65	147	43	2.8	140	5.4	12.5	C44PLGR6200ZASJ
300	330	700	1,050	65	247	50	2.3	150	3.6	12.5	C44PLGR6300ZASJ
300	330	700	1,050	75	197	55	1.4	160	4.2	12.5	C44PLGR6300AASJ
400	330	700	1,050	65	247	55	2.0	160	3.1	12.5	C44PLGR6400ZASJ
500	330	700	1,050	75	247	58	1.8	170	2.9	12.5	C44PLGR6500ZASJ
500	330	700	1,050	85	197	63	1.2	160	3.4	12.5	C44PLGR6500ZBSJ
600	330	700	1,050	85	247	65	1.6	180	2.9	12.5	C44PLGR6600AASJ
600	330	700	1,050	85	280	75	1.1	210	2.4	12.5	C44PLGR6600ZASJ
100	440	1,000	1,500	75	147	30	3.5	145	5.6	20	C44PKGR6100AASJ
100	440	1,000	1,500	65	197	50	2.3	135	4.4	20	C44PKGR6100ZASJ
120	440	1,000	1,500	65	197	50	1.8	165	4.2	20	C44PKGR6120AASJ
133	440	1,000	1,500	65	247	40	3.0	155	3.7	20	C44PKGR6133AASJ
133	440	1,000	1,500	75	197	50	1.6	170	4.0	20	C44PKGR6133ZASJ
150	440	1,000	1,500	65	247	45	2.8	160	3.5	20	C44PKGR6150AASJ
200	440	1,000	1,500	75	247	55	2.4	175	3.2	20	C44PKGR6200AASJ
250	440	1,000	1,500	85	247	60	2.0	175	3.4	20	C44PKGR6250AASJ
300	440	1,000	1,500	85	247	60	1.9	180	2.7	20	C44PKGR6300AASJ
400	440	1,000	1,500	95	247	65	1.7	200	2.5	20	C44PKGR6400AASK
22	550	1,280	1,900	65	117	40	2.1	125	13.3	30	C20AKGR5220AASK
33	550	1,280	1,900	75	117	45	1.6	130	10.6	30	C20AKGR5330AASK
47	550	1,280	1,900	65	197	50	1.4	135	7.8	30	C20AKGR5470AASK
68	550	1,280	1,900	65	247	55	1.7	145	6.2	30	C20AKGR5680AASK
100	550	1,280	1,900	75	247	60	1.4	160	5.2	30	C20AKGR6100AASK
120	550	1,280	1,900	85	247	60	1.3	165	4.6	30	C20AKGR6120AASK
150	550	1,280	1,900	95	247	60	1.2	180	4.4	30	C20AKGR6150AASK
15	640	1,400	2,100	65	117	35	2.5	120	14.1	30	C20ALGR5150AASK
22	640	1,400	2,100	65	147	35	3.0	125	10.9	30	C20ALGR5220AASK
33	640	1,400	2,100	75	147	40	2.2	135	9.1	30	C20ALGR5330AASK
47	640	1,400	2,100	65	247	55	1.9	145	6.3	30	C20ALGR5470AASK
68	640	1,400	2,100	75	247	60	1.6	160	5.3	30	C20ALGR5680AASK
100	640	1,400	2,100	95	247	60	1.3	170	4.4	30	C20ALGR6100AASK
120	640	1,400	2,100	95	247	60	1.3	175	4.1	30	C20ALGR6120AASK
150	640	1,400	2,100	116	247	60	1.2	180	3.8	30	C20ALGR6150AASK
10	780	1,700	2,500	65	117	30	3.0	130	14.1	70	C20AQGR5100AASK
15	780	1,700	2,500	75	147	35	3.6	135	10.1	70	C20AQGR5150AASK
22	780	1,700	2,500	75	147	40	2.7	140	8.9	70	C20AQGR5220AASK
33	780	1,700	2,500	85	147	50	2.0	150	7.6	70	C20AQGR5330AASK
47	780	1,700	2,500	75	247	55	1.8	160	5.2	70	C20AQGR5470AASK
68	780	1,700	2,500	85	247	60	1.5	170	4.5	70	C20AQGR5680AASK
100	780	1,700	2,500	95	247	60	1.3	180	4.0	70	C20AQGR6100AASK
15	1,000	2,300	3,300	75	147	33	2.5	150	9.2	85	C20AZGR5150AASK
20	1,000	2,300	3,300	75	140	40	2.1	150	8.3	85	C20AZGR5200ZBSK
22	1,000	2,300	3,300	75	147	35	2.0	155	8.0	85	C20AZGR5220AASK
33	1,000	2,300	3,300	75	247	40	1.7	165	5.3	85	C20AZGR5330AASK
47	1,000	2,300	3,300	85	247	45	1.4	170	4.7	85	C20AZGR5470AASK
68	1,000	2,300	3,300	95	247	55	1.2	180	4.1	85	C20AZGR5680AASK
Cap Value	VAC	Rated Voltage	Surge Voltage	D	H	Ripple Current	ESR	ESL	Thermal Res	dV/dt (V/µs)	Part Number

[1] *Maximum admissible RMS current $T_{HS} \leq 75°C$.*

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).

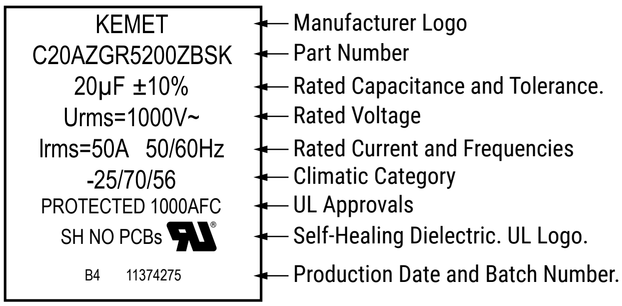
3. Maximum case temperature (T_{CASE}) ≤ 70°C

Example of calculation

Part Number: C44PKGR6100AASJ
Rated V_{RMS} = 440 [V_{RMS}]
Rated I_{RMS} = 30 [A]
R_s = 3.5 [mΩ]
R_{th} = 5.6 [°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]

$I_{RMS} = \sqrt{(13.8^2 + 27^2)} = 30 \le 30$ → Admitted
$V_{RMS} = \sqrt{(440^2 + 6.1^2)} = 440 \le 440$ → 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]
$P_T = 1.22 + 0.03 + 0.67 + 2.55 = 4.47$ [W]
$\Delta T_{HS} = 5.6 * 4.47 = 25$ [°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} = 75°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.

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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.