



## **PhiCap capacitors for power factor correction**

### **B32344D series**

**Series/Type:** B32344D

**Ordering code:** B32344D....A...

**Date:** August 2006

**Version:** 4

## Construction

- Dielectric: metallized polypropylene film
- Semi-dry; high viscosity PU 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)
- Terminals: SIGUT screw terminals

## Features

- Three-phase, provided with discharge resistors
- Dual safety system: overpressure disconnector, self-healing technology
-  file # E106388
- Naturally air cooled (or forced air cooling)
- Indoor mounting

## Technical data and specifications

Characteristics	
Rated capacitance $C_R$ and $Q_R$	According to specification table
Tolerance	-5/+10%
Connection	D (Delta)
Rated voltage $V_R$	According to specification table
Rated frequency $f_R$	50/60 Hz

<b>Maximum ratings</b> (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 $1.3 \times I_R$ (up to $1.5 \times I_R$ incl. combined effects of harmonics, over voltages and capacitance)
Maximum transient inrush current	Up to $200 \times I_R$
Power dissipation (dielectric)	< 0.2 W/kvar
Power dissipation (excluding discharge resistors)	< 0.45 W/kvar
<b>Test data</b> (accord. to IEC 60831)	
AC test voltage terminal-to-terminal	$2.15 \times V_R$ , 2 s
Insulation voltage between terminals and container	3000 V AC, 10 s
Dissipation factor $\tan \delta$ at 100 Hz	$\leq 1.0 \times 10^{-3}$



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#### 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

$t_{LD}$	$V_p$ to 100.000 operating hours
Max. 5000 switching operations per year to IEC 60831	

#### Design data

Dimensions ( $\varnothing \times l$ )	According to specification table
Weight approx.	According to specification table
Filling	High viscosity polyurethane resin
Fixing	Threaded bolt M12
Max. torque (Al can stud)	10 Nm
Mounting position	Upright. See "Maintenance and Installation Manual" for further details. Horizontal mounting with additional head support possible.

#### Terminals

Degree of protection	IP20 (Optional IP54) (to IEC 529)
Max. torque	2.5 Nm
Terminal cross section	16 mm <sup>2</sup>
Maximum terminal current	60 A (continuous)
Creepage distance	12.7 mm (to UL 810)
Clearance	9.6 mm (to UL 810)

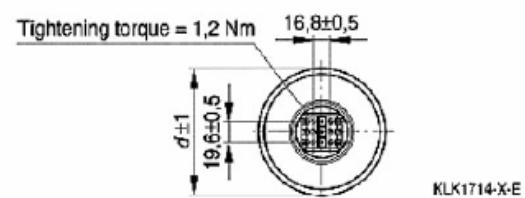
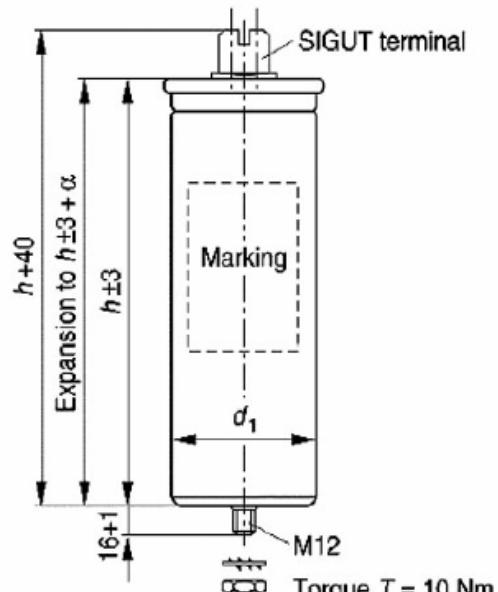
#### Safety

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 specify 3 min.

#### Reference standards

IEC 60831-1/2. UL 810-5 <sup>th</sup> edition
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#### Dimensional drawing



#### Label drawing



B32344D4252A040

 $3 \times 138 \mu\text{F}$	$-5 +10\%$	$\text{SH}$
$U_N$	$Q_N / 50 \text{ Hz}$	$Q_N / 60 \text{ Hz}$
440V~	25,00 kvar	30,00 kvar
415V~	22,23 kvar	26,68 kvar
400V~	20,65 kvar	24,78 kvar
$U_{i} = 3 \cdot U_N$	$-25 +55^\circ\text{C}$	IEC 60831
Overpressure disconnector		Non PCB
Protected File E106388 10K AFC		
Discharge before handling		
Made by EPCOS		1 G06

**PhiCap capacitors for power factor correction**
**B32344D...A...**
**B32344D series**
**Three-phase capacitors - Rated voltage 220 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h mm	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D2021A020	1.7	4.4	2.0	5.3	3 x	37.0	79.5 x 138	0.4	6
B32344D2021A520	2.0	5.5	2.5	6.6	3 x	46.0	79.5 x 138	0.4	6
B32344D2051A020	4.2	11.0	5.0	13.2	3 x	92.0	79.5 x 198	0.6	6
B32344D2071A520	6.3	16.4	7.5	19.7	3 x	137.0	89.5 x 198	0.8	4
B32344D2101A020	8.3	21.9	10.0	26.3	3 x	183.0	89.5 x 273	1.2	4
B32344D2121A520	10.4	27.4	12.5	32.9	3 x	229.0	89.5 x 273	1.5	4
B32344D2151A020	12.5	32.8	15.0	39.4	3 x	274.0	89.5 x 348	1.5	4

**Three-phase capacitors - Rated voltage 230 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h per box	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D2022A030	2.0	5.3	2.5	6.3	3 x	42.0	79.5 x 138	0.4	6
B32344D2022A530	2.5	6.3	3.0	7.5	3 x	50.0	79.5 x 138	0.4	6
B32344D2052A030	5.0	12.5	6.0	15.0	3 x	100.0	79.5 x 198	0.6	6
B32344D2072A530	7.5	18.8	9.0	22.5	3 x	150.0	89.5 x 198	0.8	4
B32344D2102A030	10.0	25.0	12.0	30.0	3 x	200.0	89.5 x 273	1.2	4
B32344D2122A530	12.5	31.3	15.0	37.5	3 x	250.0	89.5 x 273	1.5	4
B32344D2152A030	15.0	37.7	1)	1)	3 x	300.0	89.5 x 348	1.5	4

**Three-phase capacitors - Rated voltage 240 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h per box	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D2021A540	2.1	5.0	2.5	6.0	3 x	38.0	79.5 x 138	0.4	6
B32344D2031A040	2.5	6.0	3.0	7.2	3 x	46.0	79.5 x 138	0.4	6
B32344D2051A040	4.2	10.1	5.0	12.1	3 x	77.0	79.5 x 160	0.6	6
B32344D2071A540	6.3	15.0	7.5	18.0	3 x	115.0	79.5 x 198	0.6	6
B32344D2081A340	6.9	16.6	8.3	19.9	3 x	127.0	89.5 x 198	1.5	4
B32344D2101A040	8.3	20.1	10.0	24.1	3 x	154.0	89.5 x 198	0.9	4
B32344D2121A540	10.4	25.1	12.5	30.1	3 x	192.0	89.5 x 273	1.2	4
B32344D2151A040	12.5	30.0	15.0	36.0	3 x	230.0	89.5 x 273	1.2	4
B32344D2161A740	13.9	33.4	1)	1)	3 x	256.0	89.5 x 348	1.2	4

1) Product not applicable to 60 Hz, since the product's rated current is exceeded.

**Three-phase capacitors - Rated voltage 380 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h Unit	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D3071A580	6.3	9.5	7.5	11.4	3 x	46.0	79.5 x 160	0.5	6
B32344D3101A080	8.3	12.6	10.0	15.1	3 x	61.0	79.5 x 160	0.5	6
B32344D3121A580	10.4	15.9	12.5	19.1	3 x	77.0	79.5 x 198	0.6	6
B32344D3151A080	12.5	19.0	15.0	22.8	3 x	92.0	89.5 x 198	0.8	4
B32344D3201A080	16.7	25.4	20.0	30.5	3 x	123.0	89.5 x 273	1.2	4
B32344D3251A080	20.8	31.6	25.0	38.0	3 x	153.0	89.5 x 273	1.2	4

**Three-phase capacitors - Rated voltage 400 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h mm	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D4071A500	6.3	9.1	7.5	11.0	3 x	42.0	79.5 x 160	0.5	6
B32344D4072A500	7.5	10.9	9.0	13.1	3 x	50.0	79.5 x 160	0.5	6
B32344D4101A000	8.3	12.0	10.0	14.4	3 x	55.0	79.5 x 160	0.5	6
B32344D4102A000	10.0	14.6	12.0	17.5	3 x	67.0	79.5 x 198	0.6	6
B32344D4122A500	12.5	18.1	15.0	21.7	3 x	83.0	89.5 x 198	0.8	4
B32344D4152A000	15.0	21.8	18.0	26.1	3 x	100.0	89.5 x 198	0.8	4
B32344D4201A000	16.7	24.2	20.0	29.0	3 x	111.0	89.5 x 198	0.8	4
B32344D4202A000	20.0	28.9	24.0	34.7	3 x	133.0	89.5 x 273	1.2	4
B32344D4252A000	25.0	36.1	1)	1)	3 x	166.0	89.5 x 273	1.5	4

**Three-phase capacitors - Rated voltage 415 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h mm	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D4071A510	6.3	8.8	7.5	10.6	3 x	39.0	79.5 x 160	0.5	6
B32344D4072A510	7.5	10.4	9.0	12.5	3 x	46.0	79.5 x 198	0.6	6
B32344D4102A010	10.0	14.0	12.0	16.8	3 x	62.0	79.5 x 198	0.6	6
B32344D4122A510	12.5	17.4	15.0	20.9	3 x	77.0	89.5 x 198	0.8	4
B32344D4152A010	15.0	20.8	18.0	24.9	3 x	92.0	89.5 x 273	1.2	4
B32344D4202A010	20.0	27.8	24.0	33.3	3 x	123.0	89.5 x 273	1.2	4
B32344D4252A010	25.0	34.8	1)	1)	3 x	154.0	89.5 x 348	1.5	4

1) Product not applicable to 60 Hz, since the product's rated current is exceeded.

**PhiCap capacitors for power factor correction**
**B32344D...A...**
**B32344D series**
**Three-phase capacitors - Rated voltage 440 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h mm	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D4071A540	6.3	8.1	7.5	9.8	3 x	34.0	79.5 x 160	0.5	6
B32344D4072A540	7.5	9.8	9.0	11.8	3 x	41.0	79.5 x 160	0.5	6
B32344D4101A040	8.3	11.0	10.0	13.2	3 x	46.0	79.5 x 198	0.6	6
B32344D4102A040	10.0	13.2	12.0	15.8	3 x	55.0	79.5 x 198	0.6	6
B32344D4121A540	10.4	13.6	12.5	16.4	3 x	57.0	79.5 x 198	0.6	6
B32344D4151A040	12.5	16.5	15.0	19.8	3 x	69.0	89.5 x 198	0.8	4
B32344D4152A040	15.0	19.6	18.0	23.6	3 x	82.0	89.5 x 273	1.1	4
B32344D4201A040	16.7	22.0	20.0	26.4	3 x	92.0	89.5 x 273	1.2	4
B32344D4251A040	20.8	27.3	25.0	32.8	3 x	114.0	89.5 x 273	1.2	4
B32344D4252A040	25.0	33.0	1)	1)	3 x	138.0	89.5 x 348	1.5	4
B32344D4282A040	28.0	36.8	1)	1)	3 x	154.0	89.5 x 348	1.5	4

**Three-phase capacitors - Rated voltage 480 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h mm	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D4051A080	4.2	5.0	5.0	6.0	3 x	19.0	79.5 x 160	0.5	6
B32344D4052A080	5.0	6.0	6.0	7.2	3 x	23.0	79.5 x 160	0.5	6
B32344D4071A580	6.3	7.6	7.5	9.1	3 x	29.0	79.5 x 160	0.5	6
B32344D4072A580	7.5	9.1	9.0	11.0	3 x	35.0	79.5 x 198	0.6	6
B32344D4101A080	8.4	9.9	10.0	11.9	3 x	38.0	79.5 x 198	0.6	6
B32344D4121A580	10.4	12.5	12.5	15.0	3 x	48.0	89.5 x 198	0.8	4
B32344D4151A080	12.5	15.1	15.0	18.2	3 x	58.0	89.5 x 198	0.8	4
B32344D4152A080	15.0	18.0	18.0	21.6	3 x	69.0	89.5 x 273	1.2	4
B32344D4162A780	16.7	20.1	20.0	24.1	3 x	77.0	89.5 x 273	1.2	4
B32344D4202A080	20.8	25.1	25.0	30.1	3 x	96.0	89.5 x 273	1.5	4
B32344D4252A080	25.0	30.0	30.0	36.0	3 x	115.0	89.5 x 348	1.5	4
B32344D4302A080	30.0	36.1	1)	1)	3 x	138.0	94.0 x 348	1.5	4

**Three-phase capacitors - Rated voltage 525 V AC, 50/60 Hz, delta connection**

Product / Type Ordering code	50 Hz		60 Hz		C <sub>R</sub>		d x h mm	Weight kg	Quantity per box
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF				
B32344D5051A020	4.0	3.4	5.0	4.1	3 x	12.0	79.5 x 160	0.3	6
B32344D5061A020	5.0	5.4	6.0	6.5	3 x	19.0	79.5 x 160	0.3	6
B32344D5071A520	6.3	6.9	7.5	8.2	3 x	24.0	79.5 x 160	0.5	6
B32344D5101A020	8.3	9.1	10.0	11.0	3 x	32.0	79.5 x 198	0.6	6
B32344D5121A520	10.4	11.4	12.5	13.7	3 x	40.0	89.5 x 198	0.8	4
B32344D5151A020	12.5	13.7	15.0	16.5	3 x	48.0	89.5 x 273	1.1	4
B32344D5201A020	16.6	18.3	20.0	21.9	3 x	64.0	89.5 x 273	1.2	4
B32344D5202A020	20.8	22.9	25.0	27.4	3 x	80.0	89.5 x 348	1.5	4
B32344D5252A020	25.0	27.4	30.0	32.9	3 x	96.0	89.5 x 348	1.5	4

1) Product not applicable to 60 Hz, since the product's rated current is exceeded.

### **Cautions and warnings**

- In case of dents of more than 2 mm depth or any other mechanical damage, capacitors must not be used at all.
- To ensure the full functionality of the overpressure disconnector, elastic elements must not be hindered and a minimum space of 5 cm has to be kept above each capacitor.
- Do not handle the capacitor before it is discharged to max. 10% of rated voltage.
- 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 D-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**

- Ensure good, effective grounding for capacitor enclosures.
- Provide means of disconnecting and insulating a faulty component/bank.
- Handle capacitors carefully, because they may still be charged even after disconnection due to faulty discharging devices.
- The terminals of capacitors, connected bus bars and cables as well as other devices may also be energized.
- Follow good engineering practice

### 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.

### Overttemperature

Exceeding maximum allowed temperature may set the safety device out of operation.

### 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. 5 cm) for expansion above the connections (see "Clearing distance for overpressure disconnector").
  - 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 IEC60831 specification.

### 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	2 h
Frequency range 1	0 ... 55 Hz corresponding to max. 0.7 g
Displacement amplitude	0.75 mm

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.

#### Clearing distance for overpressure disconnector

Above each capacitor, a minimum space of 5 cm has to be kept. This will allow the visual control to work and enable a longitudinal extension of the can to secure the overpressure disconnector work.

#### 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 50 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 passive 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 a passive 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 a passive 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](http://www.epcos.com/material)). Should you have any more detailed questions, please contact our sales offices.
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**!** Read carefully cautions, installation and maintenance instructions as provided in the PFC product profile, installation and maintenance instruction manual. This is to ensure optimum performance of the product and prevent it from failing in worst case of bursting and fire.

On the acceptance of our product you are kindly request to approve our product specification or request our approval for your requirement (specification and application) before ordering.