



Film Capacitors – Power Factor Correction

DeltaCap Capacitors

Series/Type: MKDxxx-I-xx
Ordering code: B32300A*/ B32301A****A***/ B32301A****B***
Date: June 2016
Version: 7

© EPCOS AG 2016. Reproduction, publication and dissemination of this publication, enclosures hereto and the information contained therein without EPCOS' prior express consent is prohibited.

EPCOS AG is a TDK Group Company.

Construction and general data

- Dielectric: Polypropylene film
- Non-PCB, Semi-dry biodegradable resin
- Extruded round aluminum can with stud
- Degree of protection: IP00 (optionally IP54 with terminal cover; additional cable gland at cable entry required)

Features

- Single-phase, provided with discharge resistors
- Double safety system:
 - overpressure disconnector, self-healing technology
- Naturally air cooled (or forced air cooling)
- Indoor mounting

Typical applications

- For Power Factor Correction

Terminals

- Fast-on terminals B32300A* series
- Screw terminals B32301A* series

Mounting

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


Technical data and specifications

| Characteristics | |
|-------------------------|----------------------------------|
| Rated capacitance C_R | According to specification table |
| Tolerance | -5 / +10% |
| Rated voltage V_R | According to specification table |
| Rated frequency f_R | 50 and 60 Hz |
| Output | According to specification table |
| Rated current I_R | According to specification table |

| Maximum ratings | |
|------------------------|--|
| 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) |
| I_{max} | Up to $1.3 \cdot I_R$ (up to $1.5 \cdot I_R$ including combined effects of harmonics, overvoltages and capacitance tolerance) |
| I_S | Up to $200 \cdot I_R$ (A) |
| *Power dissipation | ≤ 0.2 W/kvar (dielectric) and ≤ 0.45 W / kvar (total) |

* Without discharge resistor

| Test data | |
|-------------------------|-------------------------------|
| V_{TT} | $2.15 \cdot V_R$ during 2 s |
| V_{TC} | 3000 V AC / 50 Hz during 10 s |
| * $\tan \delta$ (50 Hz) | $\leq 1.0 \cdot 10^{-3}$ |

* Without discharge resistor

| Climatic category –40/D | |
|--------------------------------|--|
| T_{min} | -40 °C |
| T_{max} | +55 °C |
| Storage temperature | -40 °C ... +85 °C |
| T_{max} Hotspot | +85 °C |
| Humidity | Av. rel. < 95% |
| Degree of protection | IP00 (optionally IP54 with terminal cover; additional cable gland at cable entry required) |
| Maximum altitude | 4000 m |

| Mean life expectancy | |
|---|--|
| t_{LD} | Up to 135000 hours at temperature class -40/C Up to 100000 hours at temperature class -40/D |
| Max. 5000 switchings per year acc. to IEC 60831 | |

| Design data | |
|---------------------------|--|
| Dimensions (d × h) | According to specification table |
| Weight approx | According to specification table |
| Impregnation | Non PCB, resin filling: soft polyurethane resin |
| Fixing | Threaded bolt M12 |
| Max. torque (Al can stud) | 10 Nm |
| Mounting position | Only in the vertical position. See "Maintenance and Installation Manual" for further details. |

Film Capacitors – Power Factor Correction
B32300A*/ B32301A**A***/
B32301A****B*****
DeltaCap Capacitors
MKDxxx-I-xx
Terminals

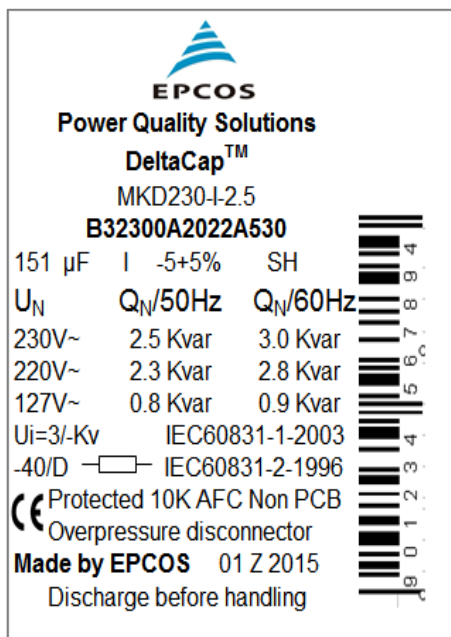
| | |
|--------------------------|--|
| Protection degree | IP00 for B32300 (optional IP54 with plastic terminal cap, additional cable gland at cable entry required); IP20 for B32301 |
| Maximum terminal current | 15 A (fast-on terminals) / 50 A (screw terminals) |
| Creepage distance (min) | 12.7 mm |
| Clearance (min) | 9.6 mm |


Safety

| | |
|----------------------------|--|
| Mechanical safety | Overpressure disconnecter |
| Max. short circuit current | (AFC: 10 kA according UL 810 standard) |
| Discharge resistor time | ≤ 60 s to 75 V or less |

Reference standards

IEC 60831–1/2, UL 810-5th edition

Label design



EPCOS
 Power Quality Solutions
 DeltaCap™
 MKD230-I-2.5
B32300A2022A530

| | | | |
|-------------|-------------------|-------------------|----|
| 151 μF | I | -5+5% | SH |
| U_N | $Q_N/50\text{Hz}$ | $Q_N/60\text{Hz}$ | |
| 230V~ | 2.5 Kvar | 3.0 Kvar | |
| 220V~ | 2.3 Kvar | 2.8 Kvar | |
| 127V~ | 0.8 Kvar | 0.9 Kvar | |
| $U_i=3/-Kv$ | IEC60831-1-2003 | | |
| -40/D | IEC60831-2-1996 | | |

Protected 10K AFC Non PCB
 Overpressure disconnecter
Made by EPCOS 01 Z 2015
 Discharge before handling

Ordering codes

| Type | 50 Hz | | 60 Hz | | C _R μF | d x h mm | Weight kg | Ordering code | Packing unit pcs |
|---|----------------|---------------------|----------------|---------------------|----------------------|-------------|--------------|------------------|------------------------|
| | Output kvar | I _R A | Output kvar | I _R A | | | | | |
| Rated voltage 230 V AC, 50/60 Hz, single phase | | | | | | | | | |
| MKD230-I-0.8 | 0.8 | 3.5 | 1.0 | 4.2 | 48 | 63.5 x 64.5 | 0.3 | B32300A2002A830 | 12 |
| MKD230-I-1.7 | 1.7 | 7.4 | 2.0 | 8.9 | 102 | 63.5 x 102 | 0.4 | B32300A2012A730 | 12 |
| MKD230-I-2.5 | 2.5 | 10.9 | 3.0 | 13.1 | 151 | 63.5 x 127 | 0.5 | B32300A2022A530 | 12 |
| Rated voltage 250 V AC, 50/60 Hz, single phase | | | | | | | | | |
| MKD250-I-0.8 | 0.8 | 3.2 | 1.0 | 3.8 | 41 | 50 x 77 | 0.2 | B32300A2002A850 | 50 |
| MKD250-I-1.7 | 1.7 | 6.8 | 2.0 | 8.2 | 87 | 63.5 x 92 | 0.4 | B32300A2012A750 | 12 |
| MKD250-I-2.0 | 2.0 | 7.8 | 2.4 | 9.4 | 100 | 63.5 x 92 | 0.4 | B32300A2022A050 | 12 |
| MKD250-I-2.5 | 2.5 | 10.0 | 3.0 | 12.0 | 127 | 63.5 x 102 | 0.5 | B32300A2022A550 | 12 |
| MKD250-I-5.0 | 5.0 | 20.0 | 6.0 | 24.0 | 255 | 75 x 166 | 0.7 | B32301A2052#050* | 6 |
| MKD250-I-7.5 | 7.5 | 30.0 | 9.0 | 36.0 | 382 | 85 x 196 | 1.1 | B32301A2072#550* | 4 |
| MKD250-I-10 | 10.0 | 40.0 | 12.0 | 48.0 | 510 | 85 x 216 | 1.2 | B32301A2102#050* | 4 |
| Rated voltage 400 V AC, 50/60 Hz, single phase | | | | | | | | | |
| MKD400-I-0.8 | 0.8 | 2.0 | 1.0 | 2.4 | 16 | 50 x 64.5 | 0.2 | B32300A4002A800 | 50 |
| MKD400-I-1.7 | 1.7 | 4.3 | 2.0 | 5.2 | 34 | 63.5 x 62.5 | 0.3 | B32300A4012A700 | 12 |
| MKD400-I-2.5 | 2.5 | 6.3 | 3.0 | 7.6 | 50 | 63.5 x 77 | 0.3 | B32300A4022A500 | 12 |
| MKD400-I-3.3 | 3.3 | 8.3 | 4.0 | 10.0 | 66 | 63.5 x 102 | 0.4 | B32300A4032A300 | 12 |
| MKD400-I-4.2 | 4.2 | 10.5 | 5.0 | 12.6 | 84 | 63.5 x 102 | 0.4 | B32300A4051A000 | 12 |
| MKD400-I-5.0 | 5.0 | 12.5 | 6.0 | 15.0 | 100 | 63.5 x 127 | 0.5 | B32300A4052A000 | 12 |
| Rated voltage 415 V AC, 50/60 Hz, single phase | | | | | | | | | |
| MKD415-I-0.8 | 0.8 | 1.9 | 1.0 | 2.3 | 15 | 50 x 64.5 | 0.2 | B32300A4082A810 | 50 |
| MKD415-I-1.7 | 1.7 | 4.0 | 2.0 | 4.8 | 31 | 63.5 x 64.5 | 0.3 | B32300A4012A710 | 12 |
| MKD415-I-2.5 | 2.5 | 6.0 | 3.0 | 7.2 | 46 | 63.5 x 102 | 0.4 | B32300A4022A510 | 12 |
| MKD415-I-3.3 | 3.3 | 8.0 | 4.0 | 9.6 | 61 | 63.5 x 102 | 0.4 | B32300A4032A310 | 12 |
| MKD415-I-5.0 | 5.0 | 12.0 | 6.0 | 14.4 | 92 | 63.5 x 127 | 0.6 | B32300A4052A010 | 12 |
| Rated voltage 440 V AC, 50/60 Hz, single phase | | | | | | | | | |
| MKD440-I-0.7 | 0.7 | 1.6 | 0.8 | 1.9 | 12 | 50 x 64.5 | 0.2 | B32300A4001A840 | 50 |
| MKD440-I-1.4 | 1.4 | 3.2 | 1.7 | 3.8 | 23 | 63.5 x 64.5 | 0.3 | B32300A4011A740 | 12 |
| MKD440-I-2.1 | 2.1 | 4.8 | 2.5 | 5.8 | 35 | 63.5 x 77 | 0.3 | B32300A4021A540 | 12 |
| MKD440-I-2.8 | 2.8 | 6.4 | 3.4 | 7.7 | 46 | 63.5 x 102 | 0.4 | B32300A4031A340 | 12 |
| MKD440-I-3.3 | 3.3 | 7.5 | 4.0 | 9.0 | 54 | 63.5 x 102 | 0.4 | B32300A4032A340 | 12 |
| MKD440-I-4.2 | 4.2 | 9.5 | 5.0 | 11.4 | 69 | 63.5 x 127 | 0.5 | B32300A4051A040 | 12 |
| MKD440-I-5.0 | 5.0 | 11.4 | 6.0 | 13.7 | 82 | 63.5 x 127 | 0.5 | B32300A4052A040 | 12 |

* Available either as B32301A****A*** series (2-terminal design, integrated resistor) or B32301A****B*** series (4-terminal design, pluggable ceramic resistor). Please replace # with the right character before ordering.

| Type | 50 Hz | | 60 Hz | | C _R | d x h | Weight | Ordering code | Packing unit pcs |
|---|-------------|------------------|-------------|------------------|----------------|-------------|--------|------------------|------------------|
| | Output kvar | I _R A | Output kvar | I _R A | μF | mm | kg | | |
| Rated voltage 480 V AC, 50/60 Hz, single-phase | | | | | | | | | |
| MKD480-I-0.7 | 0.7 | 1.5 | 0.8 | 1.8 | 10 | 50 x 64.5 | 0.2 | B32300A4001A880 | 50 |
| MKD480-I-1.4 | 1.4 | 2.9 | 1.7 | 3.5 | 19 | 63.5 x 64.5 | 0.3 | B32300A4011A780 | 12 |
| MKD480-I-2.1 | 2.1 | 4.4 | 2.5 | 5.3 | 29 | 63.5 x 77 | 0.3 | B32300A4021A580 | 12 |
| MKD480-I-2.8 | 2.8 | 5.8 | 3.4 | 7.0 | 39 | 63.5 x 102 | 0.4 | B32300A4031A380 | 12 |
| Rated voltage 525 V AC, 50/60 Hz, single-phase | | | | | | | | | |
| MKD525-I-1.4 | 1.4 | 2.7 | 1.7 | 3.2 | 16 | 63.5 x 64.5 | 0.3 | B32300A5011A720 | 12 |
| MKD525-I-2.8 | 2.8 | 5.3 | 3.4 | 6.4 | 32 | 63.5 x 102 | 0.4 | B32300A5031A320 | 12 |
| MKD525-I-3.3 | 3.3 | 6.3 | 4.0 | 7.6 | 38 | 63.5 x 102 | 0.4 | B32300A5032A320 | 12 |
| MKD525-I-4.2 | 4.2 | 8.0 | 5.0 | 9.6 | 49 | 63.5 x 127 | 0.5 | B32300A5051A020 | 12 |
| MKD525-I-25.0 | 25.0 | 47.6 | 30.0 | 57.1 | 289 | 116 x 200 | 1.9 | B32301A5252#025* | 4 |

* Available either as B32301A****A*** series (2-terminal design, integrated resistor) or B32301A****B*** series (4-terminal design, pluggable ceramic resistor). Please replace # with the right character before ordering.

Display of ordering codes for EPCOS products

The ordering code for one and the same EPCOS product can be represented differently in data sheets, data books, other publications, on the EPCOS website, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products.** Detailed information can be found on the Internet under www.epcos.com/orderingcodes

Important remark

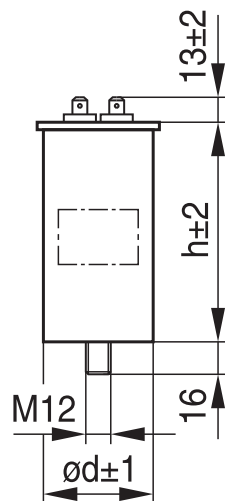


Hereafter mentioned capacitors with the wildcard character “#” are available either with integrated resistors with 2 terminals (B32301****A*** series) or with pluggable ceramic base discharge resistor with 4 terminals (B32301****B*** series).

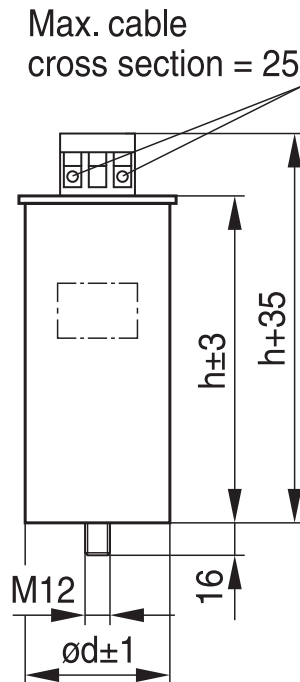
The main difference between B32301A****A*** series and B32301A****B*** series is the way of assembling the discharge resistor. The resistor of B32301A****A*** series is assembled inside of capacitor terminal cover, the ceramic resistor of B32301A****B*** is plugged into the terminal pin.

Dimensional drawings

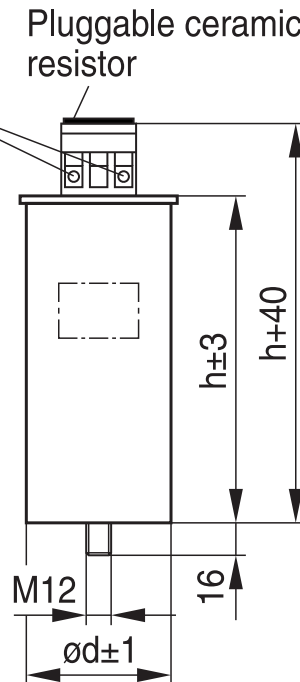
B32300A*



B32301A****A***



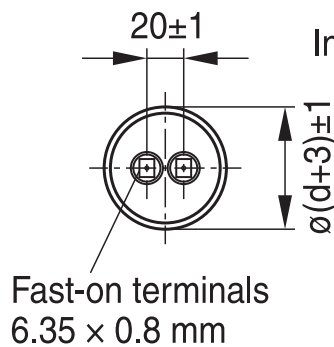
B32301A****B***



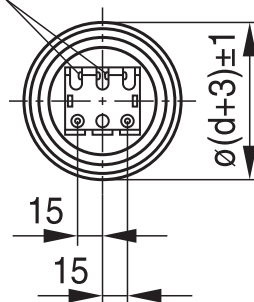
Max. cable cross section = 25 mm²

Pluggable ceramic resistor

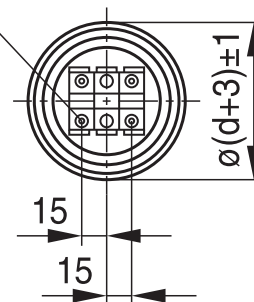
Torque = 10 Nm, Toothed washer J12 DIN 6797, Hex nut BM 12 DIN 439



Integrated resistors



Max. torque = 2.5 Nm



Creepage distance > 12.7 mm
Distance in air > 10 mm

KLK1950-6-E

Cautions and Warnings

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.

Mechanical protection

The capacitor has to be installed in a way that mechanical damages and dents in the aluminum can be 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 ≤ 60 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 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, Alu-X, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CSSP, CTVS, DeltaCap, DigiSiMic, DSSP, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PQSine, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SIP5D, SIP5K, TFAP, 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.