

EPCOS Product Brief 2015

Power Factor Correction

DeltaCap MKD Capacitors for Power Quality Solutions

Based on the well-proven MKP technology with stacked windings, DeltaCap™ capacitors are especially developed for LV-PFC applications in industrial installations. The cost-effective design offers a broad output range from 0.5 kvar to 33.0 kvar. The voltage range covers 230 V AC to 525 V AC.

Applications

- Power Factor Correction (PFC)
- Automatic capacitor banks
- Fixed PFC applications, e.g. motor compensation
- AC power electronics
- Tuned and detuned PFC systems

Features

- Compact design in cylindrical aluminum can with stud
- MKD technology with stacked windings

- Output range 0.5 ... 33 kvar
- Voltage range 230 ... 525 V AC

Safety

- Self-healing technology
- Overpressure disconnecter
- Isolated terminal (IP20) for B32304 series

Electrical

- Up to 33 kvar per capacitor for three-phase applications
- Long life expectancy up to 150 000 hours (at temperature class -40/C)
- High inrush current withstand capability (up to $200 \cdot I_R$)

Mechanical and maintenance

- Reduced mounting costs, easy installation and connection
- Low weight and compact volume
- Maintenance-free



DeltaCap MKD Capacitors



Technical data and limited values		
Standards IEC 60831-1+2, IS: 13340/41		
Overvoltage	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)
Overcurrent	I_{max}	up to $1.3 \cdot I_R$ (up to $1.5 \cdot I_R$ including combined effects of harmonics, overvoltages and capacitance)
Inrush current	I_s	up to $200 \cdot I_R$
Losses: - Dielectric - Total*		< 0.2 W/kvar < 0.45 W/kvar
Rated frequency	f	50/60 Hz
Capacitance tolerance		-5% / + 10%
Test voltage, terminal / terminal	V_{TT}	$2.15 \cdot V_R$, AC, 2 s
Test voltage, terminal / case	V_{TC}	3000 V AC, 10 s
Mean life expectancy	$t_{LD(Co)}$	up to 115 000 h at temperature class -40/D up to 150 000 h at temperature class -40/C
Ambient temperature		-40/D; max. temperature 55 °C; max. mean 24 h = 45 °C; max. mean 1 year = 35 °C; lowest temperature = -40 °C -40/C; max. temperature 50 °C; max. mean 24 h = 40 °C; max. mean 1 year = 30 °C; lowest temperature = -40 °C
Cooling		natural or forced
Humidity	H_{rel}	max. 95%
Altitude		max. 4000 m above sea level
Mounting position		upright
Mounting and grounding		threaded M12 (10 Nm) for case size diameter ≥ 50 mm
Safety		self-healing technology, overpressure disconnecter, max. allowed fault current 10 000 A in accordance with UL 810 standard
Discharge resistor		discharge module included in delivery, integrated in terminal for B32304 series
Case		extruded aluminum can
Enclosure		IP00 for B32300 and B32303 IP20 for B32304
Dielectric		polypropylene film
Impregnation		biodegradable soft resin (non PCB)
Terminals		screw terminal for B32304 series, max. 25 mm ² cable cross-section; fast-on terminals for B32300 and B32303 series
Number of switching operations		max. 5000 switchings per year according to IEC 60831-1+2

*without discharge resistors

DeltaCap MKD Capacitors



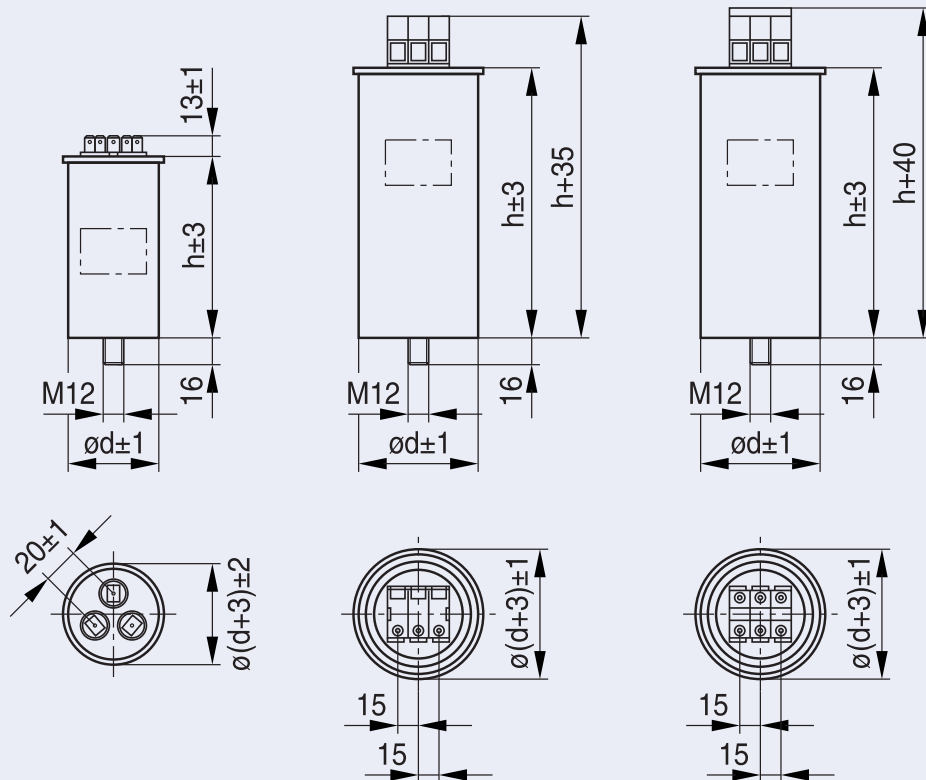
Terminal designs / dimensional drawings



B32300 / B32303 series

B32304****A*** series

B32304****B*** series



KLK1857-M

DeltaCap MKD Capacitors



Three-phase capacitors									
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, delta connection									
MKD230-D-0.5	0.5	1.3	0.6	1.6	3 • 10	50 x 148	0.4	B32303A2002A530	50
MKD230-D-0.7	0.7	1.8	0.8	2.2	3 • 14	50 x 148	0.4	B32303A2002A730	50
MKD230-D-1.0	1.0	2.5	1.2	3.0	3 • 20	50 x 148	0.4	B32303A2012A030	50
MKD230-D-1.5	1.5	3.8	1.8	4.6	3 • 30	63.5 x 148	0.6	B32303A2012A530	12
MKD230-D-2.0	2.0	5.0	2.4	6.0	3 • 40	63.5 x 148	0.6	B32303A2022A030	12
MKD230-D-2.5	2.5	6.3	3.0	7.6	3 • 50	63.5 x 148	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 275	1.7	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
Rated voltage 400 V AC, 50/60 Hz, delta connection									
MKD400-D-1.0	1.0	1.4	1.2	1.7	3 • 6.6	50 x 148	0.4	B32303A4012A000	50
MKD400-D-1.5	1.5	2.2	1.8	2.6	3 • 10	50 x 148	0.4	B32303A4012A500	50
MKD400-D-2.0	2.0	2.9	2.4	3.5	3 • 13	50 x 148	0.4	B32303A4022A000	50
MKD400-D-2.5	2.5	3.6	3.0	4.3	3 • 17	50 x 148	0.4	B32303A4022A500	50
MKD400-D-5.0	5.0	7.2	6.0	8.6	3 • 33	63.5 x 148	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	0.8	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 230	1.3	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

*) 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.

DeltaCap MKD Capacitors



Three-phase capacitors									
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 415 V AC, 50/60 Hz, delta connection									
MKD415-D-1.0	1.0	1.4	1.2	1.7	3 • 6.2	50 x 148	0.4	B32303A4012A010	50
MKD415-D-1.5	1.5	2.1	1.8	2.5	3 • 9.2	50 x 148	0.4	B32303A4012A510	50
MKD415-D-2.0	2.0	2.8	2.4	3.4	3 • 12	50 x 148	0.4	B32303A4022A010	50
MKD415-D-2.5	2.5	3.5	3.0	4.2	3 • 15	50 x 148	0.4	B32303A4022A510	50
MKD415-D-5.0	5.0	7.0	6.0	8.4	3 • 31	63.5 x 148	0.7	B32303A4052A010	12
MKD415-D-6.3	6.3	8.8	7.6	10.6	3 • 39	75 x 163	0.9	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 230	1.3	B32304A4102#010*	6
MKD415-D-12.5	12.5	17.4	15.0	20.9	3 • 77	75 x 275	1.5	B32304A4122#510*	6
MKD415-D-15.0	15.0	20.9	18.0	25.1	3 • 93	75 x 275	1.5	B32304A4152#010*	6
MKD415-D-20.0	20.0	27.8	24.0	33.4	3 • 123	85 x 275	1.7	B32304A4202#010*	4
MKD415-D-25.0	25.0	34.8	30.0	41.8	3 • 154	85 x 350	2.2	B32304A4252#010*	4
MKD415-D-30.0	30.0	42.0	--	--	3 • 185	96 x 350	2.7	B32304A4302#010*	4
Rated voltage 440 V AC, 50/60 Hz, delta connection									
MKD440-D-0.9	0.9	1.2	1.1	1.4	3 • 5.2	50 x 148	0.4	B32303A4011A040	50
MKD440-D-1.0	1.0	1.3	1.2	1.6	3 • 5.5	50 x 148	0.4	B32303A4012A040	50
MKD440-D-1.2	1.2	1.6	1.4	1.9	3 • 6.6	50 x 148	0.4	B32303A4011A540	50
MKD440-D-1.5	1.5	2.0	1.8	2.4	3 • 8.8	50 x 148	0.4	B32303A4012A540	50
MKD440-D-2.0	2.0	2.6	2.4	3.1	3 • 11	50 x 148	0.4	B32303A4020A540	50
MKD440-D-2.1	2.1	2.8	2.5	3.4	3 • 12	50 x 148	0.4	B32303A4021A540	50
MKD440-D-2.5	2.5	3.3	3.0	4.0	3 • 14	50 x 148	0.4	B32303A4022A540	50
MKD440-D-4.2	4.2	5.5	5.0	6.6	3 • 23	63.5 x 148	0.6	B32303A4051A040	12
MKD440-D-5.0	5.0	6.6	6.0	7.9	3 • 27	63.5 x 148	0.6	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 163	0.8	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 200	1.1	B32304A4102#040*	6
MKD440-D-10.4	10.4	13.6	12.5	16.3	3 • 57	75 x 200	1.1	B32304A4121#540*	6
MKD440-D-12.5	12.5	16.4	15.0	19.7	3 • 69	75 x 230	1.3	B32304A4151#040*	6
MKD440-D-15.0	15.0	19.7	18.0	23.6	3 • 82	75 x 275	1.4	B32304A4152#040*	6
MKD440-D-16.7	16.7	21.9	20.0	26.3	3 • 92	75 x 275	1.4	B32304A4201#040*	6
MKD440-D-20.8	20.8	27.3	25.0	32.8	3 • 114	85 x 275	1.7	B32304A4251#040*	4
MKD440-D-25.0	25.0	32.8	30.0	39.4	3 • 137	85 x 350	2.2	B32304A4252#040*	4
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	39.4	36.0	47.3	3 • 165	96 x 350	2.4	B32304A4302B040	4
MKD440-D-33.7	33.7	44.3	--	--	3 • 185	96 x 350	2.7	B32304A4332#040*	4

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

DeltaCap MKD Capacitors



Three-phase capacitors									
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 480 V AC, 50/60 Hz, delta connection									
MKD480-D-1.5	1.5	1.8	1.8	2.2	3 • 6.9	50 x 148	0.4	B32303A4012A580	50
MKD480-D-2.0	2.0	2.4	2.4	2.9	3 • 9.2	50 x 148	0.4	B32303A4022A080	50
MKD480-D-2.5	2.5	3.0	3.0	3.6	3 • 12	50 x 148	0.4	B32303A4022A580	50
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 230	1.3	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	75 x 275	1.4	B32304A4152#080*	6
MKD480-D-16.7	16.7	20.1	20.0	24.1	3 • 77	85 x 275	1.8	B32304A4162#780*	4
MKD480-D-20.8	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
Rated voltage 525 V AC, 50/60 Hz, delta connection									
MKD525-D-1.0	1.0	1.1	1.2	1.3	3 • 3.9	50 x 148	0.4	B32303A5012A020	50
MKD525-D-1.5	1.5	1.6	1.8	1.9	3 • 5.8	50 x 148	0.4	B32303A5012A520	50
MKD525-D-2.0	2.0	2.2	2.4	2.6	3 • 7.7	50 x 148	0.4	B32303A5022A020	50
MKD525-D-2.5	2.5	2.7	3.0	3.2	3 • 9.6	50 x 148	0.4	B32303A5022A520	50
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 163	0.8	B32304A5071#520*	6
MKD525-D-8.3	8.3	9.1	10.0	10.9	3 • 32	75 x 200	1.1	B32304A5101#020*	6
MKD525-D-10.4	10.4	11.4	12.5	13.7	3 • 40	75 x 230	1.3	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	1.9	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.

DeltaCap MKD Capacitors



Single-phase capacitors									
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									
MKD230-I-0.8	0.8	3.5	1.0	4.2	48	63.5 x 62.5	0.3	B32300A2002A830	12
MKD230-I-1.7	1.7	7.4	2.0	8.9	102	63.5 x 100	0.4	B32300A2012A730	12
MKD230-I-2.5	2.5	10.9	3.0	13.1	151	63.5 x 125	0.5	B32300A2022A530	12
Rated voltage 400 V AC, 50/60 Hz									
MKD400-I-0.8	0.8	2.0	1.0	2.4	16	50 x 62.5	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 75	0.3	B32300A4022A500	12
MKD400-I-3.3	3.3	8.3	4.0	10.0	66	63.5 x 100	0.4	B32300A4032A300	12
MKD400-I-4.2	4.2	10.5	5.0	12.6	84	63.5 x 100	0.4	B32300A4051A000	12
MKD400-I-5.0	5.0	12.5	6.0	15.0	100	63.5 x 125	0.5	B32300A4052A000	12
Rated voltage 415 V AC, 50/60 Hz									
MKD415-I-0.8	0.8	1.9	1.0	2.3	15	50 x 62.5	0.2	B32300A4002A810	50
MKD415-I-1.7	1.7	4.0	2.0	4.8	31	63.5 x 75	0.3	B32300A4012A710	12
MKD415-I-2.5	2.5	6.0	3.0	7.2	46	63.5 x 90	0.4	B32300A4022A510	12
MKD415-I-3.3	3.3	8.0	4.0	9.6	61	63.5 x 100	0.5	B32300A4032A310	12
MKD415-I-5.0	5.0	12.0	6.0	14.4	92	63.5 x 125	0.6	B32300A4052A010	12
Rated voltage 440 V AC, 50/60 Hz									
MKD440-I-0.7	0.7	1.6	0.8	1.9	12	50 x 62.5	0.2	B32300A4001A840	50
MKD440-I-1.4	1.4	3.2	1.7	3.8	23	63.5 x 62.5	0.3	B32300A4011A740	12
MKD440-I-2.1	2.1	4.8	2.5	5.8	35	63.5 x 75	0.3	B32300A4021A540	12
MKD440-I-2.8	2.8	6.4	3.4	7.7	46	63.5 x 90	0.4	B32300A4031A340	12
MKD440-I-3.3	3.3	7.5	4.0	9.0	54	63.5 x 90	0.4	B32300A4032A340	12
MKD440-I-4.2	4.2	9.5	5.0	11.4	69	63.5 x 125	0.5	B32300A4051A040	12
MKD440-I-5.0	5.0	11.4	6.0	13.7	82	63.5 x 125	0.5	B32300A4052A040	12
Rated voltage 480 V AC, 50/60 Hz									
MKD480-I-0.7	0.7	1.5	0.8	1.8	10	50 x 62.5	0.2	B32300A4001A880	50
MKD480-I-1.4	1.4	2.9	1.7	3.5	19	63.5 x 62.5	0.3	B32300A4011A780	12
MKD480-I-2.1	2.1	4.4	2.5	5.3	29	63.5 x 75	0.3	B32300A4021A580	12
MKD480-I-2.8	2.8	5.8	3.4	7.0	39	63.5 x 90	0.4	B32300A4031A380	12
Rated voltage 525 V AC, 50/60 Hz									
MKD525-I-1.4	1.4	2.7	1.7	3.2	16	63.5 x 62.5	0.3	B32300A5011A730	12
MKD525-I-2.8	2.8	5.3	3.4	6.4	32	63.5 x 90	0.4	B32300A5031A320	12
MKD525-I-3.3	3.3	6.3	4.0	7.6	38	63.5 x 100	0.4	B32300A5032A320	12
MKD525-I-4.2	4.2	8.0	5.0	9.6	49	63.5 x 125	0.5	B32300A5051A020	12

Important information: 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. We expressly point out that these statements cannot be regarded as binding statements about the suitability of our products for a particular customer application. It is incumbent on the customer to check and decide whether a product is suitable for use in a particular application. This publication is only a brief product survey which may be changed from time to time. Our products are described in detail in our data sheets. The Important notes (www.epcos.com/ImportantNotes) and the product-specific Cautions and warnings must be observed. All relevant information is available through our sales offices.