PFC Capacitors

Series/Type: EPC

Three phase (Delta Connection)

Film Capacitors – Power Factor Correction

EPC series — **Three phase (Delta Connection)**

Construction

- Dielectric: Polypropylene film
- Impregnation: Resin + Qaurtz sand
- Concentric winding
- Wave cut
- Extruded round aluminum can with stud
- Discharge resistors included
- Safety internal pressure interrupter



Features

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

Typical applications

- For Power Factor Correction

Terminals

- Optimized capacitor safety terminal

Mounting

- Threaded stud at bottom of can
  (max. torque for M12 = 10 Nm)

Technical data and specifications

Characteristics	EPC series
Rated capacitance C_R	See table below
Tolerance	–5 / +10%
Connection	D (Delta)
Rated voltage V_R	See table below
Rated frequency f_R	50/60 Hz
Output	See table below
Rated current I_R	See table below
tan δ (dielectric)**	< 0,001 (at Un / 50Hz)
Type	J

**without discharge resistors

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Maximum ratings	
V_{max} (up to 8 h daily)	1,1 Un (V AC)
V_{max} (up to 1 min)	1,3 Un (V AC)
I_{max}	1.3 • I_N (A) (including combined effects of harmonics, overvoltages and capacitance tolerance)
I_S	200 • I_R (A)

Test data	
V_{TT}	2,15 Un (V AC) / 50 Hz (during 5 s)
V_{TC}	3600 V AC / 50 Hz (during 2 s)

Climatic category –40/D	
T_{min}	–40 ºC
T_{max}	+55 ºC
Humidity	Av. rel. < 95%
Maximum altitude	2000 m

Mean life expectancy	
t_{LD}	Up to 120 000 hours
Max. 5000 switchings per year	

Design data	
Dimensions (d × h)	See table below
Impregnation	Resin + Qaurtz sand
Fixing	Threaded bolt M12/M16
Max. torque (Al can stud)	10 Nm
Mounting position	Upright (tilt up to 30 degrees is allowed)
	(other positions in space - on request)

Terminals	
Protection degree	Isolated terminals, IP20
Max. torque	2.5 Nm

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Rated voltage 400 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC400-2.5-3	400	3.6	2.5	3x16.6	D65x175	M12x16
EPC400-5-3	400	7.2	5	3x33.2	D76x175	M12x16
EPC400-7.5-3	400	11	7.5	3x49.8	D76x240	M12x16
EPC400-10-3	400	14.4	10	3x66.3	D76x240	M12x16
EPC400-12.5-3	400	18	12.5	3x82.9	D86x240	M12x16
EPC400-15-3	400	22	15	3x99.5	D96x240	M16x25
EPC400-20-3	400	30	20	3x132.7	D106x240	M16x25
EPC400-25-3	400	36	25	3x165.9	D116x240	M16x25
EPC400-30-3	400	43	30	3x199	D116x285	M16x25
EPC400-40-3	400	57.7	40	3x265.4	D136x285	M16x25
EPC400-50-3	400	72.2	50	3x331.7	D136x290	M16x25
Rated voltage 415 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC415-40-3	415	55.6	40	3x246.6	D136x285	M16x25
Rated voltage 440 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC440-12.5-3	440	16	12.5	3x68.5	D86x240	M12x16
EPC440-15-3	440	20	15	3x82.2	D96x240	M16x25
EPC440-20-3	440	26	20	3x109.6	D106x240	M16x25
EPC440-25-3	440	33	25	3x137.1	D116x240	M16x25
EPC440-28-3	440	37	28	3x153.5	D116x285	M16x25
Rated voltage 480 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC480-30-3	480	36	30	3x138.2	D116x240	M16x25
Rated voltage 525 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC525-25-3	525	27.5	25	3x96.3	D116x240	M16x25
EPC525-30-3	525	30	30	3x115.5	D116x285	M16x25
Rated voltage 580 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC580-21-3	580	22	21	3x66.3	D116x240	M16x25

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Rated voltage 690 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC690-25-3	690	20.9	25	3x55.7	D136x240	M16x25
Rated voltage 760 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC760-28,5-3	760	23	28.5	-	D136x240	M16x25
Rated voltage 800 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC800-31-3	800	23	31	3x51.4	D136x240	M16x25
EPC800-33.3-3	800	24	33.3	3x55.2	D136x240	M16x25
Rated voltage 850 V AC, 50 / 60 Hz, delta connection						
P/N:	**Un, VAC**	**In,A**	**kVAr**	**Cap., uF**	**DxH, mm**	**Stud**
EPC850-35-3	850	23.8	35	3x51.4	D136x240	M16x25

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Safety	
Mechanical safety	Overpressure disconnector
Max. short circuit current	(AFC: 10 kA)
Discharge resistor time	≤ 3 min to 75 V or less

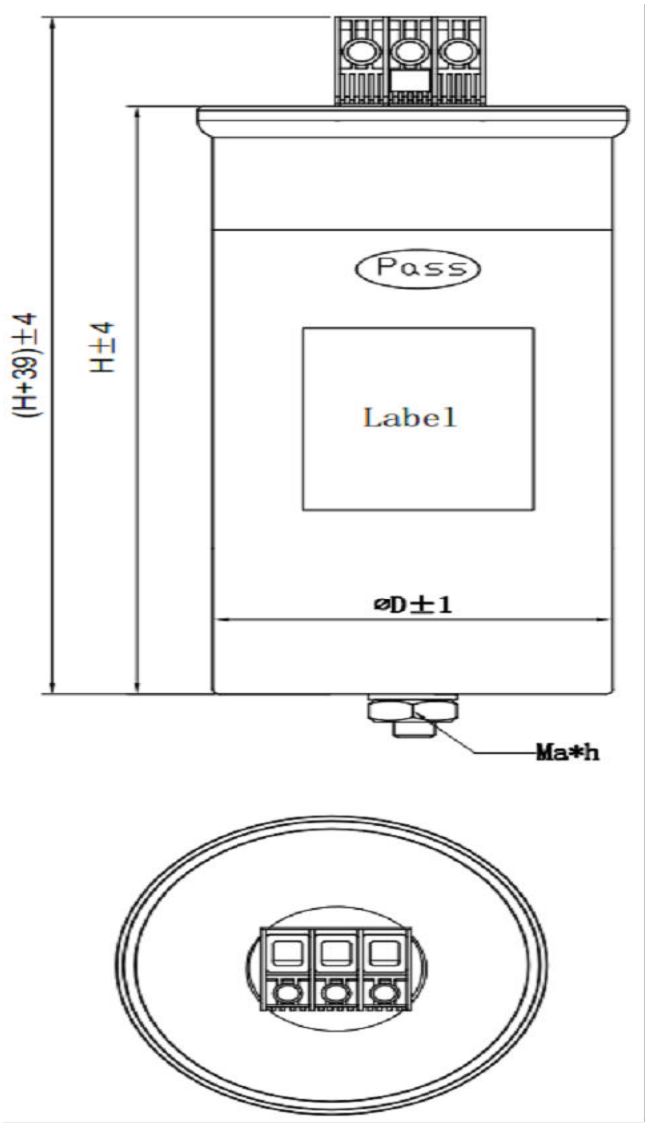
Reference standards
IEC 60831–1/2–2014, UL 810-2008
Non PCB

#: Care must be taken to insure that the maximum permissible voltages and operating temperatures are not exceeded.

Sample label design



Dimensional drawing



Cautions and warnings

- In case of dents of more than 1 mm depth or any other mechanical damage, capacitors must not be used at all.
- This applies also in cases of oil leakages.
- To ensure the full functionality of the overpressure disconnector, elastic elements must not be hindered and a minimum space of 12 mm has to be kept above each capacitor.
- Do not handle the capacitor before it is discharged.
- 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 against over current and short circuit.
- 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.

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

Electrical or mechanical misapplication of capacitors may be hazardous. Personal injury or property damage may result from bursting of the capacitor or from expulsion of oil or melted material due to mechanical disruption of the capacitor.

- Ensure good, effective grounding for capacitor enclosures.
- Provide means of disconnecting and insulating a faulty component/bank.
- The terminals of capacitors, connected bus bars and cables as well as other devices may also be energized.
- Follow good engineering practice.

Thermal load/over-temperature

After installation of the capacitor it is necessary to verify that maximum hot-spot temperature is not exceeded at extreme service conditions.

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. 12 mm) for expansion above the connections. This will enable a longitudinal extension of the can to secure the overpressure disconnector work.
   - Folding beads must not be retained by clamps.

2. The 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.

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 over current 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.

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.

Mechanical protection

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

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.

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 ≤180 seconds the voltage between the terminals must decline to less than 75 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.

The following applies to all products named in this publication:

1. 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 in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application.** As a rule we are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified.** In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
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