



AC Filter Capacitors

By Geert Stevens

INTRODUCTION

In DC to AC conversion applications, additional AC filter capacitors are used to reduce high ripple currents from switching devices such as IGBTs. These capacitors are not designed to handle high surge voltages. For applications where these surges are expected, please refer to EMI capacitors in the application note “AC Film Capacitors in Connection With the Mains” (www.vishay.com/doc?28153) for 60 Hz and 400 Hz.

AC filter capacitors must meet four major requirements:

- Excellent capacitive filtering: low inductance and low equivalent series resistance
- Withstand pulses from switching devices: high peak current capabilities
- Continuously biased by high AC voltage from a powerful energy supply
- Operate in harsh environments

All AC filter capacitors are designed to offer a high capacitance per pitch range (low inductance design) and can withstand heavy pulse loads (high peak currents).

SELECTION

For robust AC filter capacitor performance throughout the component's lifetime, an operation voltage derating should be applied if the capacitor is intended for continuous operation, herein defined as uninterrupted connection to the mains for 24 hours per day for several years. In the table below, Vishay recommends the mains voltage for each of the nominal AC voltages specified for its AC filtering series, ensuring the withstanding of mains voltages tolerances and instabilities, while assuring a long lifetime and safe component end of life.

The **nominal voltage** is normally used in the connection of the mains (supply) voltage with an associated tolerance. It can be understood in a way to be “the name” of the voltage; e.g. 240 V_{AC} ± 10 %.

The **rated voltage** is the property of a component, device, or equipment that defines the voltage it can withstand; e.g. for a nominal 240 V_{AC} supply voltage it has to be a minimum of 264 V_{AC}.

		U _{NAC}						
		230 V	250 V	275 V	310 V	350 V	440 V	480 V
MKP1847	Intended mains voltage U _{OPAC} up to 85 °C	180 V	190 V	200 V	210 V	230 V	380 V	-
	Intended mains voltage U _{OPAC} up to 105 °C	160 V	180 V	200 V	210 V	230 V	300 V	-
MKP1847C	Intended mains voltage U _{OPAC} up to 85 °C	180 V	190 V	210 V	220 V	240 V	-	-
	Intended mains voltage U _{OPAC} up to 105 °C	160 V	180 V	210 V	220 V	240 V	-	-
MKP1847H	Intended mains voltage U _{OPAC} up to 85 °C	-	190 V	-	250 V	300 V	-	380 V
	Intended mains voltage U _{OPAC} up to 105 °C	-	180 V	-	210 V	240 V	-	330 V



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HUMIDITY ROBUSTNESS FOR AC CAPACITORS

AC capacitors in general are subject to ionization phenomena, humidity, or a combination of both. These phenomenon can result in a gradual capacitance decrease and ESR increase over the component's lifetime. As not all capacitors are used under the same circumstances, Vishay has defined three humidity robustness classes for its AC filtering series capacitors that surpass standard performance:

- Robustness under humidity grade (I)
- Robustness under high humidity grade (II)
- High robustness under high humidity grade (III)

For each particular application field, Vishay can offer the best solution for AC filtering:

FAMILY	ROBUSTNESS GRADE	PERFORMANCE TEST
MKP1847	Standard	56 days 40 °C / 93 % RH, no voltage
MKP1847C	II	56 days 40 °C / 93 % RH, U_{NAC} applied
MKP1847H	III	1000 h 85 °C / 85 % RH, U_{NAC} applied