Technical Article

Input Considerations

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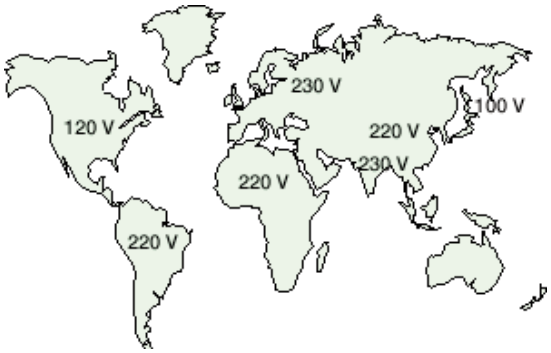
Input Filter

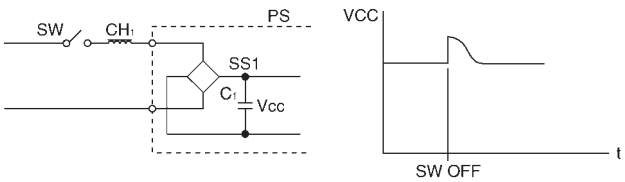
World Wide Voltage



It is important to confirm the AC voltage, frequency, and phase when selecting a power supply as these differ from region to region. If more than the specified level of voltage is applied, the power supply can be damaged. If the input voltage has a distorted wave, the unit will either not operate normally or will suffer a shortened life time.

Influence of Line Filter or Choke Coil

When a large value inductor is used as an input line filter or choke, a back emf can be generated when the supply is switched off. A high voltage can be applied to the input stage causing stress and damage to the power supply.



Influence of choke coil to input

Input Current and Power Factor

For a switched mode psu even if the input voltage remains sinusoidal, the input current will be very distorted, with large peak values due to the charging of the main bulk capacitor. This distorted current waveform results in low input power factors. Further, a large ripple current will flow in the filter capacitors. The rms input, peak and ripple currents are all given as a ratio to a "Calculated effective input current" I_e:

$$I_e = \frac{Pin}{Vin}$$

Where:

I_e = Calculated effective input current. A rms.

Pin = Calculated (or measured) input power. W.

Vin = Supply voltage rms.

Note: I_e is thus the calculated "real" component of input current (the component which produces the real power).

Because of the large harmonic component in the distorted input current, the measured input rms current will be larger by an amount defined by the power factor Pf (approximately 0.5-0.7) in the case of a capacitor input filter.

Note: Although Power Factor is normally defined as

$$\text{Power Factor} = \frac{\text{True Impact Power}}{\text{Input V•A Product}} = \frac{\text{Active Power}}{\text{Apparent Power}}$$

In the case of the "direct-off-line" rectifier capacitor input filter, the low source resistance of the supply ensures that the input voltage remains near constant and free of distortion. Hence the power factor factor may be defined as the ratio of the effective input current to the rms input current, ie.:

$$\text{Power Factor} = \frac{I_e =}{I_{in}\ (rms)}$$

Selecting Fuses

A line input fuse, must be matched to the turn-on
characteristics of the supply and the action of the inrush-limiting circuitry at maximum and minimum input voltages and full current limited load. Choose a normal-blow or slow-blow fuse that provides sufficient current margin to give reliable operation and satisfy the inrush requirements. Its continuous current rating should be low enough to provide good protection in the event of a genuine failure. However, for long fuse life, the current rating should not be too close to the maximum rms equipment input current measured at minimum input voltage and maxiumum load (perhaps 150% of Irms maximum). Use measured or calculated rms currents and allow for the form factor (approximately 0.6 for capacitor input filters) when calculating rms currents.

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