

# OVERLOADS

## General

Power transformers are subjected to overloaded conditions on a regular basis. The overloads are originated typically by loads that have high start-up current demands. As an example, a motor

may draw as much as 300% of its normal running current for a few cycles during start-up. Medium to large computers also produce a large current demand when they are first turned on. When a load is

closely matched to its transformer's capacity, momentary overloads of 200% to 300% become the norm rather than the exception.

## Dealing With Overloads

The typical startup overload is an accepted methodology in power distribution. Everything works fine as long as the protection devices are properly coordinated, the transformers are capable of delivering the current without mechanical stress failure, and the output impedance (Z%) is respectable.

Transformers quickly exhibit two identifiable characteristics at the moment of overload. The first characteristic is the output voltage drops, making it that much more difficult for hard starting devices. With a lower output voltage there exists a demand for more current to compensate. As the current demand increases, the output volt-

age continues to decrease and so on and so on. A low output Z% transformer will minimize this effect.

The output voltage of a transformer with an output Z=6% will fall 18% or more during a motor start. In contrast, a transformer with a Z=3% will only decrease 9%; much safer for the motor and all other equipment attached to the same transformer.

The second identifiable characteristic is heat. The generation of heat is exponential,  $I^2R$ . If the transformer is overloaded by 130% the heat increase is 70%! Because of this phen-

omena transformers are subject to shortened lives when operated in a continuous overload condition. Copper transformers are preferred over aluminum because aluminum transformers are prone to complete failure in a matter of hours when operated in a sustained overload.

Device startup overload is very short term and is not normally long enough to be a heating factor. Perpetual start/stop operations need to take the duty cycle into consideration.

## Other High Current Considerations

Occasionally the start up excitation surge current is confused with output surge current. The excitation or start current is the inrush current that energizes the trans-

former. Premium transformer designs take this into consideration and select reactance values that keep this current well under 20 times the full load operating

current. Typically inrush current lasts only a few cycles. It only becomes a factor when coordinating the input protection device ratings.

## Power Transformers

Power transformers require good mechanical bracing in order to survive the high current magnetic forces from surge currents and

overloads. Transformers using copper coils exhibit better cooling, longer life and lower impedance. Power transformers should show

no detrimental effects with overloads of 500% for 10 seconds or 1000% for one cycle.

## Summary

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Controlled Power's *Ultra-K*, multi-shielded, K-rated isolation transformer provides the necessary ingredients for assured long life operation under adverse overload

conditions. The *Ultra-K* is capable of handling a continuous 200% overload for hours without degradation. The *Ultra-K* is a multi-shielded copper wound low

impedance transformer designed for use in applications that require a transient and noise free voltage source and wherever harmonic currents are prevalent.



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