



## **CÔNG TY CỔ PHẦN THIẾT BỊ ĐIỆN HOÀNG PHƯƠNG**

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## **Film Capacitors – Power Factor Correction**

### DeltaCap Capacitors

Series/Type: MKDxxx-D-xx  
Ordering code: B32303A\*\*\*\*A\*\*\*/ B32304A\*\*\*\*A\*\*\*/ B32304A\*\*\*\*B\*\*\*  
Date: February 2017  
Version: 8

### Construction and general data

- Dielectric: Polypropylene film
- Non PCB, Semi-dry biodegradable resin
- Stacked winding
- Extruded round aluminum can with stud
- B32304 provided with integrated or pluggable discharge resistors

### Features

- Three-phase, internal delta connection
- Double safety system:
  - overpressure disconnecter
  - self healing technology
- Naturally air cooled (or forced air cooling)
- Indoor mounting

### Typical applications

- For Power Factor Correction

### Terminals

- Screw terminals - B32304A\* series
- Fast-on terminals - B32303A\* 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%
Connection	D (Delta)
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



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B32304A\*\*\*\*B\*\*\***
**DetaCap Capacitors**
**MKDxxx-D-xx**
**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 $1.5 \cdot I_R$ (A) (including combined effects of harmonics, overvoltages and capacitance tolerance)
$I_S$	Up to $200 \cdot I_R$ (A)
Power dissipation*	$\leq 0.2$ W/kvar (dielectric) and $\leq 0.45$ W / kvar (total)

\* Without discharge resistor

**Test data**

$V_{TT}$	$2.15 \cdot V_R$ , 2 s
$V_{TC}$	3000 V AC, 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	IP20
Maximum altitude	4000 m

**Mean life expectancy**

$t_{LD}$	Up to 135 000 hours at temperature class -40/C Up to 100 000 hours at temperature class -40/D
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Max. 5000 switchings per year acc. to IEC 60831

**Design data**

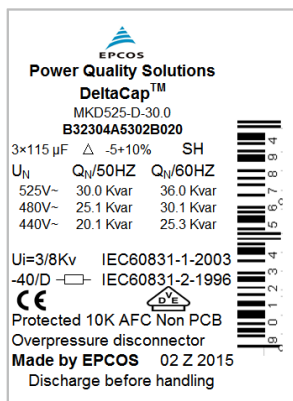
Dimensions (d x h)	According to specification table
Weight approx.	According to specification table
Impregnation	Non PCB, resin filling: soft biodegradable polyurethane resin
Fixing	Threaded bolt M12
Max. torque (Al can stud)	10 Nm
Mounting position	Only in the upright position. See "Maintenance and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

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**B32303A\*\*\*\*A\*\*\* / B32304A\*\*\*\*A\*\*\* /  
B32304A\*\*\*\*B\*\*\***
**DeltaCap Capacitors**
**MKDxxx-D-xx**

<b>Terminals</b>	
Protection degree	IP00 for B32303; IP20 for B32304
Max. torque	2 Nm
Maximum terminal current	50 A (screw terminals and hose cables) 15 A (fast on terminals)
Creepage distance (min)	12.7 mm (to UL 810)
Clearance (min)	9.6 mm (to UL 810)

<b>Safety</b>	
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

<b>Reference standards</b>	
IEC 60831–1/2, UL 810-5th edition	

**Label design**

**Important remark**


Hereafter mentioned capacitors with the wildcard character “#” are available either with integrated resistors with 3 terminals (B32304\*\*\*\*A\*\*\* series) or with pluggable ceramic base discharge resistor with 6 terminals (B32304\*\*\*\*B\*\*\* series).

The main difference between B32304\*\*\*\*A\*\*\* series and B32304\*\*\*\*B\*\*\* series is the way of assembling the discharge resistor. The resistor of B32304\*\*\*\*A\*\*\* series is assembled inside of capacitor terminal cover, the ceramic resistor of B32304\*\*\*\*B\*\*\* is plugged into the terminal pin.

**Ordering codes**

Type	50 Hz		60 Hz		C <sub>R</sub> μF	d x h mm	Weight kg	Ordering code	Packing unit pcs
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A					
<b>Rated voltage 230 V AC, 50/60 Hz, delta connection</b>									
MKD230-D-0.5	0.5	1.3	0.6	1.6	3 • 10	50 x 150	0.4	B32303A2002A530	50
MKD230-D-0.7	0.7	1.8	0.8	2.2	3 • 14	50 x 150	0.4	B32303A2002A730	50
MKD230-D-1.0	1.0	2.5	1.2	3.0	3 • 20	50 x 150	0.4	B32303A2012A030	50
MKD230-D-1.5	1.5	3.8	1.8	4.6	3 • 30	63.5 x 150	0.6	B32303A2012A530	12
MKD230-D-2.0	2.0	5.0	2.4	6.0	3 • 40	63.5 x 150	0.6	B32303A2022A030	12
MKD230-D-2.5	2.5	6.3	3.0	7.6	3 • 50	63.5 x 150	0.8	B32303A2022A530	12
MKD230-D-5.0	5.0	12.6	6.0	15.1	3 • 100	75 x 200	1.1	B32304A2052#030*	6
MKD230-D-7.5	7.5	18.8	9.0	22.6	3 • 151	75 x 275	1.4	B32304A2072#530*	6
MKD230-D-10.0	10.0	25.1	12.0	30.1	3 • 201	85 x 275	1.7	B32304A2102#030*	4
MKD230-D-12.5	12.5	31.4	15.0	37.7	3 • 251	85 x 350	2.2	B32304A2122#530*	4
MKD230-D-15.0	15.0	37.7	18.0	45.2	3 • 301	85 x 350	2.2	B32304A2152#030*	4
<b>Rated voltage 400 V AC, 50/60 Hz, delta connection</b>									
MKD400-D-1.0	1.0	1.4	1.2	1.7	3 • 6.6	50 x 150	0.4	B32303A4012A000	50
MKD400-D-1.5	1.5	2.2	1.8	2.6	3 • 10	50 x 150	0.4	B32303A4012A500	50
MKD400-D-2.0	2.0	2.9	2.4	3.5	3 • 13	50 x 150	0.4	B32303A4022A000	50
MKD400-D-2.5	2.5	3.6	3.0	4.3	3 • 17	50 x 150	0.4	B32303A4022A500	50
MKD400-D-5.0	5.0	7.2	6.0	8.6	3 • 33	63.5 x 150	0.6	B32303A4052A000	12
MKD400-D-6.3	6.3	9.1	7.6	10.9	3 • 42	75 x 163	0.8	B32304A4071#500*	6
MKD400-D-7.5	7.5	10.8	9.0	13.0	3 • 50	75 x 163	0.9	B32304A4072#500*	6
MKD400-D-8.3	8.3	12.0	10.0	14.4	3 • 55	75 x 200	1.1	B32304A4101#000*	6
MKD400-D-10.0	10.0	14.4	12.0	17.3	3 • 66	75 x 200	1.1	B32304A4102#000*	6
MKD400-D-12.5	12.5	18.0	15.0	21.6	3 • 83	75 x 275	1.4	B32304A4122#500*	6
MKD400-D-15.0	15.0	21.7	18.0	26.0	3 • 100	75 x 275	1.4	B32304A4152#000*	6
MKD400-D-16.7	16.7	24.1	20.0	28.9	3 • 111	85 x 275	1.8	B32304A4201#000*	4
MKD400-D-20.0	20.0	28.9	24.0	34.7	3 • 133	85 x 275	1.8	B32304A4202#000*	4
MKD400-D-25.0	25.0	36.1	30.0	43.3	3 • 166	85 x 350	2.2	B32304A4252#000*	4
MKD400-D-30.0	30.0	43.3	--	--	3 • 199	96 x 275	2.4	B32304A4302#000*	4

\* Available either as B32304A\*\*\*\*A\*\*\* series (3-terminal design, integrated resistor) or B32304A\*\*\*\*B\*\*\* series (6-terminal design, pluggable ceramic resistor). Please replace # with the right character before ordering.

**Film Capacitors – Power Factor Correction**
**B32303A\*\*\*\*A\*\*\*/ B32304A\*\*\*\*A\*\*\*/  
B32304A\*\*\*\*B\*\*\***
**DetaCap Capacitors**
**MKDxxx-D-xx**

Type	50 Hz		60 Hz		C <sub>R</sub> μF	d x h mm	Weight kg	Ordering code	Packing unit pcs
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A					
<b>Rated voltage 415 V AC, 50/60 Hz, delta connection</b>									
MKD415-D-1.0	1.0	1.4	1.2	1.7	3 • 6.2	50 x 150	0.4	B32303A4012A010	50
MKD415-D-1.5	1.5	2.1	1.8	2.5	3 • 9.2	50 x 150	0.4	B32303A4012A510	50
MKD415-D-2.0	2.0	2.8	2.4	3.4	3 • 12	50 x 150	0.4	B32303A4022A010	50
MKD415-D-2.5	2.5	3.5	3.0	4.2	3 • 15	63.5 x 150	0.6	B32303A4022A510	12
MKD415-D-5.0	5.0	7.0	6.0	8.4	3 • 31	63.5 x 150	0.8	B32303A4052A010	12
MKD415-D-6.3	6.3	8.8	7.6	10.6	3 • 39	75 x 200	1.0	B32304A4071#510*	6
MKD415-D-7.5	7.5	10.4	9.0	12.5	3 • 46	75 x 200	1.1	B32304A4072#510*	6
MKD415-D-10.0	10.0	13.9	12.0	16.7	3 • 62	75 x 275	1.4	B32304A4102#010*	6
MKD415-D-12.5	12.5	17.4	15.0	20.9	3 • 77	75 x 275	1.4	B32304A4122#510*	6
MKD415-D-15.0	15.0	20.9	18.0	25.1	3 • 93	85 x 275	1.7	B32304A4152#010*	4
MKD415-D-20.0	20.0	27.8	24.0	33.4	3 • 123	85 x 275	2.2	B32304A4202#010*	4
MKD415-D-20.8	20.8	28.9	25.0	34.7	3 • 128	85 x 350	2.4	B32304A4251#010*	4
MKD415-D-25.0	25.0	34.8	30.0	41.8	3 • 154	85 x 350	2.4	B32304A4252#010*	4
MKD415-D-30.0	30.0	41.7	36.0	50.0	3 • 185	96 x 350	2.7	B32304A4302#010*	4
<b>Rated voltage 440 V AC, 50/60 Hz, delta connection</b>									
MKD440-D-0.9	0.9	1.2	1.1	1.4	3 • 5.2	50 x 127	0.4	B32303A4011A040	50
MKD440-D-1.0	1.0	1.3	1.2	1.6	3 • 5.5	50 x 127	0.4	B32303A4012A040	50
MKD440-D-1.2	1.2	1.6	1.4	1.9	3 • 6.6	50 x 127	0.4	B32303A4011A540	50
MKD440-D-1.5	1.5	2.0	1.8	2.4	3 • 8.8	50 x 127	0.4	B32303A4012A540	50
MKD440-D-2.0	2.0	2.6	2.4	3.1	3 • 11	50 x 150	0.5	B32303A4022A040	50
MKD440-D-2.1	2.1	2.8	2.5	3.4	3 • 12	50 x 150	0.5	B32303A4021A540	50
MKD440-D-2.5	2.5	3.3	3.0	4.0	3 • 14	63.5 x 150	0.7	B32303A4022A540	12
MKD440-D-4.2	4.2	5.5	5.0	6.6	3 • 23	63.5 x 150	0.7	B32303A4051A040	12
MKD440-D-5.0	5.0	6.6	6.0	7.9	3 • 27	63.5 x 150	0.8	B32303A4052A040	12
MKD440-D-6.3	6.3	8.3	7.6	10.0	3 • 35	75 x 163	0.8	B32304A4071#540*	6
MKD440-D-7.5	7.5	9.8	9.0	11.8	3 • 41	75 x 200	1.1	B32304A4072#540*	6
MKD440-D-8.3	8.3	10.9	10.0	13.1	3 • 46	75 x 200	1.1	B32304A4101#040*	6
MKD440-D-10.0	10.0	13.1	12.0	15.7	3 • 55	75 x 275	1.4	B32304A4102#040*	6
MKD440-D-10.4	10.4	13.6	12.5	16.3	3 • 57	75 x 275	1.4	B32304A4121#540*	6
MKD440-D-12.5	12.5	16.4	15.0	19.7	3 • 69	75 x 275	1.4	B32304A4151#040*	6
MKD440-D-15.0	15.0	19.7	18.0	23.6	3 • 82	85 x 275	1.7	B32304A4152#040*	4
MKD440-D-16.7	16.7	21.9	20.0	26.3	3 • 92	85 x 275	1.7	B32304A4201#040*	4
MKD440-D-20.0	20.0	26.2	24.0	31.5	3 • 110	85 x 275	1.9	B32304A4202#040*	4
MKD440-D-20.8	20.8	27.3	25.0	32.8	3 • 114	85 x 275	2.2	B32304A4251#040*	4
MKD440-D-25.0	25.0	32.8	30.0	39.4	3 • 137	85 x 275	2.2	B32304A4252#040*	4

\* Available either as B32304A\*\*\*\*A\*\*\* series (3-terminal design, integrated resistor) or B32304A\*\*\*\*B\*\*\* series (6-terminal design, pluggable ceramic resistor). Please replace # with the right character before ordering.

**Film Capacitors – Power Factor Correction**
**B32303A\*\*\*\*A\*\*\* / B32304A\*\*\*\*A\*\*\* /  
B32304A\*\*\*\*B\*\*\***
**DetaCap Capacitors**
**MKDxxx-D-xx**

Type	50 Hz		60 Hz		C <sub>R</sub> μF	d x h mm	Weight kg	Ordering code	Packing unit pcs
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A					
<b>Rated voltage 440 V AC, 50/60 Hz, delta connection - continue</b>									
MKD440-D-28.0	28.0	36.7	33.6	44.0	3 • 154	85 x 350	2.2	B32304A4282#040*	4
MKD440-D-30.0	30.0	39.0	--	--	3 • 164	85 x 350	2.7	B32304A4302#040*	4
MKD440-D-33.0	33.0	43.3	--	--	3 • 181	85 x 350	2.7	B32304A4332#040*	4
MKD440-D-33.8	33.8	44.4	--	--	3 • 185	85 x 350	2.7	B32304A4332#840*	4

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B32304A\*\*\*\*B\*\*\***
**DetaCap Capacitors**
**MKDxxx-D-xx**

Type	50 Hz		60 Hz		C <sub>R</sub> μF	d x h mm	Weight kg	Ordering code	Packing unit pcs
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A					
<b>Rated voltage 480 V AC, 50/60 Hz, delta connection</b>									
MKD480-D-1.5	1.5	1.8	1.8	2.2	3 • 6.9	50 x 127	0.4	B32303A4012A580	50
MKD480-D-2.0	2.0	2.4	2.4	2.9	3 • 9.2	50 x 150	0.5	B32303A4022A080	50
MKD480-D-2.5	2.5	3.0	3.0	3.6	3 • 12	63.5 x 150	0.7	B32303A4022A580	12
MKD480-D-5.0	5.0	6.0	6.0	7.2	3 • 23	75 x 163	0.8	B32304A4052#080*	6
MKD480-D-6.3	6.3	7.6	7.6	9.1	3 • 29	75 x 163	0.8	B32304A4071#580*	6
MKD480-D-7.5	7.5	9.0	9.0	10.8	3 • 35	75 x 200	1.1	B32304A4072#580*	6
MKD480-D-8.3	8.3	10.0	10.0	12.0	3 • 38	75 x 200	1.1	B32304A4101#080*	6
MKD480-D-10.4	10.4	12.5	12.5	15.0	3 • 48	75 x 275	1.4	B32304A4121#580*	6
MKD480-D-12.5	12.5	15.0	15.0	18.0	3 • 58	75 x 275	1.4	B32304A4151#080*	6
MKD480-D-15.0	15.0	18.0	18.0	21.6	3 • 69	85 x 275	1.7	B32304A4152#080*	4
MKD480-D-16.7	16.7	20.1	20.0	24.1	3 • 77	85 x 275	1.8	B32304A4162#780*	4
MKD480-D-20.0	20.0	24.1	24.0	28.9	3 • 92	85 x 350	2.2	B32304A4201#080*	4
MKD480-D-20.8	20.8	25.0	25.0	30.0	3 • 96	85 x 350	2.2	B32304A4202#080*	4
MKD480-D-25.0	25.0	30.1	30.0	36.1	3 • 115	85 x 350	2.2	B32304A4252#080*	4
MKD480-D-30.0	30.0	36.0	36.0	43.0	3 • 138	96 x 350	2.7	B32304A4302#080*	4
MKD480-D-33.0	33	39.7	--	--	3 • 152	96 x 350	2.7	B32304A4332#080*	4
<b>Rated voltage 525 V AC, 50/60 Hz, delta connection</b>									
MKD525-D-1.0	1.0	1.1	1.2	1.3	3 • 3.9	50 x 150	0.4	B32303A5012A020	50
MKD525-D-1.5	1.5	1.6	1.8	1.9	3 • 5.8	50 x 150	0.4	B32303A5012A520	50
MKD525-D-2.0	2.0	2.2	2.4	2.6	3 • 7.7	63.5 x 150	0.6	B32303A5022A020	12
MKD525-D-2.5	2.5	2.7	3.0	3.2	3 • 9.6	63.5 x 150	0.6	B32303A5022A520	12
MKD525-D-5.0	5.0	5.5	6.0	6.6	3 • 19	75 x 163	0.8	B32304A5061#020*	6
MKD525-D-6.3	6.3	6.9	7.6	8.3	3 • 24	75 x 200	1.0	B32304A5071#520*	6
MKD525-D-8.3	8.3	9.1	10.0	10.9	3 • 32	75 x 275	1.4	B32304A5101#020*	6
MKD525-D-10.4	10.4	11.4	12.5	13.7	3 • 40	75 x 275	1.4	B32304A5121#520*	6
MKD525-D-12.5	12.5	13.7	15.0	16.4	3 • 48	75 x 275	1.4	B32304A5151#020*	6
MKD525-D-16.7	16.7	18.4	20.0	22.1	3 • 64	85 x 275	1.8	B32304A5201#020*	4
MKD525-D-20.8	20.8	22.9	25.0	27.5	3 • 80	85 x 350	2.2	B32304A5202#020*	4
MKD525-D-25.0	25.0	27.5	30.0	33.0	3 • 96	85 x 350	2.2	B32304A5252#020*	4
MKD525-D-30.0	30.0	33.0	36.0	39.0	3 • 115	96 x 350	2.7	B32304A5302#020*	4

\* Available either as B32304A\*\*\*\*A\*\*\* series (3-terminal design, integrated resistor) or B32304A\*\*\*\*B\*\*\* series (6-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](http://www.epcos.com/orderingcodes)

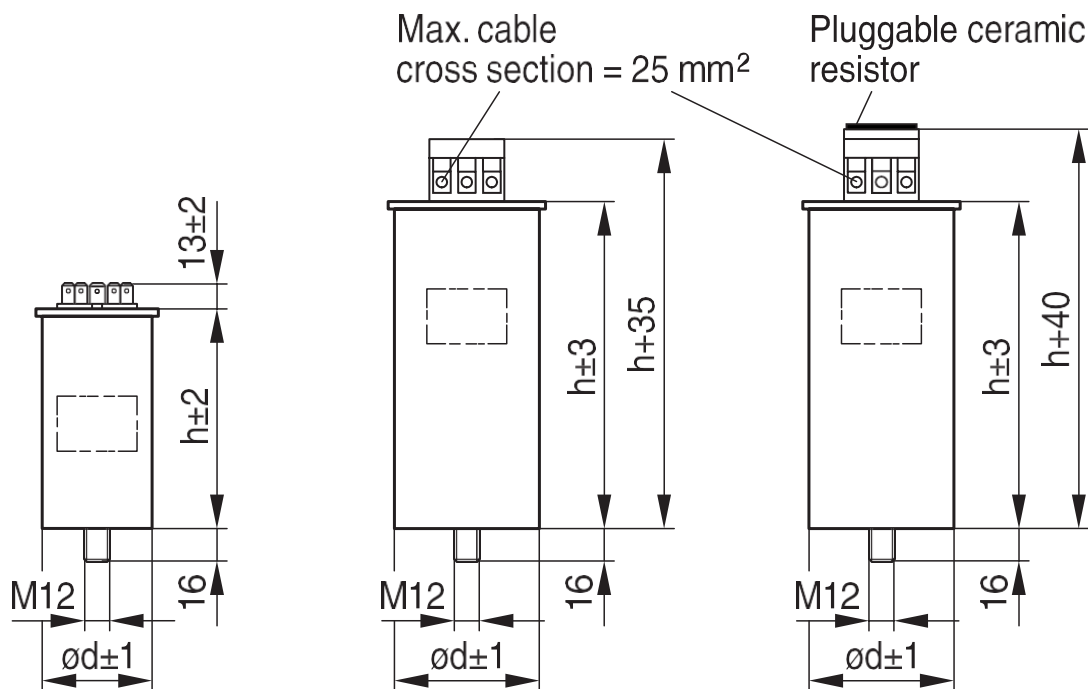


Dimensional drawings

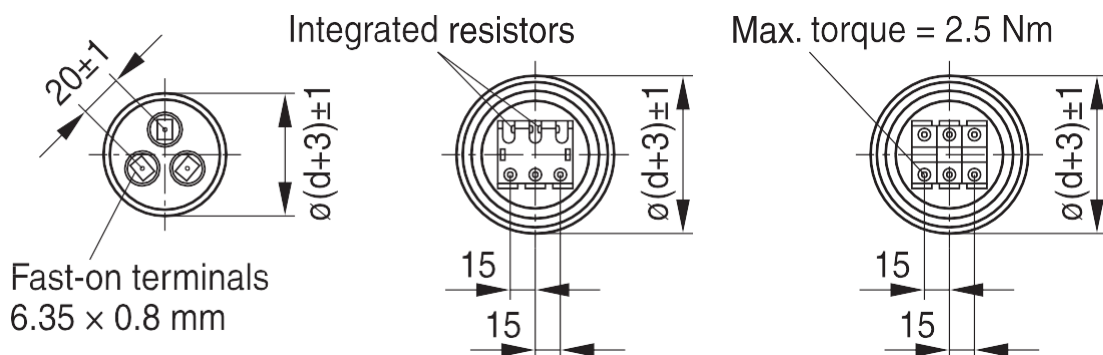
B32303 series

B32304\*\*\*\*A\*\*\* series

B32304\*\*\*\*B\*\*\* series



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



Creepage distance > 12.7 mm  
Distance in air > 10 mm

KLK1857-M-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 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  $\leq 60$  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:

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