

PhaseCap Premium PFC Capacitors

Gas-impregnated ■ Dry type ■ Concentric winding ■ Wave-cut ■ Triple safety system

General

PhaseCap capacitors in cylindrical aluminum cases have been designed for power factor correction in low-voltage plants. Loads like motors and transformers consume active power as well as reactive power. Generators, supply cables and other electrical distribution equipment, in turn, should be relieved of reactive power. The MKK (metalized plastic compact)

AC series (> 5.0 to 33.8 kvar) is intended to increase packing density per bank and cut component costs. Improved thermal response and simplified installation are advantages of the cylindrical aluminum case.



Applications

- Automatic PFC equipment, capacitor banks
- Individual fixed PFC (e.g. motors, transformers, lighting)
- Group fixed PFC
- Tuned and detuned capacitor banks
- Harmonic trap applications (e.g. UPS, frequency drives and converters)

Features

Electrical

- Long useful life
- High pulse current withstand capability ($200 \times I_R$)
- Corona-free

Mechanical and maintenance

- Reduced mounting costs
- Maintenance-free

Safety

- Dry design
- Self-healing
- Overpressure disconnecter
- Non-flammable
- Touch-proof terminals
- Longterm approved

Environment

- Easy disposal
- Non-polluting
- PCB-free

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The compact PhaseCap capacitor is a self-healing, metalized polypropylene film capacitor. The current-carrying metal layer (electrode) is vapor-deposited onto one side of the film.

Compact design – low height, weight and volume

Three electrically separated capacitor elements are wound concentrically in a single operation onto an insulated metal core tube, which guarantees excellent winding precision. The electrodes are connected by metal spraying the face ends of the winding elements. The capacitor elements are star, delta or series connected.

The compact MKK winding elements are housed in a cylindrical aluminum case and hermetically sealed by a press-rolled metal lid.

Triple safety system

- Dry technology: instead of a liquid impregnating agent, the capacitor is filled with gas. So there is no risk of fire caused by spurting or leaking oil. Dry design is a must for ecologically sensitive applications and insurance follow-up.
- Self-healing: the capacitor repairs itself after overload.
- Overpressure disconnecter: this prevents the capacitor from bursting at the end of its useful life or through electrical or thermal overload.

Innovative and reliable SIGUT connection technology

SIGUT terminals ensure reliable and straightforward connection, even in a parallel capacitor circuit, with benefits like

- simplified parallel connection of input ends in series,
- protection against electric shock hazard (IP20/IP54 to VDE 0106 part 100),
- additional connection of discharge resistors for extra reliability and safety,
- clamping device to prevent loosening of screws,
- cable cross-sections up to 16 mm².

Extended useful life of 115 000 operating hours

After a long drying phase in a high vacuum to eliminate moisture from the active element, the capacitor is impregnated. The case is filled with inert gas and sealed. Then routine tests are performed for gas leakage.

This production process helps to avoid oxidation and partial discharges (corona effect), promoting capacitance stability over an extremely long period, an essential in filter circuit applications.

High inrush current withstand capability is crucial

Capacitors used for power factor correction undergo a lot of switching operations. The high inrush currents that go along with this must be handled without degrading useful life. The pulse strength of this technology comes in particular from the enlarged, sensitive contact area (improved metal spraying). The breakthrough came with a Siemens patent called the wave cut, plus heavy-edge film design. PhaseCap capacitors can easily handle inrush currents of up to 200 times rated current.

And where it is crucial

- Parallel connection of capacitors
- Non-detuned capacitors
- Capacitor banks using standard contactors
- Restoration after voltage interruptions and brownouts

Further publications see page 91.

PhaseCap Premium PFC Capacitors

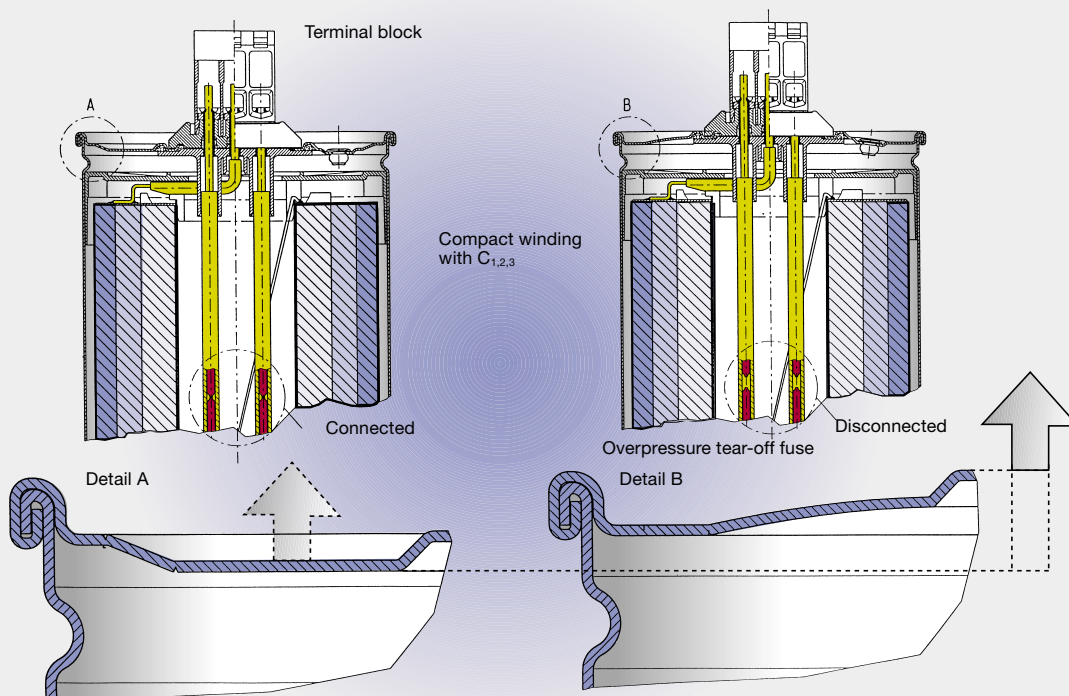
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Technical Data

Standards IEC 831-1+2, EN 60831-1+2, VDE 560-46+47

Overvoltage	U_{max}	$U_R + 10\%$ (up to 8 h daily) / $U_R + 15\%$ (up to 30 min daily) / $U_R + 30\%$ (up to 1 min)
Overcurrent	I_{max}	$1.3 \cdot I_R$ (in certain cases higher)
Inrush current	I_S	$200 \cdot I_R$
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	U_{TT}	$2.15 \cdot U_{R1}$, AC, 10 s
Test voltage, terminal/case	U_{TC}	up to $U_R \leq 660$ V: 3000 V _{AC} , 10 s; above $U_R = 660$ V: 6000 V _{AC} , 10 s
Useful life	$t_{LD(Co)}$	115 000 h
Ambient temperature		-40/D, max. 55 °C, with forced cooling higher ambient temperature possible; in some cases different temperature category for 60 Hz (see table)
Cooling		natural or forced
Humidity	H_{rel}	max. 95%
Altitude		4 000 m above sea level
Mounting position		random
Mounting and grounding		threaded M12 stud on bottom of case
Safety		dry technology, overpressure disconnecter, self-healing
Discharge resistors		discharge module included
Case		extruded aluminum
Enclosure		IP20, indoor mounting (optionally with cap for IP54)
Dielectric		polypropylene film
Impregnation		non-PCB, inert gas
Terminals		dual, three-way SIGUT terminal strip with electric shock protection (VDE 0106 part 100), max. 16 mm ² cable cross-section
Certification		cUL file # E96954
Number of switching operations		5 000 switchings per year according IEC831

Overpressure disconnecter (tear-off fuse)



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Three-Phase Capacitors

Rated voltage 230 V_{AC}, 50/60 Hz, delta connection

Type	50 Hz		60 Hz		C _N μF	d x h mm	Weight kg	Ordering code	Packing unit ²⁾
	Output kvar	I _R A	Output kvar	I _R A					
MKK230-D-05-01	5.0	13.1	6.3	15.7	3 * 104	121 x 164	1.3	B25667A2317A375	6
MKK230-D-07.5-01	7.5	18.8	9.0	22.6	3 * 150	121 x 164	1.3	B25667A2457A375	6
MKK230-D-10-01	10.4	26.1	12.5	31.4	3 * 209	121 x 164	1.5	B25667A2627A375	6
MKK230-D-12.5-01	12.5	31.4	15.0 ¹⁾	38.2 ¹⁾	3 * 250	121 x 200	1.7	B25667A2757A375	4

Rated voltage 400 V_{AC}, 50/60 Hz, delta connection

MKK400-D-05-01	5.0	7.2	6.0	8.7	3 * 32	121 x 164	1.2	B25667A5996A375	6
MKK400-D-06.3-01	6.3	9.0	7.5	10.8	3 * 40	121 x 164	1.4	B25667A5127A375	6
MKK400-D-07.5-01	7.5	10.8	9.0	13.0	3 * 50	121 x 164	1.2	B25667A3147A375	6
MKK400-D-10-01	10.4	15.0	12.5	18.0	3 * 69	121 x 164	1.3	B25667A3207A375	6
MKK400-D-12.5-01	12.5	18.0	15.0	21.7	3 * 83	121 x 164	1.3	B25667A3247A375	6
MKK400-D-15-01	15.0	21.7	18.0	26.0	3 * 100	121 x 164	1.5	B25667A3297A375	6
MKK400-D-20-01	20.8	30.0	25.0	36.0	3 * 138	142 x 200	2.0	B25667A3417A375	4
MKK400-D-25-01	25.0	36.0	30.0	39.4 ¹⁾	3 * 166	142 x 200	2.2	B25667A3497A375	4

Rated voltage 415 V_{AC}, 50/60 Hz, delta connection

MKK415-D-05-01	5.0	7.0	6.0	8.4	3 * 32	121 x 164	1.2	B25667A5966A375	6
MKK415-D-06.3-01	6.3	8.7	7.5	10.4	3 * 40	121 x 164	1.4	B25667A5127A375	6
MKK415-D-10-01	10.4	14.5	12.5	17.4	3 * 62	121 x 164	1.4	B25667A4187A375	6
MKK415-D-12.5-01	12.5	17.4	15.0	20.9	3 * 77	121 x 164	1.5	B25667A4237A365	6
MKK415-D-15-01	15.0	20.9	18.0	25.1	3 * 93	121 x 164	1.5	B25667A4277A375	6
MKK415-D-16.7-01	16.7	23.3	20.0	27.9	3 * 103	121 x 164	1.6	B25667A4307A365	6
MKK415-D-20-01	20.8	29.0	25.0 ¹⁾	34.8 ¹⁾	3 * 128	121 x 200	1.7	B25667A4387A375	4
MKK415-D-25-01	25.0	34.8	30.0 ¹⁾	41.8 ¹⁾	3 * 154	142 x 200	2.1	B25667A4467A375	4

Rated voltage 440 V_{AC}, 50/60 Hz, delta connection

MKK440-D-05-01	5.0	6.6	6.0	7.9	3 * 27	121 x 164	1.2	B25667A4826A375	6
MKK440-D-07.5-01	7.5	9.9	9.0	11.8	3 * 40	121 x 164	1.4	B25667A5127A375	6
MKK440-D-10-01	10.4	13.7	12.5	16.4	3 * 57	121 x 164	1.3	B25667A4177A375	6
MKK440-D-11.2-01	11.2	14.7	13.4	17.7	3 * 62	121 x 164	1.4	B25667A4187A375	6
MKK440-D-12.5-01	12.5	16.4	15.0	19.7	3 * 69	121 x 164	1.4	B25667A4207A375	6
MKK440-D-14.2-01	14.2	18.7	17.0	22.4	3 * 77	121 x 164	1.5	B25667A4237A365	6
MKK440-D-15-01	15.0	19.7	18.0	23.6	3 * 82	121 x 164	1.6	B25667A4247A375	6
MKK440-D-18.8-01	18.8	24.7	22.6	29.6	3 * 103	121 x 164	1.6	B25667A4307A365	6
MKK440-D-20-01	20.8	27.3	25.0	32.8	3 * 114	142 x 200	2.1	B25667A4347A375	4
MKK440-D-25-01	25.0	32.8	30.0 ¹⁾	39.4 ¹⁾	3 * 137	142 x 200	2.3	B25667A4417A375	4
MKK440-D-28-01	28.2	37.0	33.8 ¹⁾	44.4 ¹⁾	3 * 154	142 x 200	2.5	B25667A4467A365	4
MKK440-D-30-01	30.0	39.4	–	–	3 * 165	142 x 200	2.5	B25667S4497J375	4

Customized products available upon request. Minimum order quantity 200 pieces.

1) Temperature class deviation –40/B max. 45 °C

2) Packing units for capacitors equal minimum order quantity. Orders will be rounded up to packing unit or multiple of it.

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Three-Phase Capacitors

Rated voltage 480 V_{AC}, 50/60 Hz, delta connection

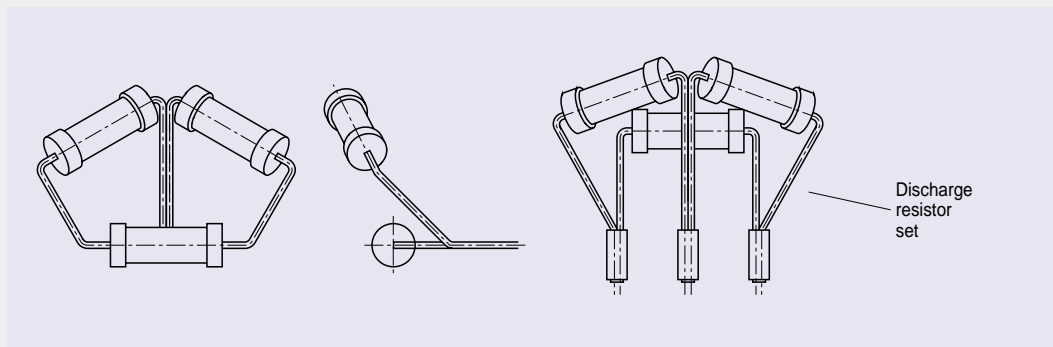
Type	50 Hz		60 Hz		C _N μF	d x h mm	Weight kg	Ordering code	Packing unit ²⁾
	Output kvar	I _R A	Output kvar	I _R A					
MKK480-D-05-01	5.0	6.0	6.0	7.2	3 * 24	121 x 164	1.1	B25667A5726A375	6
MKK480-D-06.5-01	6.5	7.5	7.8	9.0	3 * 32	121 x 164	1.2	B25667A5966A375	6
MKK480-D-08.3-01	8.3	10.0	10.0	12.0	3 * 40	121 x 164	1.4	B25667A5127A375	6
MKK480-D-10-01	10.4	12.5	12.5	15.0	3 * 48	121 x 164	1.3	B25667A5147A375	6
MKK480-D-12.5-01	12.5	15.1	15.0	18.1	3 * 57	121 x 164	1.5	B25667A5177A375	6
MKK480-D-15-01	15	18.1	18.0	21.7	3 * 69	121 x 200	1.7	B25667A5197A375	4
MKK480-D-16.7-01	16.7	20.0	20.1	24.0	3 * 77	121 x 200	1.8	B25667A4237A355	4
MKK480-D-20-01	20.8	25.0	25.0	30.1	3 * 96	142 x 200	2.2	B25667A5287A375	4
MKK480-D-25-01	25.0	30.0	30.0 ¹⁾	36.1 ¹⁾	3 * 115	142 x 200	2.4	B25667A5347J375	4
MKK480-D-31-01	31.0	37.0	–	–	3 * 143	142 x 200	2.4	B25667S4427J375	4

Rated voltage 525 V_{AC}, 50/60 Hz, delta connection

MKK525-D-06.3-01	6.3	6.9	7.5	8.3	3 * 24	121 x 164	1.1	B25667A5726A375	6
MKK525-D-08.3-01	8.3	9.2	10.0	11.0	3 * 32	121 x 164	1.2	B25667A5966A375	6
MKK525-D-10-01	10.4	11.5	12.5	13.7	3 * 40	121 x 164	1.4	B25667A5127A375	6
MKK525-D-12.5-01	12.5	13.8	15.0	16.5	3 * 48	121 x 164	1.3	B25667A5147A375	6
MKK525-D-15-01	15.0	16.5	18.0	19.8	3 * 57	121 x 164	1.5	B25667A5177A375	6
MKK525-D-16.7-01	16.7	18.4	20.0	22.1	3 * 69	121 x 200	1.7	B25667A5197A375	4
MKK525-D-20-01	20.8	22.9	25.0	27.5	3 * 80	142 x 200	2.0	B25667A5247A375	4
MKK525-D-25-01	25.0	27.5	30.0 ¹⁾	33.0 ¹⁾	3 * 96	142 x 200	2.0	B25667A5287A375	4
MKK525-D-30-01	30	33	–	–	3 * 115	142 x 200	2.4	B25667A5347J375	4

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Discharge resistors



1) Temperature class deviation –40/B max. 45 °C

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Single-Phase Capacitors

Rated voltage 230 V_{AC}, 50/60 Hz

Type	50 Hz		60 Hz		C _N μF	d x h mm	Weight kg	Ordering code	Packing unit ¹⁾
	Output kvar	I _R A	Output kvar	I _R A					
MKK230-I-05-01	5.2	22.6	6.2	27.0	313	121 x 164	1.1	B25667A2317A175	6
MKK230-I-08.3-01	8.3	36.2	10.0	44.0	502	121 x 164	1.3	B25667A2507A175	6

Rated voltage 400 V_{AC}, 50/60 Hz

MKK400-I-7.5-01	7.5	18.8	9.0	22.5	144	121 x 164	1.5	B25667A5147A175	6
MKK400-I-8.7-01	8.7	21.7	10.4	26.0	173	121 x 200	1.7	B25667A5177A175	4
MKK400-I-12.5-01	12.5	31.2	15.0	37.5	249	121 x 164	1.3	B25667A3247A175	6

Rated voltage 440 V_{AC}, 50/60 Hz

MKK440-I-8.3-01	8.3	18.9	10.0	22.7	144	121 x 164	1.5	B25667A5147A175	6
MKK440-I-10.5-01	10.5	23.9	12.6	28.6	173	121 x 200	1.7	B25667A5177A175	4

Rated voltage 525 V_{AC}, 50/60 Hz

MKK525-I-12.5-01	12.5	23.8	15.0	28.6	144	121 x 164	1.5	B25667A5147A175	6
MKK525-I-15-01	15	28.6	18.0	34.3	173	121 x 200	1.7	B25667A5177A175	4

Plastic protective case for capacitor

Capacitor Ø mm	For cable gland	Cable diameter outside mm	Dimensions mm				Ordering code
			l ₁	l ₂	l ₃	h	
121 x 164	IP54	9–13	134	110	177	243	B44066X9122A000
121 x 200 / 142 x 200	IP54	10–18	154.5	130.5	186	280	B44066X9142A000

Plastic protective terminal cover

Capacitor Ø mm	For cable gland	Cable diameter outside mm	Dimensions mm		Ordering code
			Ø d ₁	Ø d ₂	
121 x 164	PG 13,5	9–13	116	125	B44066K1211A000
121 x 200	PG 16	10–14	116	125	B44066K1212A000
142 x 200	PG 21	14–18	137	145	B44066K1421A000

Customized products available upon request. Minimum order quantity 200 pieces.

Protective terminal cover



Protective case for capacitor



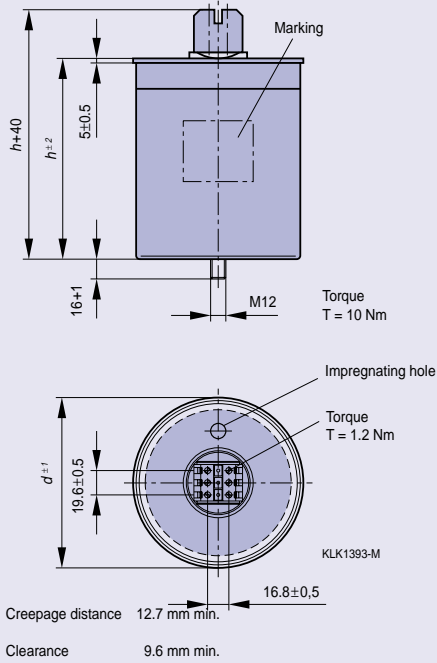
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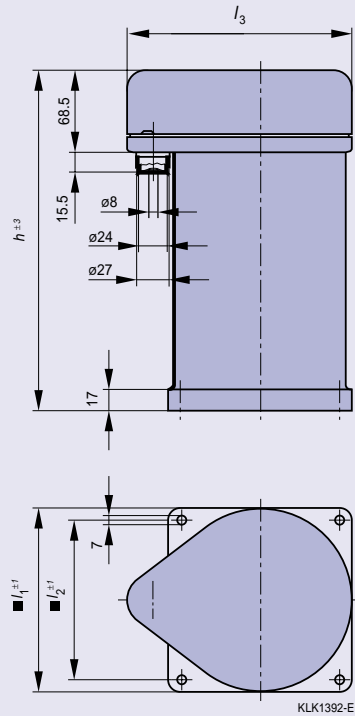
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Dimensional Drawings

Capacitor



Protective case for capacitor

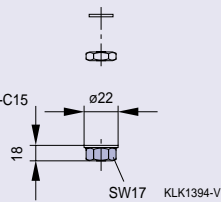


Mounting

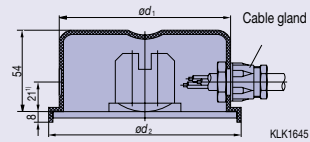
Toothed washer
J 12.5 DIN 6797

Hex nut
BM 12 DIN 439

or
Nut C61010-A415-C15



Protective cover for terminal



1) Perforation for second cable gland