

EPCOS Product Brief 2011

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)

PQS



PoleCap Capacitors

Electrical features

- Long service life, low dissipation factor
- High insulation resistance
- Compact design: due to the concentric winding, small dimensions allow high packing density in the panel
- Cylindrical aluminum can with stud: easy installation, mounting position upright and/or horizontal possible

Safety features

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

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 has passed all tests performed by VDE and ERDA (Electrical Research & Development Association), based on IEC 60831 standards for PFC capacitors. In addition, the PoleCap has shown excellent performance in outdoor temperature tests, operating at a lower temperature than capacitors with an additional steel enclosure. The PoleCap provides better cooling due to the single-housing concept, resulting in a longer service life and higher reliability. Apart from the pole mounting option, the PoleCap is the ideal device in dusty or moistly surroundings, thanks to its high impermeability.

Visible fault control

Capacitors mounted on masts must permit operational monitoring from the ground. The PoleCap series is equipped with a red strip that becomes visible as soon as the overpressure disconnecter has been triggered in response to a malfunction.

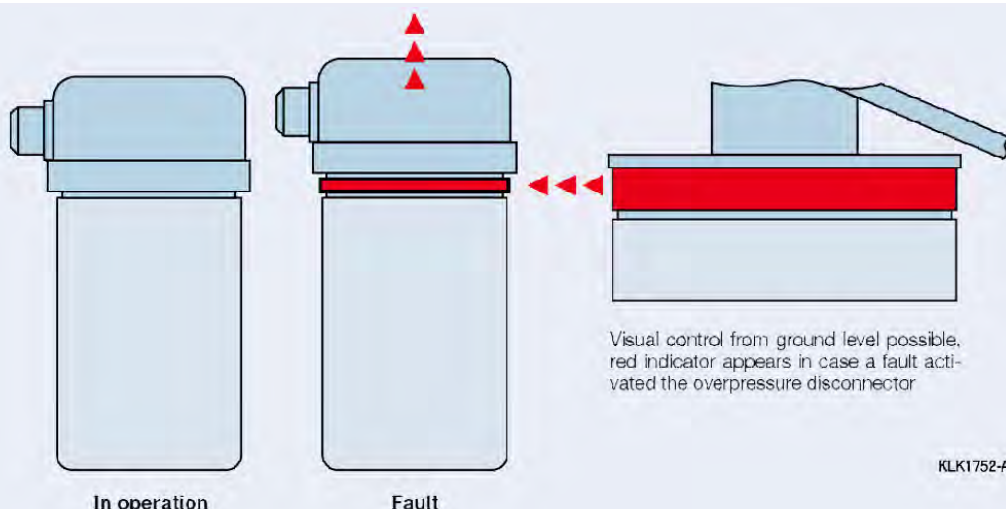
What makes the PoleCap unique is its thermal response. The conventional solution for capacitors designed for outdoor use or mast mounting is to fit an additional protective casing. Capacitor losses lead to self-heating of the space between inner can and outer casing. This accumulated heat surrounds the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

The PoleCap is 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 provides 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 test 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 of 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.

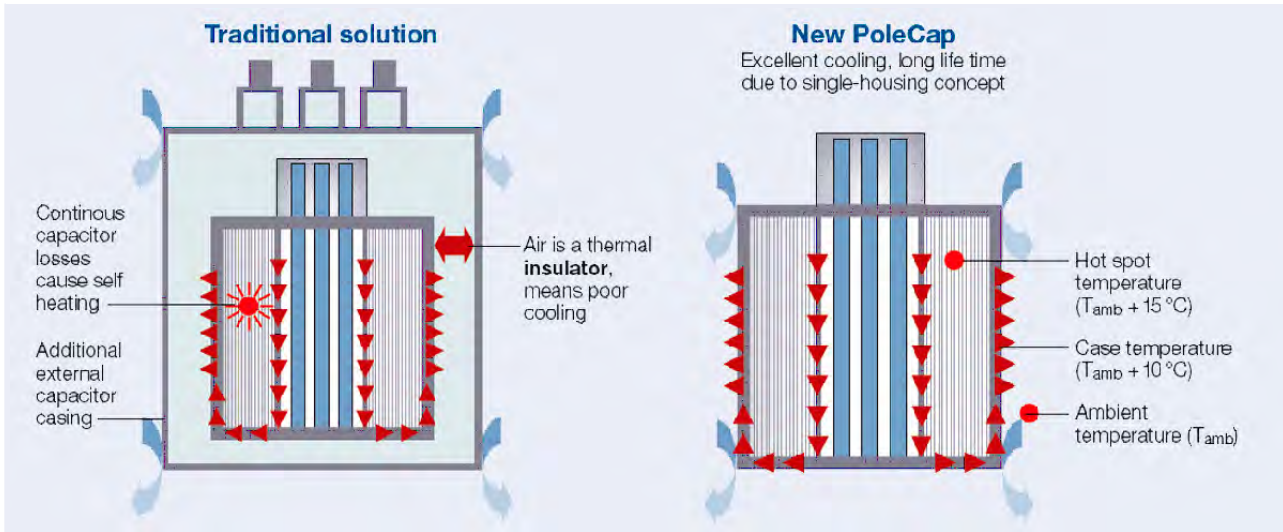
Visual fault indicator



PoleCap Capacitors



Thermal design



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} | $1.3 \cdot I_R$ (including combined effects of harmonics, overvoltages and capacitance tolerance) |
| Inrush current | I_s | Up to $200 \cdot I_R$ |
| Losses: - Dielectric - Total ¹⁾ | | < 0.2 W/kvar < 0.45 W/kvar |
| Rated frequency | f | 50/60 Hz |
| Capacitance tolerance | | +10/-5% |
| Test voltage, terminal / terminal | V_{TT} | $2.15 \cdot V_R$, AC, 10 s |
| Test voltage, terminal / case | V_{TC} | Up to $V_R \leq 660\text{ V}$: 3 000 V AC, 10 s; above $V_R = 660\text{ V}$: 6 000 V AC, 10 s |
| Mean life expectancy | $t_{LD(Co)}$ | Up to 100 000 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. 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, maximum allowed fault current 10 000 A in accordance with UL 810-standard |
| Discharge resistors | | Discharge module included, < 50 V in 60 s ²⁾ |
| 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. 5 000 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 _R | d x h | Weight | Ordering code | Qty. per box ¹⁾ | Cable cross section mm ² |
|--|----------------|---------------------|----------------|---------------------|----------------|-----------|--------|-----------------|----------------------------|-------------------------------------|
| | Output kvar | I _R A | Output kvar | I _R A | | | | | | |
| Rated voltage 400 V AC, 50/60 Hz, delta connection | | | | | | | | | | |
| MKP400-D-0.5-P | 0.50 | 1.0 | 0.60 | 1.0 | 3 • 3.5 | 82 x 210 | 0.4 | B25671A4002A500 | 6 | 1 |
| MKP400-D-1.0-P | 1.00 | 1.0 | 1.20 | 2.0 | 3 • 6.5 | 82 x 210 | 0.5 | B25671A4012A000 | 6 | 1 |
| MKP400-D-2.0-P | 2.00 | 3.0 | 2.40 | 3.0 | 3 • 13.5 | 82 x 210 | 0.5 | B25671A4022A000 | 6 | 1.5 |
| MKP400-D-3.0-P | 3.00 | 4.0 | 3.60 | 5.0 | 3 • 20 | 82 x 210 | 0.6 | B25671A4032A000 | 6 | 2.5 |
| MKP400-D-4.0-P | 4.00 | 6.0 | 4.80 | 7.0 | 3 • 26.5 | 82 x 210 | 0.6 | B25671A4042A000 | 6 | 2.5 |
| MKK400-D-05-P | 5.00 | 7.0 | 6.00 | 9.0 | 3 • 33 | 125 x 217 | 1.5 | B25671A3996A375 | 4 | 2.5 |
| MKK400-D-07.5-P | 7.50 | 11.0 | 9.00 | 13.0 | 3 • 50 | 125 x 217 | 1.5 | B25671A3147A375 | 4 | 2.5 |
| MKK400-D-10-P | 10.40 | 15.0 | 12.50 | 18.0 | 3 • 69 | 125 x 217 | 1.7 | B25671A3207A375 | 4 | 4 |
| MKK400-D-12.5-P | 12.50 | 18.0 | 15.00 | 22.0 | 3 • 83 | 125 x 217 | 1.8 | B25671A3247A375 | 4 | 6 |
| MKK400-D-15-P | 15.00 | 22.0 | 18.00 | 26.0 | 3 • 99.5 | 125 x 217 | 2.0 | B25671A3297A375 | 4 | 6 |
| MKK400-D-20-P | 20.80 | 30.0 | 25.00 | 36.0 | 3 • 138 | 145 x 253 | 2.7 | B25671A3417A375 | 4 | 10 |
| MKK400-D-25-P ³⁾ | 25.00 | 36.0 | - | - | 3 • 166 | 145 x 253 | 2.9 | B25671A3497A375 | 4 | 10 |
| Rated voltage 440 V AC, 50/60 Hz, delta connection | | | | | | | | | | |
| MKP440-D-0.5-P | 0.50 | 1.0 | 0.60 | 1.0 | 3 • 2.8 | 82 x 210 | 0.4 | B25671A4002A540 | 6 | 1 |
| MKP440-D-1.0-P | 1.00 | 1.0 | 1.20 | 1.0 | 3 • 5.5 | 82 x 210 | 0.5 | B25671A4012A040 | 6 | 1 |
| MKP440-D-2.0-P | 2.00 | 3.0 | 2.40 | 4.0 | 3 • 11.0 | 82 x 210 | 0.5 | B25671A4022A040 | 6 | 1.5 |
| MKP440-D-3.0-P | 3.00 | 4.0 | 3.60 | 5.0 | 3 • 16.5 | 82 x 210 | 0.6 | B25671A4032A040 | 6 | 2.5 |
| MKP440-D-4.0-P | 4.00 | 5.0 | 4.80 | 6.0 | 3 • 22 | 82 x 210 | 0.6 | B25671A4042A040 | 6 | 2.5 |
| MKK440-D-05- P | 5.00 | 7.0 | 6.00 | 8.0 | 3 • 27 | 125 x 217 | 1.5 | B25671A4826A375 | 4 | 2.5 |
| MKK440-D-07.5-P | 7.50 | 10.0 | 9.00 | 12.0 | 3 • 41 | 125 x 217 | 1.5 | B25671A4127A375 | 4 | 2.5 |
| MKK440-D-10.4-P | 10.40 | 14.0 | 12.50 | 16.0 | 3 • 57 | 125 x 217 | 1.7 | B25671A4177A375 | 4 | 4 |
| MKK440-D-11.2-P | 11.20 | 15.0 | 13.40 | 18.0 | 3 • 61 | 125 x 217 | 1.8 | B25671A4187A375 | 4 | 4 |
| MKK440-D-12.5-P | 12.50 | 16.0 | 15.00 | 20.0 | 3 • 69 | 125 x 217 | 1.9 | B25671A4207A375 | 4 | 6 |
| MKK440-D-14.2-P | 14.20 | 19.0 | 17.00 | 22.0 | 3 • 78 | 125 x 217 | 2.0 | B25671A4237A365 | 4 | 6 |
| MKK440-D-15-P | 15.00 | 20.0 | 18.00 | 24.0 | 3 • 82 | 125 x 217 | 2.1 | B25671A4247A375 | 4 | 6 |
| MKK440-D-18.8-P | 18.80 | 25.0 | 22.60 | 30.0 | 3 • 103 | 145 x 253 | 2.7 | B25671A4307A375 | 4 | 10 |
| MKK440-D-20-P | 20.80 | 27.0 | 25.00 | 33.0 | 3 • 114 | 145 x 253 | 2.8 | B25671A4347A375 | 4 | 10 |
| MKK440-D-25-P | 25.00 | 33.0 | - | - | 3 • 137 | 145 x 253 | 3.0 | B25671A4417A375 | 4 | 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.

PoleCap Capacitors



Three-phase capacitors

| Type | 50 Hz | | 60 Hz | | C _R | d x h | Weight | Ordering code | Qty. per box ¹⁾ | Cable cross section mm ² |
|--|----------------|---------------------|---------------------|---------------------|----------------|-----------|--------|-----------------|----------------------------|-------------------------------------|
| | Output kvar | I _R A | Output kvar | I _R A | | | | | | |
| Rated voltage 525 V AC, 50/60 Hz, delta connection | | | | | | | | | | |
| MKP525-D-0.5-P | 0.50 | 1.0 | 0.60 | 1.0 | 3 • 2.0 | 82 x 210 | 0.4 | B25671A5002A520 | 6 | 1 |
| MKP525-D-1.0-P | 1.00 | 1.0 | 1.20 | 1.0 | 3 • 4.0 | 82 x 210 | 0.4 | B25671A5012A020 | 6 | 1 |
| MKP525-D-2.0-P | 2.00 | 2.0 | 2.40 | 2.0 | 3 • 8.0 | 82 x 210 | 0.5 | B25671A5022A020 | 6 | 1.5 |
| MKP525-D-3.0-P | 3.00 | 3.0 | 3.60 | 4.0 | 3 • 12.0 | 82 x 210 | 0.5 | B25671A5032A020 | 6 | 2.5 |
| MKP525-D-4.0-P | 4.00 | 4.0 | 4.80 | 5.0 | 3 • 16.0 | 82 x 210 | 0.5 | B25671A5042A020 | 6 | 2.5 |
| MKP525-D-5.0-P | 5.00 | 6.0 | 6.00 | 7.0 | 3 • 19.5 | 82 x 210 | 0.6 | B25671A5052A020 | 6 | 2.5 |
| MKK525-D-06.3-P | 6.30 | 7.0 | 7.50 | 8.0 | 3 • 24 | 125 x 217 | 1.4 | B25671A5726A375 | 4 | 2.5 |
| MKK525-D-08.3-P | 8.30 | 9.0 | 10.00 | 11.0 | 3 • 32 | 125 x 217 | 1.5 | B25671A5966A375 | 4 | 2.5 |
| MKK525-D-10-P | 10.40 | 11.0 | 12.50 | 14.0 | 3 • 40 | 125 x 217 | 1.8 | B25671A5127A375 | 4 | 4 |
| MKK525-D-12.5-P | 12.50 | 14.0 | 15.00 | 17.0 | 3 • 48 | 125 x 217 | 2.0 | B25671A5147A375 | 4 | 6 |
| MKK525-D-15-P | 15.00 | 17.0 | 18.00 | 20.0 | 3 • 58 | 125 x 253 | 2.2 | B25671A5177A375 | 4 | 6 |
| MKK525-D-16.7-P | 16.70 | 18.0 | 20.00 | 22.0 | 3 • 64 | 125 x 253 | 2.3 | B25671A5197A375 | 4 | 6 |
| MKK525-D-20-P | 20.80 | 22.0 | 25.00 | 28.0 | 3 • 80 | 145 x 253 | 2.9 | B25671A5247A375 | 4 | 10 |
| MKK525-D-25-P ³⁾ | 25.00 | 28.0 | 30.00 ²⁾ | 33.0 ²⁾ | 3 • 96 | 145 x 253 | 3.2 | B25671A5287A375 | 4 | 10 |
| MKK525-D-30-P ^{1,3)} | 30.00 | 33.0 | – | – | 3 • 115 | 145 x 253 | 3.1 | B25671A5347A375 | 4 | 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. 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.