PoleCap Capacitors for Power Factor Correction (Outdoor usage)

MKK-Series

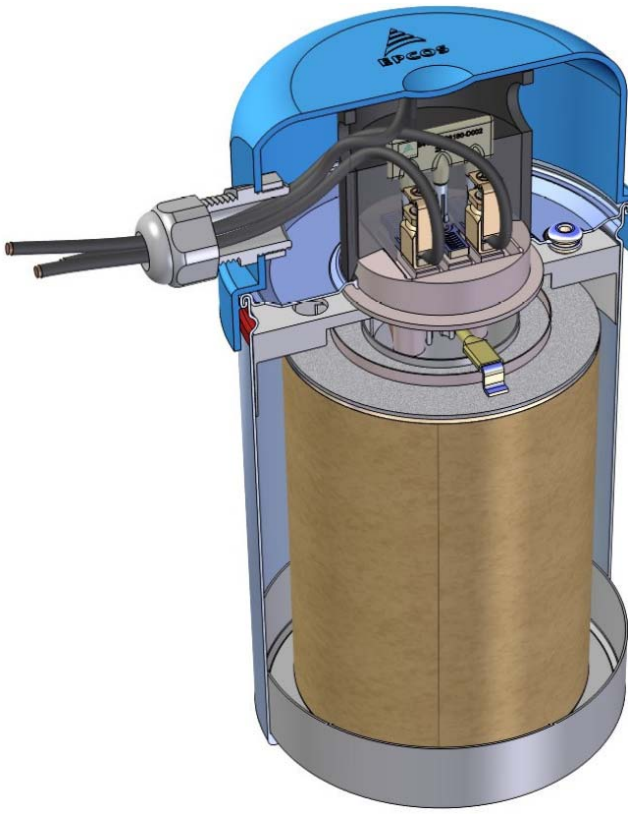
Series/Type: **B25671**
Ordering code: **B25671A4187A375**

Date: June 2005
Version: 1

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Construction

- Dielectric: Polypropylene film
- Gas-impregnated / dry type
- Concentric winding
- Wave cut
- Extruded round aluminum can with stud
- Provided with ceramic discharge module
- Triple safety system



Features

- Three phase, delta connected
- Self-healing technology
- Naturally air cooled (or forced air cooling)
- Outdoor mounting

Ambient

- Highest insulation strength for outdoor applications (to IEC 60831, 15kV)
- 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 aluminium (corrosion-free operation)
- Double housing of terminals for protection against hazardous parts, ingress of solid foreign bodies, dust and harmful effects of water

Technical data and specifications

Characteristics		
Rated capacitance C_R	3 x 61 µF	
Tolerance	-5 / +10%	
Connection	D (Delta)	
Rated voltage V_R	440 VAC	
Rated frequency f_R	50 Hz	60 Hz
Output	11.2 kvar	13.4 kvar
Rated current I_R	15 A	18 A
tanδ (dielectric)	0.2 W / kvar	

Maximum ratings	
U_{max} (up to 8 h daily)	480 VAC
U_{max} (up to 1 min)	570 VAC
I_{max}	1.3 x I_R (A)
I_S	200 x I_R (A)

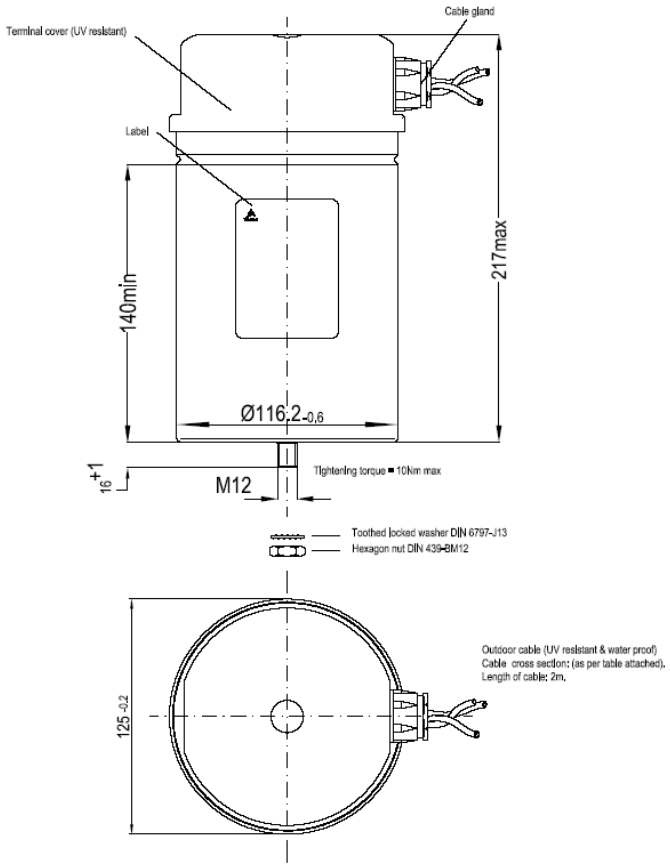
Test data	
U_{TT}	950 VAC / 50 Hz during 10 s
U_{TC}	3,000 VAC / 50 Hz during 10 s
tanδ (50 Hz)	≤ 0.5 W / kvar

Climatic category / -40/D	
T_{min} (-)	40 ºC
T_{max} (+)	55 ºC
Humidity	av. rel. < 95%
Maximum altitude	4,000 m

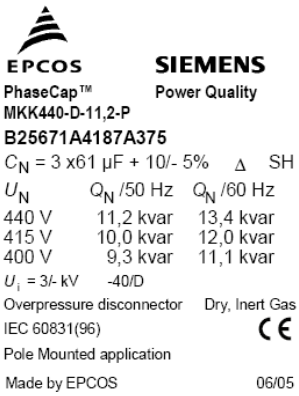
Mean life expectancy	
t_{LD}	Up to 100,000 hours
Max. 5000 switchings per year acc. to IEC 60831	

Design data	
Dimensions (Ø x l)	125 x 217 mm
Weight approx	1.8 kg
Impregnation	Dry, inert gas
Fixing	Threaded bolt M12
Max. torque (Al can stud)	10 Nm
Mounting position	Any mounting position possible. See “Maintenance and Installation Manual” for further details.

Dimensional drawing



Label design



Terminals	
Enclosure	IP54 internally protected
Connection cables	Length 2 m (UV resistant & water proof)
Cable cross section / Cable gland	4 mm^2 / PG 13.5
Maximum terminal current	50 A
Creepage distance	12.7 mm
Clearance	9.6 mm

Safety	
Mechanical safety	Overpressure disconnector
Max. short circuit current	(AFC: 10 kA)
Discharge resistor time	≤ 1 min (50 V)

Reference standards
IEC 60831-1/2

Cautions, Installation and Maintenance

- In case of dents of more than 2 mm depth or any other mechanical damage, capacitors must not be used at all.
- To ensure the full functionality of the overpressure disconnector, elastic elements must not be hindered and a minimum space of 5 cm has to be kept above each capacitor.
- Do not handle the capacitor before it is discharged to max. 10% of rated voltage.
- Resonance cases must be avoided by appropriate application design in any case.
- Handle capacitors carefully, because they may still be charged even after disconnection due to faulty discharging devices.
- Protect the capacitor properly agains overcurrent and short circuit.
- When the red stripe of the visual fault indicator can be seen, the capacitor has to be replaced in any case.
- Failure to follow cautions may result, worst case, in premature failures, bursting and fire.

Discharging

Capacitors must be discharged to a maximum of 10% of rated voltage before they are switched in again. This prevents an electric impulse discharge in the application, influences the capacitor's service life and protects against electric shock. The capacitor must be discharged to 75 V or less within 3 minutes. There must be not any switch, fuse or any other disconnecting device in the circuit between the power capacitor and the discharging device. PoleCap capacitors have a pre-mounted ceramic discharge module; alternatively discharge reactors are available from EPCOS. Discharge and short circuit capacitor before handling!

Service life expectancy

Electrical components do not have an unlimited service life expectancy; this applies to self-healing capacitors too. The maximum service life expectancy may vary depending on the application the capacitor is used in.

Safety

- Ensure good, effective grounding for capacitor enclosures.
- Provide means of disconnecting and insulating a faulty component/bank.
- Handle capacitors carefully, because they may still be charged even after disconnection due to faulty discharging devices.
- The terminals of capacitors, connected bus bars and cables as well as other devices may also be energized.
- Follow good engineering practice.

Overcurrent and short circuit protection

- Use HRC fuses or MCCBs for short circuit protection. Short circuit protection and connecting cables should be selected so that 1.5 times the rated capacitor current can be permanently handled.
- HRC fuses do not protect a capacitor against overload
  - they are only for short circuit protection.
- The HRC fuse rating should be 1.6 to 1.8 times rated capacitor current.

- Do not use HRC fuses to switch capacitors (risk of arcing).
- Use thermal magnetic overcurrent relays for overload protection.

Resonance cases

Resonance cases must be avoided by appropriate application design in any case. Maximum total RMS capacitor current (incl. fundamental harmonic current) specified in technical data must not be exceeded.

Overtemperature

Exceeding maximum allowed temperature may set the safety device out of operation.

Overpressure Disconnector

To ensure full functionality of an overpressure disconnector, the following must be observed:

1. The elastic elements must not be hindered, i.e.
   - connecting lines must be flexible leads (cables),
   - there must be sufficient space (min. 5 cm) for expansion above the connections (see "Clearing distance for overpressure disconnector").
   - folding beads must not be retained by clamps.
2. Maximum allowed fault current of 10000 A in accordance with UL 810 standard must be assured by the application.
3. Stress parameters of the capacitor must be within the IEC60831 specification.

Re-switching vs. phase-opposition

In case of voltage interruption, a sufficient discharge time has to be ensured to avoid phase-opposition and resulting high inrush currents.

Vibration resistance

The resistance to vibration of capacitors corresponds to IEC 68, part 2–6.

Max. test conditions:

Test duration	2 h
Frequency range 1	0 ... 55 Hz corresponding to max. 0.7 g
Displacement amplitude	0.75 mm

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 PoleCap capacitor has to be installed in a way that mechanical damages and dents in the aluminum can are avoided.

Clearing distance for overpressure disconnector

Above each capacitor, a minimum space of 5 cm has to be kept. This will allow the visual control to work and enable a longitudinal extension of the can to secure the over-pressure disconnector work.

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.

Choosing the best spot for mounting

Especially in regions with long periods of sunshine and high temperatures, the PoleCap should be installed in such a way that it is located in the shadow of the pole for most of the daylight. In addition to the natural cooling by the wind in combination with the single-housing of the capacitor, this will help to keep the hot spot temperature at the lowest level possible.

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 60 seconds the voltage between the terminals must decline to less than 50 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.

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The following applies to all products named in this publication:

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