Film capacitors – Power Factor Correction

PhiCap capacitors

Series/Type: **B32340C / MKPxxx-I**
Ordering code: **B32340C****A***

Date: June 2009
Version: 3

© EPCOS AG 2009. Reproduction, publication and dissemination of this publication, enclosures hereto and the information contained therein without EPCOS' prior express consent is prohibited

Preliminary data

Construction

- Dielectric: metallized polypropylene film
- Semi-dry; biodegradable soft resin; non-PCB
- Case: extruded round aluminum can with stud
- Mounting and grounding: threaded M12 stud on bottom of can
- Degree of protection: IP20 (optionally IP54 with terminal cover; additional cable gland at cable entry required)

Features

- Single phase, provided with discharge resistors
- Dual safety system: overpressure disconnector, self-healing technology
- c UL us file # E106388
- C22.2 Nº190 MC # 236094
- Naturally air cooled (or forced air cooling)
- Indoor mounting

Typical applications

- For Power Factor Correction

Terminals

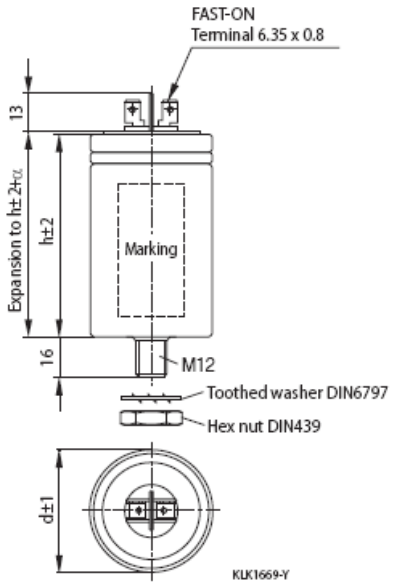
- Fast-on terminals

Mounting

- Threaded stud at bottom of can (max. torque = 10 Nm for M12)



Dimensional drawing



Characteristics

Rated capacitance C_R and Q_R	According to specification table
Tolerance	–5/+10%
Rated voltage V_R	According to specification table
Rated frequency f_R	50/60 Hz

Technical data and specifications	
Maximum ratings (accord. to IEC 60831)	
Maximum permissible voltage V_{max}	V_R +10% (up to 8 h daily) V_R +15% (up to 30 min daily) V_R +20% (up to 5 min daily) V_R +30% (up to 1 min daily)
Maximum permissible current I_{max}	Up to 1.3 · I_R (up to 1.5 · I_R incl. combined effects of harmonics, over voltages and capacitance)
Maximum transient inrush current	Up to 200 · I_R
Power dissipation (dielectric)	< 0.2 W/kvar
Power dissipation (excluding discharge resistors)	< 0.45 W/kvar
Test data (accord. To IEC 60831)	
AC test voltage terminal-to-terminal	2.15 · V_R, 2 s
Insulation voltage between terminals and container	3000 V AC, 10 s
Dissipation factor tan δ at 100 Hz	$\leq 1.0 \cdot 10^{-3}$
Climatic category / -25/D (to IEC 60831)	
Ambient temperature	Max. temp. = 55 °C Max. mean 24 h = 45 °C Max. mean 1 year = 35 °C Lowest temperature = –25 °C
Maximum permissible humidity	Average relative < 95%
Maximum permissible altitude	4000 m
Mean life expectancy	
t_{LD}	Up to 100.000 operating hours
Max. 5 000 switching operations according to IEC 60831	

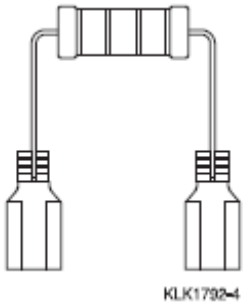
Preliminary data

Design data	
Dimensions (d × l)	According to specification table
Weight approx.	According to specification table
Filling	Biodegradable soft resin
Fixing	Threaded bolt M12
Max. torque (Al can stud)	10 Nm (for Ø 63.5 mm)
Mounting position	Upright. See “Installation and maintenance instructions for PFC capacitors” for further details.
Terminals	
Degree of protection	IP20, option IP54 with plastic terminal cap; additional cable gland at cable entry required.
Creepage distance	10 mm
Clearance	16.5 mm (to UL 810)
Safety	
Mechanical safety	Tear off fuses overpressure disconnector
Max. short circuit current	(AFC: 10 kA) (to UL 810)
Discharge resistor time	≤ 1 min (75 V) , IEC 60831 specifies 3 min.

Reference standards

IEC 60831–1/2. UL 810-5th edition

Single phase resistor, included in the extend of delivery



Preliminary data

Single-phase capacitors – V_R = 220 V AC, 50/60 Hz								
Product / Type Ordering code	50 Hz Output kvar	 I_R A	60 Hz Output kvar	 I_R A	C_R µF	Dimensions d x h mm	Weight kg	Quantity per box
MKP220-I-0.7 B32340C2001A820	0.7	3.1	0.8	3.8	45	63.5 × 105	0.30	12
MKP220-I-1.4 B32340C2011A720	1.4	6.3	1.7	7.6	91	63.5 × 142	0.40	12
MKP220-I-1.7 B32340C2021A520	1.7	7.6	2.0	9.0	110	63.5 × 142	0.40	12
MKP220-I-2.1 B32340C2021A020	2.1	9.5	2.5	11.4	137	63.5 × 142	0.40	12
MKP220-I-2.3 B32340C2021A520	2.3	10.3	2.7	12.5	150	63.5 × 142	0.50	12
MKP220-I-2.8 B32340C2031A320	2.8	12.5	3.3	15.0	183	63.5 × 142	0.50	12
Single-phase capacitors – V_R = 230 V AC, 50/60 Hz								
Product / Type Ordering code	50 Hz Output kvar	 I_R A	60 Hz Output kvar	 I_R A	C_R µF	Dimensions d × h mm	Weight kg	Quantity per box
MKP230-I-0.8 B32340C2002A830	0.8	3.6	1.0	4.3	50	63.5 × 105	0.30	12
MKP230-I-1.7 B32340C2012A730	1.7	7.2	2.0	8.7	100	63.5 × 142	0.40	12
MKP230-I-2.5 B32340C2022-A530	2.5	10.9	3.0	13.1	150	63.5 × 142	0.50	12
Single-phase capacitors – V_R = 380 V AC, 50/60 Hz								
Product / Type Ordering code	50 Hz Output kvar	 I_R A	60 Hz Output kvar	 I_R A	C_R µF	Dimensions d × h mm	Weight kg	Quantity per box
MKP380-I-0.7 B32340C3002A680	0.7	1.8	0.8	2.2	15	63.5 × 68	0.30	12
MKP380-I-1.4 B32340C3011A780	1.4	3.6	1.7	4.4	31	63.5 × 68	0.30	12
MKP380-I-2.1 B32340C3021A580	2.1	5.5	2.5	6.6	46	63.5 × 105	0.40	12
MKP380-I-2.8 B32340C3031A380	2.8	7.4	3.3	8.9	62	63.5 × 105	0.40	12
MKP380-I-4.2 B32340C3051A080	4.2	10.9	5.0	13.1	91	63.5 × 142	0.40	12

Preliminary data

Single-phase capacitors – V_R = 400 V AC, 50/60 Hz

Product / Type Ordering code	50 Hz Output kvar	50 Hz I_R A	60 Hz Output kvar	60 Hz I_R A	C_R µF	Dimensions d × h mm	Weight kg	Quantity per box
MKP400-I-0.8 B32340C4002A800	0.8	2.0	1.0	2.3	15	63.5 × 68	0.30	12
MKP400-I-1.7 B32340C4012A700	1.7	4.2	2.0	5.0	33	63.5 × 68	0.30	12
MKP400-I-2.5 B32340C4022A500	2.5	6.3	3.0	7.5	50	63.5 × 105	0.40	12
MKP400-I-3.3 B32340C4032A300	3.3	8.4	4.0	10.0	66	63.5 × 105	0.40	12
MKP400-I-4.2 B32340C4051A000	4.2	10.4	5.0	12.5	83	63.5 × 142	0.50	12
MKP400-I-5.0 B32340C4052A000	5.0	12.4	6.0	15.0	99	63.5 × 142	0.50	12

Single-phase capacitors – V_R = 415 V AC, 50/60 Hz

Product / Type Ordering code	50 Hz Output kvar	50 Hz I_R A	60 Hz Output kvar	60 Hz I_R A	C_R µF	Dimensions d × h mm	Weight kg	Quantity per box
MKP415-I-0.8 B32340C4002A810	0.8	2.0	1.0	2.4	15	63.5 × 68	0.35	12
MKP415-I-1.7 B32340C4012A710	1.7	4.0	2.0	4.8	31	63.5 × 105	0.45	12
MKP415-I-2.5 B32340C4022A510	2.5	6.0	3.0	7.2	46	63.5 × 142	0.50	12
MKP415-I-3.3 B32340C4032A310	3.3	8.0	4.0	9.7	62	63.5 × 142	0.50	12
MKP415-I-5.0 B32340C4052A010	5.0	12.0	6.0	14.4	91	63.5 × 142	0.50	12

Preliminary data

Single-phase capacitors – V_R = 440 V AC, 50/60 Hz

Product / Type Ordering code	50 Hz Output kvar	50 Hz I_R A	60 Hz Output kvar	60 Hz I_R A	C_R µF	Dimensions d × h mm	Weight kg	Quantity per box
MKP440-I-0.7 B32340C4001A840	0.7	1.6	0.8	1.9	11	63.5 × 68	0.30	12
MKP440-I-1.4 B32340C4011A740	1.4	3.2	1.7	3.8	23	63.5 × 68	0.30	12
MKP440-I-2.1 B32340C4021A540	2.1	4.7	2.5	5.7	34	63.5 × 105	0.40	12
MKP440-I-2.8 B32340C4031A340	2.8	6.4	3.3	7.6	46	63.5 × 105	0.40	12
MKP440-I-3.3 B32340C4032A340	3.3	7.6	4.0	9.1	55	63.5 × 142	0.50	12
MKP440-I-4.2 B32340C4051A040	4.2	9.5	5.0	11.4	68	63.5 × 142	0.50	12
MKP440-I-5.0 B32340C4052A040	5.0	11.4	6.0	13.6	82	63.5 × 142	0.50	12

Single-phase capacitors – V_R = 480 V AC, 50/60 Hz

Product / Type Ordering code	50 Hz Output kvar	50 Hz I_R A	60 Hz Output kvar	60 Hz I_R A	C_R µF	Dimensions d x h mm	Weight kg	Quantity per box
MKP480-I-0.7 B32340C4001A880	0.7	1.5	0.8	1.7	10	63.5 × 105	0.30	12
MKP480-I-1.4 B32340C4011A780	1.4	2.9	1.7	3.5	19	63.5 × 105	0.30	12
MKP480-I-2.1 B32340C4021A580	2.1	4.3	2.5	5.2	29	63.5 × 105	0.30	12
MKP480-I-2.8 B32340C4031A380	2.8	5.8	3.3	6.9	38	63.5 × 142	0.50	12

Preliminary data

Single-phase capacitors – V_R = 525 V AC, 50/60 Hz

Product / Type Ordering code	50 Hz Output kvar	 I_R A	60 Hz Output kvar	 I_R A	C_R µF	Dimensions d × h mm	Weight kg	Quantity per box
MKP525-I-1.4 B32340C5011A720	1.4	2.6	1.7	3.1	16	63.5 × 105	0.30	12
MKP525-I-2.8 B32340C5031A320	2.8	5.2	3.3	6.2	31	63.5 × 142	0.50	12
MKP525-I-3.3 B32340C5032A320	3.3	6.3	4.0	7.6	38	63.5 × 142	0.60	12
MKP525-I-4.2 B32340C5051A020	4.2	8.0	5.0	9.5	48	63.5 × 142	0.60	12

Preliminary data

Cautions and warnings

- In case of dents of more than 1 mm depth or any other mechanical damage, capacitors must not be used at all.
- This applies also in cases of oil leakages.
- To ensure the full functionality of the overpressure disconnector, elastic elements must not be hindered and a minimum space of 12 mm has to be kept above each capacitor.
- Do not handle the capacitor before it is discharged.
- Resonance cases must be avoided by appropriate application design in any case.
- Handle capacitors carefully, because they may still be charged even after disconnection due to faulty discharging devices.
- Protect the capacitor properly against over current and short circuit.
- Failure to follow cautions may result, worst case, in premature failures, bursting and fire.

Discharging

Capacitors must be discharged to a maximum of 10% of rated voltage before they are switched in again. This prevents an electric impulse discharge in the application, influences the capacitor's service life and protects against electric shock. The capacitor must be discharged to 75 V or less within 3 minutes. There must be not any switch, fuse or any other disconnecting device in the circuit between the power capacitor and the discharging device. Discharge resistors are included in the deliver; alternatively discharge reactors are available from EPCOS. Discharge and short circuit capacitor before handling!

Service life expectancy

Electrical components do not have an unlimited service life expectancy; this applies to self-healing capacitors too. The maximum service life expectancy may vary depending on the application the capacitor is used in.

Safety

Electrical or mechanical misapplication of capacitors may be hazardous. Personal injury or property damage may result from bursting of the capacitor or from expulsion of oil or melted material due to mechanical disruption of the capacitor.

- Ensure good, effective grounding for capacitor enclosures.
- Provide means of disconnecting and insulating a faulty component/bank.
- The terminals of capacitors, connected bus bars and cables as well as other devices may also be energized.
- Follow good engineering practice.

Thermal load/over-temperature

After installation of the capacitor it is necessary to verify that maximum hot-spot temperature is not exceeded at extreme service conditions.

Overpressure disconnector

To ensure full functionality of an overpressure disconnector, the following must be observed:

1. The elastic elements must not be hindered, i.e.
   - connecting lines must be flexible leads (cables),
   - there must be sufficient space (min. 12 mm) for expansion above the connections. This will enable a longitudinal extension of the can to secure the overpressure disconnector work.
   - folding beads must not be retained by clamps.
2. Maximum allowed fault current of 10000 A in accordance with UL 810 standard must be assured by the application.
3. Stress parameters of the capacitor must be within the IEC 60831 specification.

Overcurrent and short circuit protection

- Use HRC fuses or MCCBs for short circuit protection. Short circuit protection and connecting cables should be selected so that 1.5 times the rated capacitor current can be permanently handled.
- HRC fuses do not protect a capacitor against overload
  - they are only for short circuit protection.
- The HRC fuse rating should be 1.6 to 1.8 times rated capacitor current.
- Do not use HRC fuses to switch capacitors (risk of arcing).
- Use thermal magnetic over current relays for overload protection.

Resonance cases

Resonance cases must be avoided by appropriate application design in any case. Maximum total RMS capacitor current (incl. fundamental harmonic current) specified in technical data must not be exceeded.

Re-switching vs. phase-opposition

In case of voltage interruption, a sufficient discharge time has to be ensured to avoid phase-opposition and resulting high inrush currents.

Vibration resistance

The resistance to vibration of capacitors corresponds to IEC 68, part 2–6.

Max. test conditions:

Test duration	6 h*
Frequency range 1	10 ... 55 Hz*
Displacement amplitude	0.75 mm*

*corresponding to max. 98.1 m/s” or 10 *g*

These figures apply to the capacitor alone. Because the fixing and the terminals may influence the vibration properties, it is necessary to check stability when a capacitor is built in and exposed to vibration. Irrespective of this, you are advised not to locate capacitors where vibration amplitude reaches the maximum in strongly vibrating equipment.

Preliminary data

Mechanical protection

The capacitor has to be installed in a way that mechanical damages and dents in the aluminium can are avoided.

Grounding

The threaded bottom stud of the capacitor has to be used for grounding. In case grounding is done via metal chassis that the capacitor is mounted to, the layer of varnish beneath the washer and nut should be removed. The maximum tightening torque is 10 Nm.

Maintenance

- Check tightness of the connections/terminals periodically.
- Take current reading twice a year and compare with nominal current. Use a harmonic analyser or true effective RMS-meter.
- In case of current above the nominal current check your application for modifications.
- If a significant increase in the amount of non-linear loads has been detected, then a consultant has to be called in for a harmonic study.
- In case of the presence of harmonics installation of a de-tuned capacitor bank (reactors) must be considered.
- Check the discharge resistors/reactors and in case of doubt, check their function:
  (1) Power the capacitor up and down.
  (2) After 90 seconds the voltage between the terminals must decline to less than 75 V.
- Check the temperature of capacitors directly after operation for a longer period, but make sure that the capacitors have been switched off. In case of excessive temperature of individual capacitors, it is recommended to replace these capacitors, as this should be an indication for loss factor increase, which is a sign for reaching end of life.

Storage and operating conditions

Do not use or store capacitors in corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. In dusty environments regular maintenance and cleaning especially of the terminals is required to avoid conductive path between phases and/or phases and ground.

Note

For detailed information about PFC capacitors and cautions, refer to the latest version of EPCOS PFC Product Profile.
Important: Please note that the „General Safety Recommendations for Power Capacitors“ by ZVEI (German Electrical and Electronic Manufacturers´ Association (ZVEI) have to be observed in addition to the caution guidelines stated in the data sheet (Internet: www.epcos.com/pfc).

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application.** As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified.** In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.epcos.com/material). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order. We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.
7. The trade names EPCOS, BAOKE, Alu-X, CeraDiode, CSMP, CSSP, CTVS, DSSP, MiniBlue, MKK, MLSC, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SIMID, SineFormer, SIOV, SIP5D, SIP5K, ThermoFuse, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.epcos.com/trademarks.

TradeElectronics.ru

гарантия бесперебойности производства и качества выпускаемой продукции

О компании

ООО "ТрейдЭлектроникс" - это оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов. Реализуемая нашей компанией продукция насчитывает более полумиллиона наименований.

Благодаря этому наша компания предлагает к поставке практически не ограниченный ассортимент компонентов как оптовыми, мелкооптовыми партиями, так и в розницу.

Наличие собственной эффективной системы логистики обеспечивает надежную поставку продукции по конкурентным ценам в точно указанные сроки.

Срок поставки со стоков в **Европе и Америке – от 3 до 14 дней.**

Срок поставки из **Азии – от 10 дней.**

Благодаря развитой сети поставщиков, помогаем в поиске и приобретении экзотичных или снятых с производства компонентов.

Предоставляем спец цены на элементы для создания инженерных сэмплов.

Упорный труд, качественный результат дают нам право быть уверенными в себе и надежными для наших клиентов.

Наша компания это:

- Гарантия качества поставляемой продукции
- Широкий ассортимент
- Минимальные сроки поставок
- Техническая поддержка
- Подбор комплектации
- Индивидуальный подход
- Гибкое ценообразование

Наша организация особенно сильна в поставках модулей, микросхем, пассивных компонентов, ксайленсах (XC), EPF, EPM и силовой электроники.

Большой выбор предлагаемой продукции, различные виды оплаты и доставки, позволят Вам сэкономить время и получить максимум выгоды от сотрудничества с нами!

Trade Electronics.ru

гарантия бесперебойности производства и качества выпускаемой продукции

Перечень производителей, продукцию которых мы поставляем на российский рынок



Trade Electronics.ru

гарантия бесперебойности производства и качества выпускаемой продукции

С удовольствием будем прорабатывать для Вас поставки всех необходимых компонентов по текущим запросам для скорейшего выявления групп элементов, по которым сотрудничество именно с нашей компанией будет для Вас максимально выгодным!

С уважением,

Менеджер отдела продаж ООО

«Трейд Электроникс»

Шишлаков Евгений

8 (495)668-30-28 доб 169

manager28@tradeelectronics.ru

http://www.tradeelectronics.ru/