



## Film Capacitors – Power Factor Correction

DeltaCap BKMJ series capacitors

**Series/Type:**        **BKMJ series**

Date:                    Oct 10, 2021.

Version:                01

### Construction

- Dielectric: Polypropylene film
- Resin filling: Non-PCB, biodegradable soft resin
- Wave cutting technology
- Square structure
- Provided with built-in discharge resistances

### Features

- Three phase delta connected,
- Provided with discharge resistances
- Double safety system:
  - Overpressure disconnecter,
  - Self healing technology
- Naturally air cooled (or forced air cooling)
- Indoor mounting

### Typical applications

- For Power Factor Correction
  - Filtering out harmonic wave
  - Improve the quality of power supply
  - Improve the power factor

### Terminals

- Screw terminals



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#### Technical data and specifications

Characteristics	
Rated capacitance $C_R$	According to specification table
Tolerance	-5% ~ +10%
Connection	D (Delta)
Rated voltage $V_R$	According to specification table
Rated frequency $f_R$	50 and 60 Hz
Output	According to specification table
Rated current $I_R$	According to specification table

Maximum ratings	
$V_{max}$	$V_R + 10\%$ (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)
$I_{max}$	Up to $1.5 \cdot I_R$ (A) (including combined effects of harmonics, overvoltages and capacitance tolerance)
$I_S$	Up to $200 \cdot I_R$ (A)

Test data	
$U_{TT}$	$2.15 \times U_N$ , during 10 s
$U_{TC}$	$(2 \times U_N) + 2000$ V AC or 3000V AC, during 10 s
$\tan \delta$ (100 Hz)	$\leq 2.0 \times 10^{-3}$

Climatic category -40/D	
$T_{min}$	-40 °C
$T_{max}$	+55 °C
Humidity	Av. rel. < 95%
Maximum altitude	4000 m

Mean life expectancy	
$t_{LD}$	Up to 100 000 hours at temperature class -40/D Up to 135 000 hours at temperature class -40/C
Max. 5000 switchings per year acc. to IEC 60831.1/2-2014	

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<b>Design data</b>	
Dimensions (B×L×H)	According to specification table
Impregnation	Non PCB, resin filling: soft polyurethane resin
Mounting position	Only in the upright position See “Maintenance and Installation Manual” for further details. Horizontal mounting with additional head support possible

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#### Terminals

Protection degree	IP20
Max.torque	6Nm
Terminal cross section	50mm <sup>2</sup>
Maximum terminal current	100 A
Creepage distance (min)	≥24 mm
Clearance (min)	≥23 mm


#### Safety

Mechanical safety	Overpressure disconnecter
Max. short circuit current	(AFC: 10 kA according UL 810 standard)
Discharge resistor time	≤ 180 s to 75 V or less (IEC 60831)

#### Reference standards

IEC 60831-1/2-2014 GB/T 12747.1/2-2017

### Label design




**Power Quality Solutions**  
**DeltaCap™**

**BKMJ-0.48-30-3**


138.2 |  $\bar{F}_i$  |  $\alpha$  -5%~+10% SH

$U_N$	$Q_N/50\text{Hz}$	$Q_N/60\text{Hz}$
480V~	30.00kvar	36.00kvar
440V~	25.21kvar	30.25kvar
415V~	22.43kvar	26.91kvar



Please don't touch terminals of  
Electronic components in working

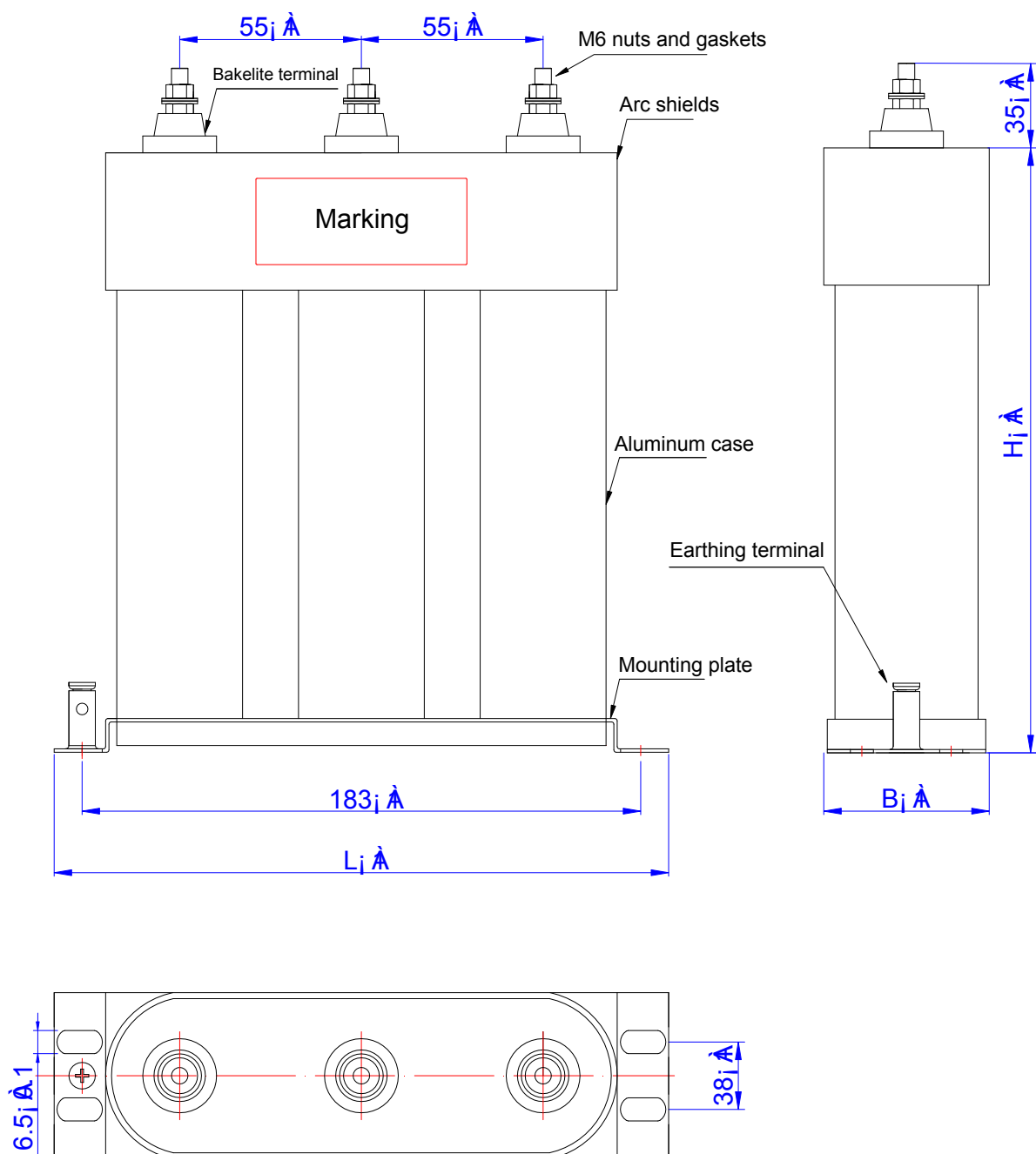
Built-in discharge safety device  
Please wait for 3 minutes after discharge

$U_i=3/-K_v$  IEC 60831-1-2014  
 $-40/D$   IEC 60831-2-2014  
 Protected 10K AFC Non PCB  
 Overpressure disconnecter  
 Discharge before handling  
 Made by Universal October 10 2021

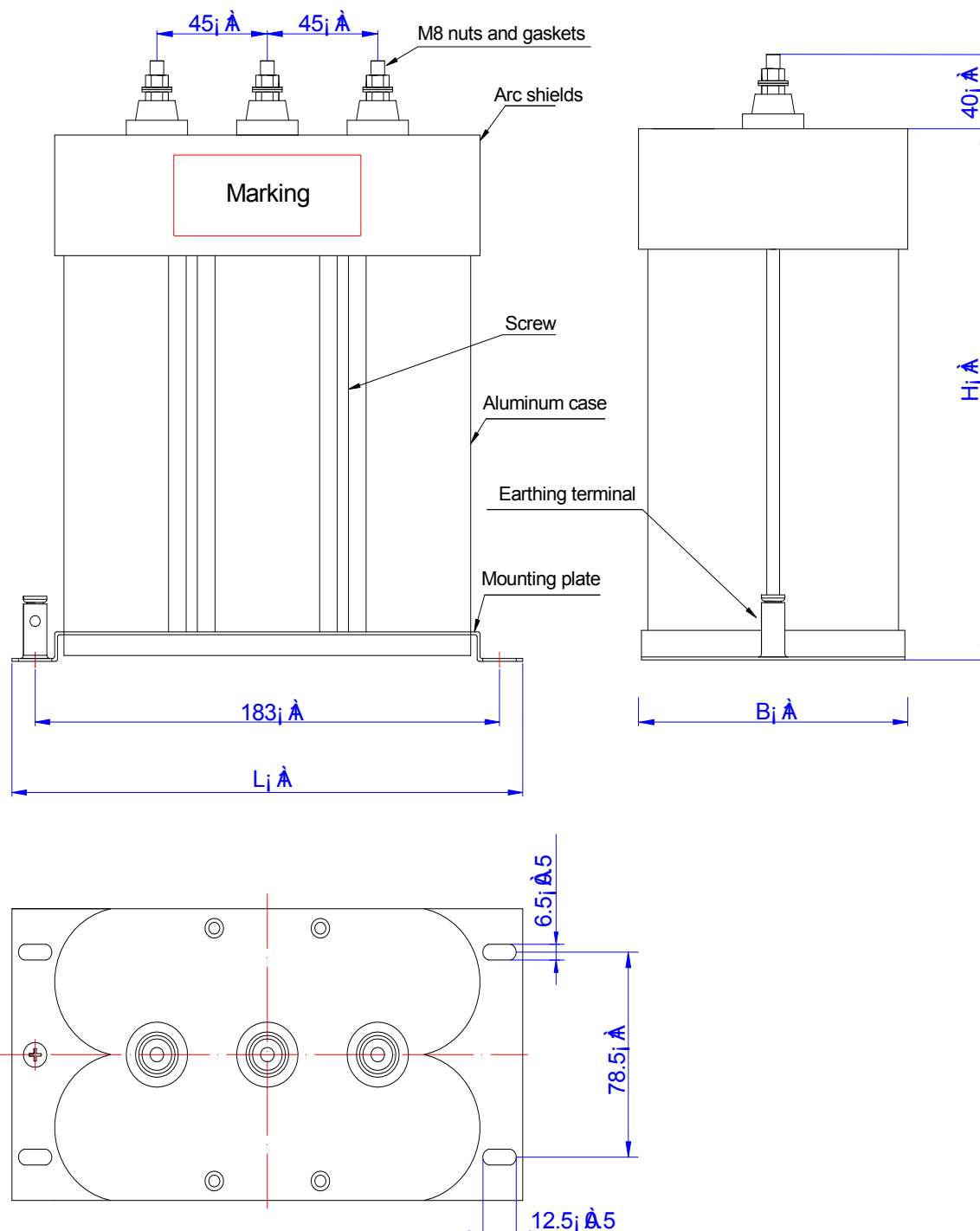
Note: parameter marked in “  ” is variable

### Dimension drawing

#### Type A:



### Type B:



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**Specification table**

Type	50Hz		60Hz		C <sub>R</sub>	Dimension ) (mm			Construction	Packing unit pcs
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF	L	B	H		
Rated voltage 450 V AC, 50/60 Hz, delta connection										
BKMJ-0.45-5-3	5.0	6.4	6.0	7.7	26.2×3	200	60	140	Type A	5
BKMJ-0.45-10-3	10.0	12.9	12.0	15.4	52.4×3	200	60	160	Type A	5
BKMJ-0.45-15-3	15.0	19.3	18.0	23.1	78.6×3	200	60	210	Type A	5
BKMJ-0.45-20-3	20.0	25.7	24.0	30.8	104.8×3	200	60	240	Type A	5
BKMJ-0.45-25-3	25.0	32.1	30.0	38.5	131.0×3	200	115	210	Type B	3
BKMJ-0.45-30-3	30.0	38.5	36.0	46.2	157.2×3	200	115	210	Type B	3
BKMJ-0.45-35-3	35.0	44.9	42.0	54.0	183.4×3	200	115	240	Type B	3
BKMJ-0.45-40-3	40.0	51.4	48.0	61.6	209.6×3	200	115	240	Type B	3
Rated voltage 480 V AC, 50/60 Hz, delta connection										
BKMJ-0.48-5-3	5.0	6.0	6.0	7.2	23.0×3	200	60	140	Type A	5
BKMJ-0.48-10-3	10.0	12.0	12.0	14.5	46.0×3	200	60	160	Type A	5
BKMJ-0.48-15-3	15.0	18.0	18.0	21.7	69.0×3	200	60	210	Type A	5
BKMJ-0.48-20-3	20.0	24.0	24.0	28.9	92.1×3	200	60	240	Type A	5
BKMJ-0.48-25-3	25.0	30.0	30.0	36.0	115.2×3	200	115	210	Type B	3
BKMJ-0.48-30-3	30.0	36.0	36.0	43.3	138.2×3	200	115	210	Type B	3
BKMJ-0.48-35-3	35.0	42.0	42.0	50.5	161.2×3	200	115	240	Type B	3
BKMJ-0.48-40-3	40.0	48.2	48.0	57.8	184.2×3	200	115	240	Type B	3



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Type	50Hz		60Hz		C <sub>R</sub>	Dimension ) (mm			Construction	Packing unit pcs
	Output kvar	I <sub>R</sub> A	Output kvar	I <sub>R</sub> A	μF	L	B	H		
Rated voltage 525 V AC, 50/60 Hz, delta connection										
BKMJ-0.525-5-3	5.0	5.5	6.0	6.6	19.3×3	200	60	140	Type A	5
BKMJ-0.525-10-3	10.0	11.0	12.0	13.2	38.5×3	200	60	160	Type A	5
BKMJ-0.525-15-3	15.0	16.5	18.0	19.8	57.8×3	200	60	210	Type A	5
BKMJ-0.525-20-3	20.0	22.0	24.0	26.4	77.0×3	200	60	240	Type A	5
BKMJ-0.525-25-3	25.0	27.5	30.0	33.0	96.3×3	200	115	210	Type B	3
BKMJ-0.525-30-3	30.0	33.0	36.0	39.6	115.5×3	200	115	210	Type B	3
BKMJ-0.525-35-3	35.0	38.5	42.0	46.2	134.8×3	200	115	240	Type B	3
BKMJ-0.525-40-3	40.0	44.0	48.0	52.8	154.0×3	200	115	240	Type B	3

### Note:

If it is the single-phase capacitor with the same voltage and capacity, capacitor without middle terminal, it is current is 1.732 times rated current, and other parameters are the same

### 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 disconnecter, 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.

### 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 disconnecter

To ensure full functionality of an overpressure disconnecter, 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 disconnecter 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.

Vibration resistance

The resistance to vibration of capacitors corresponds to IEC 60831, part 2–6.

Max. test conditions:

Test duration	6 h*
Frequency range 1	10 ... 55 Hz*
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 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  $\leq 180$  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.

