



Film Capacitors – Power Factor Correction

PhaseCap Energy Resin filled capacitors

Series/Type:	PhaseCap Energy Plus
Ordering code:	VCTB256V2T1
Date:	2021-06-18
Version:	2.0

Construction

- Dielectric: Polypropylene film
- Non PCB, Soft biodegradable resin
- Wave cut
- Extruded round aluminum can with stud
- Provided with ceramic discharge module or discharge module block
- Over pressure disconnecter for **all 3** phases

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 terminals

Mounting

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

Technical data and specifications

Characteristics	VCTB256V2T1	
Rated capacitance C_N	3 x 76.9 μ F	
Tolerance	-5 /+5%	
Connection	D (Delta)	
Rated voltage U_N	480 V	
Rated frequency f_N	50 Hz	60 Hz
Output Q_N	16.7 kvar	20.0 kvar
Rated current I_N	20.1 A	24.1 A
Dimensions (d x h)	100 x 207 mm	
Weight (approx.)	1.9 kg	

Maximum ratings

Maximum permissible voltage (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)
Maximum permissible current (I_{max})	Up to $1.6 \dots 2.0 \cdot I_R$ (A) (including combined effects of harmonics, overvoltages and capacitance tolerance) depending on the individual type
Maximum inrush current (I_s)	$\leq 500 I_R$ (A) depending on the individual type Max. 15000 switching's per year

Test data

Voltage test between terminals (V_{TT})	$2.15 \cdot V_N$ V AC / 50 Hz, 2s
Voltage test between terminals and container (V_{TC})	3600 V AC / 50 Hz, 2 s up to $V_R = 525$ V AC

Design data

Dielectric losses	0.2 W / kvar
* Total losses	0.45 W / kvar
Impregnation	Non PCB, soft biodegradable resin

* Without discharge resistor

Climatic category

\ominus Minimum	- 40 °C
\ominus Maximum	+ 60 °C
Ambient temperature	Class -40/60: Max. short time: + 60 °C, max. mean 24 h: +50 °C; max mean 1 year: +40 °C; lowest temperature: - 40 °C
Storage temperature	- 40 °C + 85 °C
\ominus Hotspot max.	85 °C
Humidity	Average relative < 95%

Mean life expectancy

t_{LD}	<p>Up to 240 000 hours (temperature class –40/D) Hotspot temperature $\leq 65^{\circ}\text{C}$ (Max. mean ambient temperature per year = $+35^{\circ}\text{C}$)</p> <p>Up to 220 000 hours (temperature class –40/60) Hotspot temperature $\leq 70^{\circ}\text{C}$ (Max. mean ambient temperature per year = $+40^{\circ}\text{C}$) Failure rate < 3%</p>
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Terminals

Protection degree	Isolated terminals, IP20, indoor mounting (optionally with terminal cap for IP54), VDE 0106 part 100
Max. torque	2.0 Nm
Terminal cross section	25 mm ² (without cable and lug)
Maximum terminal current	80 A
Creepage distance (min)	12.7 mm
Clearance (min)	9.6 mm


Mounting

Fixing	Threaded bolt M12
Max. torque (Al can stud)	10 Nm
Mounting position	Upright / horizontal See "Maintenance and Installation Manual" for further details.
Maximum altitude	4000 m

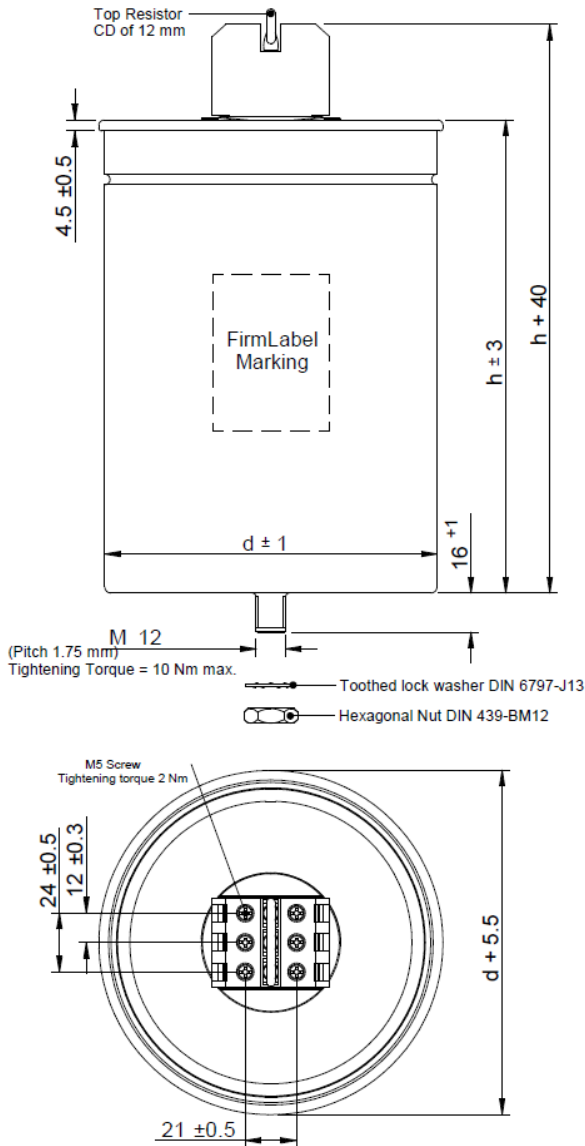
Safety

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

Approvals / reference standards

Approval Mark	Standard of reference	Certificate
	IEC 60831–1/2 Edition 3.0 (2014)	-

Dimensional drawings



Marking



VCTB256V2T1 MKK480-D-16.7-04
B25675C4162M780

$C_N = 3 \times 76.9 \mu\text{F} -5/+5\% \Delta \text{ SH}$

U_N $Q_N/50\text{Hz}$ $Q_N/60\text{Hz}$

480 V 16.7 kvar 20.0 kvar

440 V 14.0 kvar 16.8 kvar

415 V 12.5 kvar 15.0 kvar

$U_i = 3/8\text{kV} -40/60$

Overpressure disconnecter

Non PCB



IEC 60831 - 1/2 (2014)

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Warning: wait 5 minutes after Isolating supply before handling.

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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.

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 50 V or less within 1 minute. There must be not any switch, fuse or any other disconnecting device in the circuit between the power capacitor and the discharging device. PhaseCap Energy-capacitors have a pre-mounted ceramic discharge module; alternatively discharge reactors are available from TDK. 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 maximum total RMS 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 the maximum total RMS 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 68, 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 for M12 stud.

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 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 TDK PFC

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Release 2018-10