

AC Filter Capacitors

Capacitors placed on AC voltage lines filter the main harmonics coming from the converter due to the switching devices and clean the Voltage/Current waveform transmitted to the load/grid. They are so called AC filter capacitors. On three-phase AC power lines, these capacitors can be placed in either a delta or wye configuration. In a delta configuration, the capacitors are connected between the different phases, but in a wye configuration, the capacitors are connected between each phase and a central point. Depending on the system design, this neutral point is sometimes connected to the ground or left as a floating neutral.

These capacitors provide filtering for the AC voltage lines (input or output). Depending on size, power and additional requirements coming from the application the AC Filter capacitor can be found in Box or Can Configuration. AC Filter Power Box configuration is looked for low/medium power device with limited dimension. Instead AC Filter Power Can configuration can be found on high power lines with filter inductors (for instance LCL filters) requiring also some safety certification like UI-810 , and connected in banks with several capacitors in series/parallel.

Overall both configuration are highly reliable and completely safe thanks to the self-healing capability

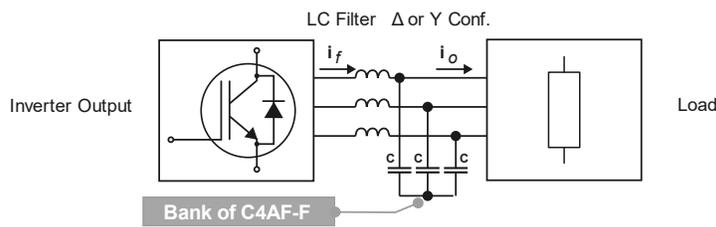


Figure 3: KEMET's C4AF-F capacitors in an AC filter (wye config) application

KEMET's new C4AF-F series capacitors represent a step forward in technology. It is an AC filter Power Box series with high current capability, Miniaturized dimension and High reliability in Harsh Environment conditions particularly suitable for latest utility scale converters used in Solar, Wind and Charging stations applications . These capacitors have high ripple current capability of up to 40Arms and 19Arms average making them suitable for working with WBG devices. C4AF-F is the most miniaturized AC Filter Box series in the current KEMET Film product portfolio providing the opportunity for more capacitance value per single capacitor, thus, allowing the use of fewer capacitors and reduction of assembly costs and busbar length. The Advanced THB capability is confirmed by 85°C/85% r.h. at V_{nac} for 1500 Hrs Test with $\Delta C/C \leq -10\%$ providing high reliability in Solar, Wind and Charging stations applications demanding longer lifetime expectancy in Dry and Harsh Conditions.

DC-Link Capacitors

Capacitors in the DC circuits at the output or input stages of a converter are called DC-link capacitors. These serve as filters on the DC voltage limiting the fluctuations, absorbing high ripple current generated by fast-switching IGBTs or MOSFETs devices as well as energy storage capacitance to provide instantaneous current to all downstream circuits. They can also be used in certain applications to store energy for failsafe power loss operations.

DC-link capacitors must be able to withstand high power, high ripple currents, and high instantaneous rate of voltage change over time in terms of dV/dt .

They need to do this reliably and safely in extreme conditions, as many of these power converters are found in windmills, solar farms, and other renewable energy source circuits.

Depending on size, power and additional requirements coming from the application the DC-link capacitor can be found in Box or Can Configuration

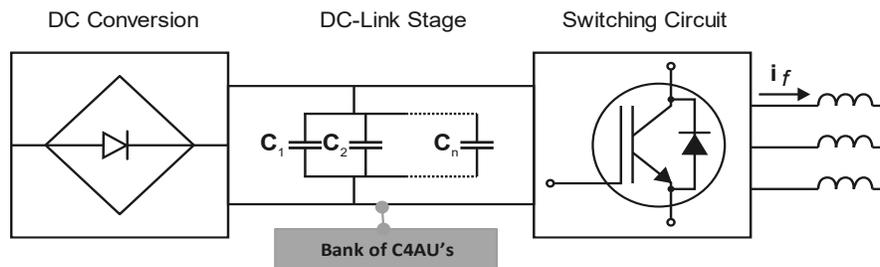


Figure 4: KEMET's C4AU capacitors in a DC-link application

KEMET's C4AU series DC link capacitors represent an additional technological progress in the KEMET Film product portfolio. It is a DC-Link Power Box with high Voltage and dV/dt capability, Miniaturized dimension and High reliability in Harsh Environment conditions particularly suitable for latest converter typologies used in Solar, Wind and Charging stations applications. These capacitors have high Voltage capability to 1440 Vdc @85°C and 90 V/ μ s making them suitable for working with High energy density and WBG devices. C4AU is one of the most miniaturized DC-link Box series in the current KEMET Film product portfolio providing the opportunity for more capacitance value per single capacitor, thus, allowing the use of fewer capacitors and reduction of assembly costs and busbar length. The C4AU THB performances (85°C/85% r.h. at Vdc @85°C for 1000 Hrs with $\Delta C/C \leq -10\%$) are in line with Solar, Wind and Charging stations applications demanding longer lifetime expectancy in Dry and in Harsh Conditions.

EMI Suppression

Differential mode noise can be studied and understood by looking at the schematic, PCB layout, or wiring diagram of any converter circuit. Common mode noise is unwanted, difficult to understand, and often involves the physics of currents flowing around parasitic capacitance or another seemingly random source which becomes more complex in high-power electronics.

Common and differential mode noise can be introduced back into the power line when equipment is connected to the local power grid or AC mains. To prevent propagating noise to other equipment that is connected to the AC (power) line, an Electromagnetic Interference (EMI) filter is placed between the AC line and the rest of the converter. The capacitors filter the power line, decoupling it from any common-mode noise that may be generated by the converter connections and switching devices, and suppress EMI.

KEMET R53B capacitor is ideal for the EMI filter stages of any converters. R53B is class X2 capacitor meeting all the required approvals and it is the first to market X2 technology in terms of combined THB grade IIIB, Higher Voltage, longer lifetime expectancy and low halogen content. The Advanced THB capability up 85°C/85% r.h. at V_{nac} for 1000 Hrs with $\Delta C/C \leq -10\%$ and the longer lifetime up 220 kHrs @85°C in Dry condition makes this product particularly suitable for Solar, Wind and Charging stations applications demanding longer lifetime expectancy and reliability in Dry and Harsh Conditions. Additionally the Higher Rated Voltage up 350 Vac fits quite well with wye configuration in the 480 Vac USA three-phase system.

