



# PoleCap Capacitors

## for Outdoor Low-Voltage Applications

The PoleCap series represents a new approach in terms of outdoor, pole-mounted and fixed PFC. It is an add-on-design to the well-established PhaseCap (MKK) and PhiCap (MKP) capacitors approved for long term-operation with special properties for outdoor-usage.

### Applications

- Pole mounting, i.e. outdoor installation, connected to low-voltage overhead lines and mounted onto the poles of the overhead line
- Fixed PFC of an individual load, indoor as well as outdoor, specially in applications with high dust or moisture concentration
- Automatic PFC systems

### Product features

- Factory pre-assembled cable and discharge resistors reduce labor costs and increase reliability

- Excellent heat dissipation due to single-housing concept
- Grounding provided by means of a M12 mounting stud
- Compact design and low dimensions/weight
- Easy installation and assembly
- Provided with fault identification for easy checking after installation (visible from the ground)

### Electrical features

- Long service life
- Low dissipation factor
- High insulation resistance

### Safety features

- All life parts are fully covered during operation
- Self-healing
- Dry technology
- Three-phase overpressure disconnecter
- Discharge resistors
- High-voltage impulse insulation

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## Ambient

- High insulation strength for outdoor applications (to IEC 60831, 15 kV)
- Terminal cover, cable gland and connection cable made of material resistant to weather, UV radiation and aging
- Cable UV-resistant and flame retardant
- Housing of pure aluminum (corrosion optimized)
- Double housing of terminals for protection against hazardous parts, ingress of solid foreign bodies, dust and harmful effects of water

## Tests

The PoleCap passed all tests performed by VDE and ERDA (Electrical Research & Development Association), based on the international IEC 60831 standards for PFC-capacitors. In addition, the PoleCap has demonstrated excellent performance in outdoor temperature tests, showing that these capacitors operate at a lower temperature than those with an additional steel enclosure. The PoleCap presents better cooling due to the single-housing concept, resulting in a longer service life cycle and higher reliability.

Apart from the possibility of pole mounting, thanks to its high impermeability the PoleCap is the ideal device in dusty or moistly surroundings.

## Visible fault control

Capacitors mounted on masts must permit operational monitoring from the ground.

The PoleCap-series are equipped with a red strip that becomes visible as soon as the overpressure disconnecter has triggered in response to a malfunction.

## Red strip visible after triggering of overpressure disconnecter

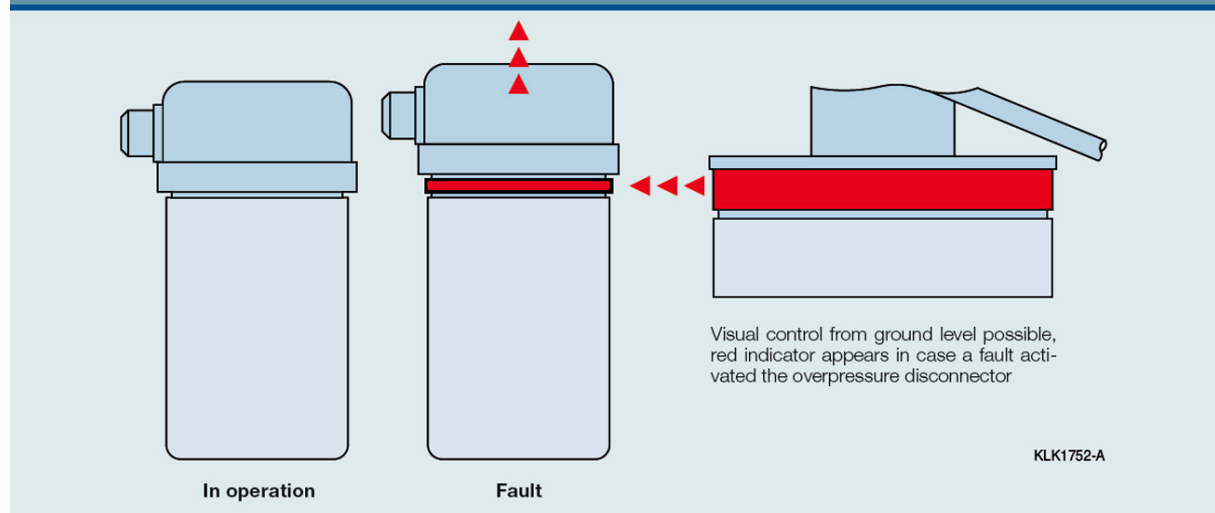
What makes the PoleCap unique is its thermal response. The conventional solution for capacitors designed for outdoor use or mast mounting is to fit an additional protective casing. Capacitor losses lead to self-heating that heats up the space between inner can and outer casing. This accumulated heat then surrounds the capacitor, which is heating up already, like an electric blanket. Insufficient cooling then makes premature aging of the capacitor inevitable.

The PoleCap, on the other hand, designed to prevent this extra heat reservoir from forming. Tests have shown that PoleCaps with their single-can design operate at a significantly lower temperature than conventional capacitors with additional steel casings. The PoleCap uses convection alone for inner cooling. This property gives it a longer operating life and higher reliability.

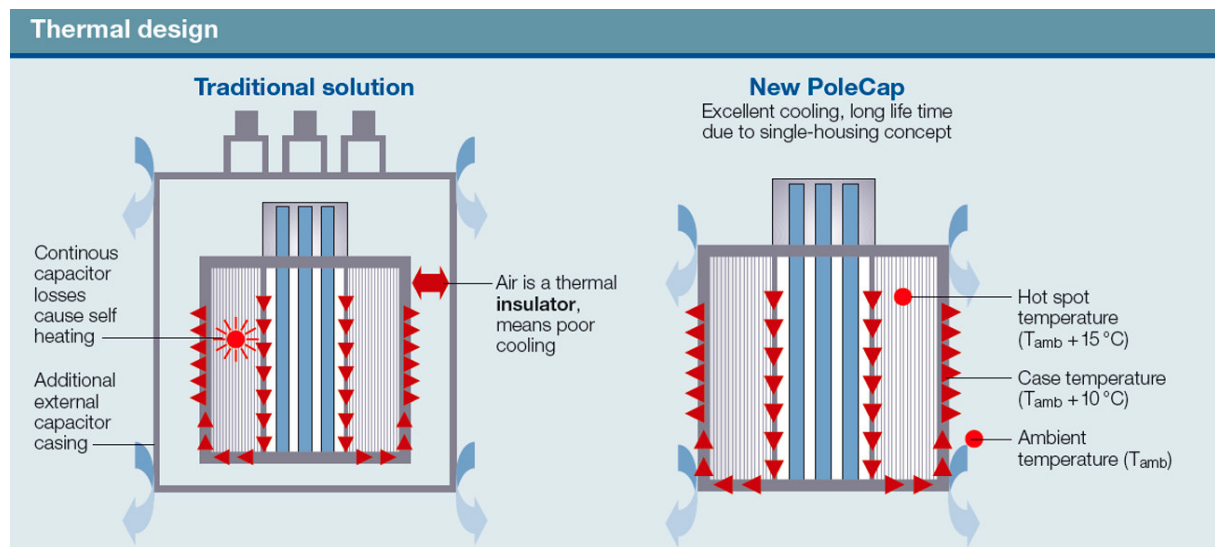
In order to accurately compare the thermal behavior of two capacitors with and without additional protective casings, tests were carried out under very harsh climatic conditions. A voltage of 440 V was applied to both capacitors, which were exposed to direct sunlight. Evaluation of the temperatures measured with thermistors shows that the can and core temperatures of the capacitor with the extra casing are significantly higher than for the PoleCap.

The PoleCap without extra casing attains a hot-spot temperature 7 °C lower than in conventional solutions. This is a significant advantage, as experience shows that a temperature reduction of this size roughly doubles the operating life of the capacitor.

## Visual fault indicator



# PoleCap Capacitors



**Technical data and limit values**

Standards IEC 60831-1+2, EN 60831-1+2, UL 810 5th edition

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	$I_{max}$	$1.3 \times I_R$ (including combined effects of harmonics, overvoltages and capacitance tolerance)
Inrush current	$I_S$	Up to $200 \times I_R$
Losses: - Dielectric - Total <sup>1)</sup>		< 0.2W/kvar < 0.45W/kvar
Rated frequency	f	50/60 Hz
Capacitance tolerance		+10/-5%
Test voltage, terminal / terminal	$V_{TT}$	$2.15 \times V_R$ , AC, 10 s
Test voltage, terminal / case	$V_{TC}$	Up to $V_R \leq 660\text{ V}$ : 3000 VAC, 10 s; above $V_R = 660\text{ V}$ : 6000 VAC, 10 s
Mean life expectancy	$t_{LD(Co)}$	Up to 100000 h
Ambient temperature		-40/D; max. temp. 55 °C; max. mean 24 h = 45 °C; max. mean 1 year = 35 °C; lowest temperature = -40 °C
Cooling		Natural
Altitude		Max. 4000 m above sea level
Mounting position		Random
Mounting and grounding		Threaded M12 stud on bottom of case
Safety		Dry technology, overpressure disconnecter, self-healing, maximum allowed fault current 10000 A in accordance with UL 810-standard
Discharge resistors		Discharge module included, < 50 V in 60 s <sup>2)</sup>
Case		Extruded aluminum
Enclosure		IP54
Dielectric		Polypropylene film
Impregnation		Inert gas
Terminals		Connection cable length 2 m (UV resistant and water proof)
Number of switching operations		Max. 5000 switching operations per year according to IEC 60831
Lightning impulse voltage test (terminals/container)		15 kVp

1) without discharge resistor and cable

2) Types: B25671A3497A375, B25671A5287A375, B25671A5347A375 < 50 V in 90 s

# PoleCap Capacitors

Three-phase capacitors											
Type	50 Hz		60 Hz		C <sub>R</sub> μF	d x h mm	Weight kg	Ordering code	Qty. per box <sup>1)</sup>	Qty. per pallet	Cable cross section mm <sup>2</sup>
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A							
<b>Rated voltage 400 V AC, 50/60 Hz, delta connection</b>											
MKP400-D-0.5-P	0.50	1.0	0.60	1.0	3 x 3.5	82 x 210	0.4	B25671A4002A500	6	108	1
MKP400-D-1.0-P	1.00	1.0	1.20	2.0	3 x 6.5	82 x 210	0.5	B25671A4012A000	6	108	1
MKP400-D-2.0-P	2.00	3.0	2.40	3.0	3 x 13.5	82 x 210	0.5	B25671A4022A000	6	108	1.5
MKP400-D-3.0-P	3.00	4.0	3.60	5.0	3 x 20	82 x 210	0.6	B25671A4032A000	6	108	2.5
MKP400-D-4.0-P	4.00	6.0	4.80	7.0	3 x 26.5	82 x 210	0.6	B25671A4042A000	6	108	2.5
MKK400-D-05-P	5.00	7.0	6.00	9.0	3 x 33	125 x 217	1.5	B25671A3996A375	4	48	2.5
MKK400-D-07.5-P	7.50	11.0	9.00	13.0	3 x 50	125 x 217	1.5	B25671A3147A375	4	48	2.5
MKK400-D-10-P	10.40	15.0	12.50	18.0	3 x 69	125 x 217	1.7	B25671A3207A375	4	48	4
MKK400-D-12.5-P	12.50	18.0	15.00	22.0	3 x 83	125 x 217	1.8	B25671A3247A375	4	48	6
MKK400-D-15-P	15.00	22.0	18.00	26.0	3 x 99.5	125 x 217	2.0	B25671A3297A375	4	48	6
MKK400-D-20-P	20.80	30.0	25.00	36.0	3 x 138	145 x 253	2.7	B25671A3417A375	4	48	10
MKK400-D-25-P <sup>3)</sup>	25.00	36.0	–	–	3 x 166	145 x 253	2.9	B25671A3497A375	4	48	10
<b>Rated voltage 440 V AC, 50/60 Hz, delta connection</b>											
MKP440-D-0.5-P	0.50	1.0	0.60	1.0	3 x 2.8	82 x 210	0.4	B25671A4002A540	6	108	1
MKP440-D-1.0-P	1.00	1.0	1.20	1.0	3 x 5.5	82 x 210	0.5	B25671A4012A040	6	108	1
MKP440-D-2.0-P	2.00	3.0	2.40	4.0	3 x 11.0	82 x 210	0.5	B25671A4022A040	6	108	1.5
MKP440-D-3.0-P	3.00	4.0	3.60	5.0	3 x 16.5	82 x 210	0.6	B25671A4032A040	6	108	2.5
MKP440-D-4.0-P	4.00	5.0	4.80	6.0	3 x 22	82 x 210	0.6	B25671A4042A040	6	108	2.5
MKK440-D-05-P	5.00	7.0	6.00	8.0	3 x 27	125 x 217	1.5	B25671A4826A375	4	48	2.5
MKK440-D-07.5-P	7.50	10.0	9.00	12.0	3 x 41	125 x 217	1.5	B25671A4127A375	4	48	2.5
MKK440-D-10.4-P	10.40	14.0	12.50	16.0	3 x 57	125 x 217	1.7	B25671A4177A375	4	48	4
MKK440-D-11.2-P	11.20	15.0	13.40	18.0	3 x 61	125 x 217	1.8	B25671A4187A375	4	48	4
MKK440-D-12.5-P	12.50	16.0	15.00	20.0	3 x 69	125 x 217	1.9	B25671A4207A375	4	48	6
MKK440-D-14.2-P	14.20	19.0	17.00	22.0	3 x 78	125 x 217	2.0	B25671A4237A365	4	48	6
MKK440-D-15-P	15.00	20.0	18.00	24.0	3 x 82	125 x 217	2.1	B25671A4247A375	4	48	6
MKK440-D-18.8-P	18.80	25.0	22.60	30.0	3 x 103	145 x 253	2.7	B25671A4307A375	4	48	10
MKK440-D-20-P	20.80	27.0	25.00	33.0	3 x 114	145 x 253	2.8	B25671A4347A375	4	48	10
MKK440-D-25-P	25.00	33.0	–	–	3 x 137	145 x 253	3.0	B25671A4417A375	4	48	10
<b>Rated voltage 525 V AC, 50/60 Hz, delta connection</b>											
MKP525-D-0.5-P	0.50	1.0	0.60	1.0	3 x 2.0	82 x 210	0.4	B25671A5002A520	6	108	1
MKP525-D-1.0-P	1.00	1.0	1.20	1.0	3 x 4.0	82 x 210	0.4	B25671A5012A020	6	108	1
MKP525-D-2.0-P	2.00	2.0	2.40	2.0	3 x 8.0	82 x 210	0.5	B25671A5022A020	6	108	1.5
MKP525-D-3.0-P	3.00	3.0	3.60	4.0	3 x 12.0	82 x 210	0.5	B25671A5032A020	6	108	2.5
MKP525-D-4.0-P	4.00	4.0	4.80	5.0	3 x 16.0	82 x 210	0.5	B25671A5051A020	6	108	2.5
MKP525-D-5.0-P	5.00	6.0	6.00	7.0	3 x 19.5	82 x 210	0.6	B25671A5042A020	6	108	2.5
MKK525-D-06.3-P	6.30	7.0	7.50	8.0	3 x 24	125 x 217	1.4	B25671A5726A375	4	48	2.5
MKK525-D-08.3-P	8.30	9.0	10.00	11.0	3 x 32	125 x 217	1.5	B25671A5966A375	4	48	2.5
MKK525-D-10-P	10.40	11.0	12.50	14.0	3 x 40	125 x 217	1.8	B25671A5127A375	4	48	4
MKK525-D-12.5-P	12.50	14.0	15.00	17.0	3 x 48	125 x 217	2.0	B25671A5147A375	4	48	6
MKK525-D-15-P	15.00	17.0	18.00	20.0	3 x 58	125 x 253	2.2	B25671A5177A375	4	48	6
MKK525-D-16.7-P	16.70	18.0	20.00	22.0	3 x 64	125 x 253	2.3	B25671A5197A375	4	48	6
MKK525-D-20-P	20.80	22.0	25.00	28.0	3 x 80	145 x 253	2.9	B25671A5247A375	4	48	10
MKK525-D-25-P <sup>3)</sup>	25.00	28.0	30.00 <sup>2)</sup>	33.0 <sup>2)</sup>	3 x 96	145 x 253	3.2	B25671A5287A375	4	48	10
MKK525-D-30-P <sup>1,3)</sup>	30.00	33.0	–	–	3 x 115	145 x 253	3.1	B25671A5347A375	4	48	10

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

1) Temperature class deviation –40/C max. 50 °C

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

3) Discharge time: < 50 V in 90 s

\*) Packing units for capacitors equal minimum order quantity. Orders will be rounded up to packing unit or multiple thereof.

**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 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 may be changed from time to time without prior notice. Our products are described in detail in our data sheets. The Important Notes ([www.epcos.com/ImportantNotes](http://www.epcos.com/ImportantNotes)) and the product specific warnings and cautions must be observed. All relevant information is available through our sales offices.