Film Capacitors – Power Factor Correction

PhiCap capacitors

Series/Type: **MKP480-D-20.8**
Ordering code: **B32344E4202A080**

Date: June 2011
Version: 2

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Construction

- Dielectric: Polypropylene film
- Non-PCB, semi-dry biodegradable resin
- Extruded round aluminium can with stud
- Provided with ceramic discharge module
- Triple safety system

Features

- Three-phase, delta connected
- Self-healing technology
- Naturally air cooled (or forced air cooling)
- Indoor mounting

Typical applications

- For power factor correction

Terminals

- Optimized capacitor safety terminals

Mounting

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

Technical data and specifications

Characteristics	MKP480-D-20.8	
Rated capacitance C_N	3 × 96 µF	
Tolerance	–5 / +10%	
Connection	D (Delta)	
Rated voltage V_N	480 V AC	
Rated frequency f_N	50 Hz	60 Hz
Output	20.8 kvar	25.0 kvar
Rated current I_R	25.0 A	30.1 A
tan δ_0 (dielectric)	0.2 W / kvar	
W_N	66 Ws	
R_S	3.31 mΩ	

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Maximum ratings	
V_{max} (up to 8 h daily)	530 V AC
V_{max} (up to 1 min)	620 V AC
I_{max}	Up to 1.3 × I_R (A) including combined effects of harmonics, overvoltages and capacitance tolerance
I_S	200 × I_R (A)

Test data	
V_{TT}	1 050 V AC / 50 Hz during 10 s
V_{TC}	3 000 V AC / 50 Hz during 10 s
*tan δ (50 Hz)	≤ 0.5 W / kvar

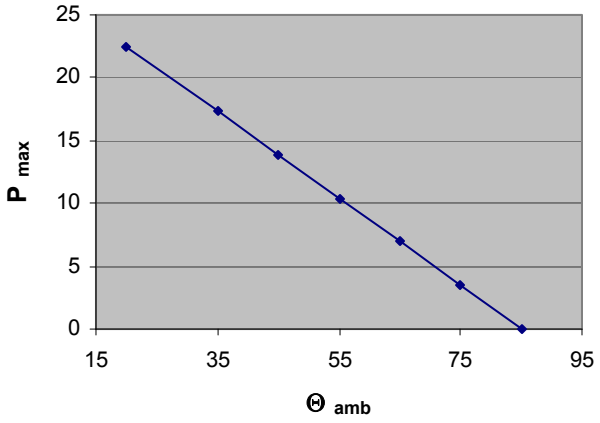
* Without discharge resistor

Design data	
Dimensions (d x h)	85 x 273 mm
Weight approx.	1.2 kg
Impregnation	Non-PCB, semi-dry biodegradable resin
Fixing	Threaded bolt M12
Max. torque (Al can stud)	10 Nm
Mounting position	Upright See “Maintenance and Installation Manual” for further details.

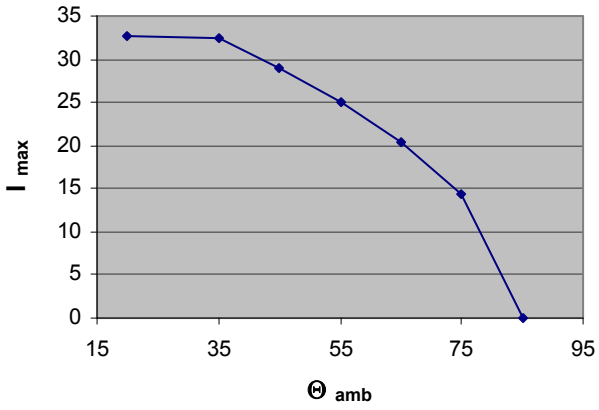
Climatic category –40/D		
Θ min.	–40 ºC	
Θ max.	+55 ºC	
Storage temperature	–40 ºC … +85 ºC	
$\Theta_{hotspot,max}$	+85 ºC	
Maximum power loss at $\Theta_{ambient}$	P max	at $\Theta_{ambient}$
	10.4 W	+55 ºC
	6.9 W	+65 ºC
	3.5 W	+75 ºC
	0 W	+85 ºC
Humidity	av. rel. < 95%	
Degree of protection	IP 20	
Maximum altitude	4 000 m	

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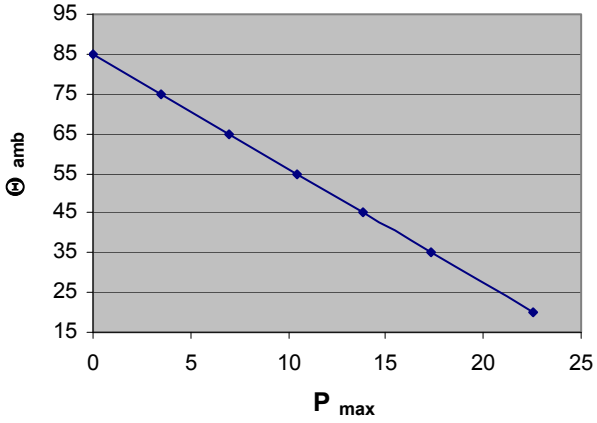
Max. allowable power loss at specific ambient Temp.
B32344E4202A080



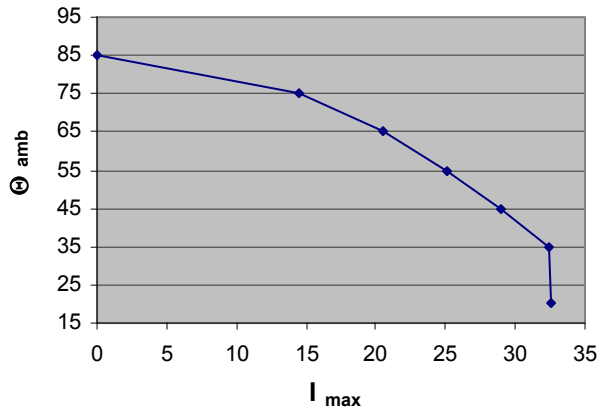
Max. allowable current (rms) at specific ambient Temp.
B32344E4202A080



Max. allowable ambient Temp. at specific power loss
B32344E4202A080



Max. allowable ambient Temp. at specific current (rms)
B32344E4202A080



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Mean life expectancy	
t_{LD}	Up to 135 000 hours (temperature class –40/C); $\Theta_{HS} \leq 70$ °C Up to 100 000 hours (temperature class –40/D); $\Theta_{HS} \leq 70$ °C
Max. 5000 switchings per year	

Terminals	
Protection degree	Isolated terminals, IP20
Max. torque	1.2 Nm
Terminal cross section	16 mm^2
Maximum terminal current	50 A
Creepage distance (min.)	12.7 mm
Clearance (min.)	9.6 mm

Safety	
Mechanical safety	Overpressure disconnector
Max. short circuit current	(AFC: 10 kA)
Discharge resistor time	≤ 60 s to 50 V or less

Reference standards
IEC 60831–1/2, UL 810-5th edition
Certification: cUL file 106388; CSA file C22.2 N°190 MC #236094 (up to Ø 85 mm); GOST

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Label design

EPCOS

Power Quality solutions

PhiCap™

MKP480-D-20.8

B32344E4202A080

3 x 96 µF Δ -5 +10% SH

*U*n	Q_N /50 Hz	Q_N /60 Hz
480 Vac	20.8 kvar	25.0 kvar
440 Vac	17.5 kvar	21.0 kvar
415 Vac	15.5 kvar	18.7 kvar

U_i = 3/- kV	-40/+55ºC	IEC 60831

9 DIGITPO NOSR.NO

C22.2 N°190 MC#236094 Non Flammable Fluid 55°C

"DISCHARGE AVANT DE TOUCHER
AUX PIECES SOUS TENSION"

Overpressure disconnector Non PCB

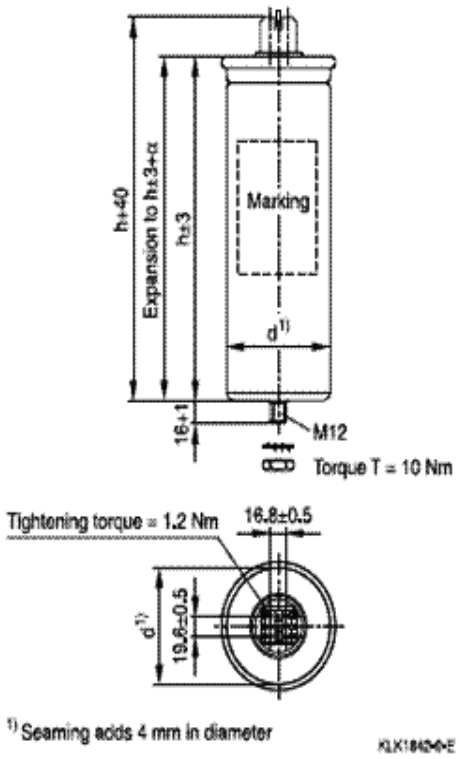
Protected File E106388 10K AFC

АИ50

Made by EPCOS WWNYY

DISCHARGE CAPACITOR BEFORE HANDLING

Dimensional drawing



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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. PhiCap capacitors E-series have a pre-mounted ceramic discharge module; 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.

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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. The 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 IEC60831 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*

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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 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.

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