

Electrical Transient Types

IEEE Standard 1100 and IEC Standard 61000 define several types of electrical transients.

Table 2 lists electrical transients with commonly used names and descriptions. Note that other names may be used to describe these transients.

Figure 2 illustrates some of these transient types overlayed onto the voltage operating envelope to provide insight into how they differ.

Note: Electrical power transients are not limited to the magnitude and duration values shown. Table 2 and Figure 2 are not intended to list all possible transients.

Table 2. Electrical transient types

Transient type	Description
Voltage spike	High magnitude, short duration Special measurement equipment is needed to observe. Potential to damage electronic circuits.
Voltage sag	Medium magnitude, medium duration Longer duration sags may show up in RMS (root mean square) trend data, although shorter duration sags will not. Potential for undervoltage trips; overvoltage trips may also occur due to inrush when power returns.
Voltage swell	Medium magnitude, medium duration Longer duration swells may show up in RMS trend data, although shorter duration swells will not. Potential for overvoltage trips.
Momentary power loss	Short duration power outage, often associated with transferring power between sources (e.g., utility to generator). Potential for large transients when the incoming power source is connected.
Voltage “brownout” or “blackout”	Medium-to-long duration loss of electrical power. Expect equipment to shutdown and restart after power returns; restart may be manual or automatic.
Voltage imbalance	Three-phase voltages are not equal A small voltage imbalance may lead to a large current imbalance. Potential to overload phase(s) that carry higher current.
Electrical harmonics	Non-sinusoidal voltage or current, typically associated with variable-speed drives. (refer to <i>Engineers Newsletter</i> 47-1 “Harmonic Distortion in Electrical Systems”)
Electromagnetic Interference (EMI)	High-frequency noise interferes with communications and control boards.

Figure 2. Transient types within the voltage operating envelope

