



Passive Components

Power Resistor Terminology

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Pre-Charge Resistor

This is used on system start up to charge the DC coupling capacitor. The resistor limits the inrush current during charging of the DC coupling capacitor. This capacitor sits across the DC voltage source to keep the line voltage constant when the input voltage drops low. The resistor must be able to absorb high energy from a single pulse, over a short time.

- **Key Feature:** Short term overload capability

Inrush Limiting Resistor

Similar to precharge resistor, but offers protection to the rectifier section of circuit.

- **Key Feature:** Short term overload capability

Capacitor Discharge Resistor

The resistor is fitted across the capacitor terminals to provide a safety function. When the voltage to the capacitor is removed, the resistor discharges any residual voltage in the capacitor making it safe to touch. The resistor must handle continuous power as it dissipates power continuously when the capacitor is connected to a voltage source.

- **Key Feature:** Continuous power dissipation

Braking Resistor

The resistor is used in a variable speed drive to absorb the energy created when the motor decelerates quickly. These can be fitted internally or externally to the drive. The rate that the motor decelerates is controlled by the amount of energy dumped into the resistor. During the braking cycle (deceleration) lots of little pulses of energy are dissipated by the resistor over a short period of time.

- **Key Feature:** Dissipation of repetitive energy pulses

Crowbar Resistor

The resistor is used to drop the voltage to earth safely, generating a zero voltage in the circuit when a fault has been detected.

- **Key Feature:** Ability to absorb large short term energy and voltage overloads, with a high insulation resistance

Balancing Resistor

The resistor is used to balance the voltage across critical components (such as IGBTs) when they are connected in series. This is to ensure that each component has equal voltage stress during operation.

- **Key Feature:** Tight tolerance, low power and high ohmic value

Current Sense Resistor

A low ohmic resistor creates a small voltage drop in the circuit. As the current in the circuit changes the voltage drop will vary. The change in voltage drop is used to measure the current to or from the circuit. This current can be monitored allowing an action in the control software.

- **Key Feature:** Low ohmic value, high accuracy

Snubber Resistor

The resistor is used to absorb transient high voltage spikes produced by switching a solid state switch (like relays, IGBTs, GTOs, etc.). It is connected in series with a capacitor across the switch. These switching operations can be very high frequency therefore the resistor must have a low inductance, so that the transient spike is not transferred back into the switch.

- **Key Feature:** Dissipation of repetitive energy pulses, low inductance

Note: Partial Discharge

A resistor with low Partial discharge is a requirement of many of the applications above. Partial discharge is a form of high voltage test that can be used to measure the life of the component. It measures the amount and size of voids in the insulation and therefore the quality of it.