**DMM Meters**

**CAT I**

Application: Electronic

• Protected electronic equipment.

• Equipment connected to (source) circuits in which measures are taken to limit transient over voltages to an appropriately low level.

• Any high-voltage, low-energy source derived from a high winding resistance transformer, such as the high-voltage section of a copier.

**CAT II**

Application: Single-phase receptacle connected loads

• Appliance, portable tools, and other household and similar loads.

• Outlet and long branch circuits.

• Outlets at more than 10 meters (30 feet) from CAT III source.

• Outlets at more that 20 meters (60 feet) from CAT IV source.

**CAT III**

Application: Three-phase distribution, including single-phase commercial lighting

• Equipment in fixed installations, such as switchgear and polyphase motors.

• Bus and feeder in industrial plants.

• Feeders and short branch circuits, distribution panel devices.

• Lighting systems in larger buildings.

• Appliance outlets with short connections to service entrance.

**CAT IV**

Application: Three-phase at utility connection, any outdoor conductors

• Refers to the “origin of installation”; i.e., where low-voltage connection is made to utility power.

• Electricity meters, primary overcurrent protection equipment.

• Outside and service entrance, service drop from pole to building, run between meter and panel.

• Overhead line to detached building, underground line to well pump.

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| Overvoltage  Installation Category | Working Voltage  (dc or ac-rms to ground) | Peak Impulse Transient  (20 repetitions) | Test Source  **(**Ω **= V/A)** |
| CAT I | 600 V | 2500 V | 30 ohms |
| CAT I | 1000 V | 4000 V | 30 ohms |
| CAT II | 600 V | 4000 V | 12 ohms |
| CAT II | 1000 V | 6000 V | 12 ohms |
| CAT III | 600 V | 6000 V | 2 ohms |
| CAT III | 1000 V | 8000 V | 2 ohms |
| CAT IV | 600 V | 8000 V | 2 ohms |

**Crest factor**

With the growth of electronic power supplies, the currents drawn from today's electrical distribution systems are no longer pure 60 or 50 cycle sine waves. These currents have become fairly distorted, due to the harmonic content these power supplies generate. However, electrical power system components such as fuses, bus bars, conductors, and thermal elements of circuit breakers are rated in rms current because their main limitation has to do with heat dissipation. If we want to check an electrical circuit for overloading, we need to measure the rms current and compare the measured value to the rated value for the component in question. Therefore, today's test equipment must be able to accurately measure the True-rms value of a signal regardless of how distorted the signal may be.

Crest factor is a simple ratio of a signal's peak value to its rms value. For a pure ac sine wave, the crest factor would be 1:1.414. However, a signal that has a very sharp pulse would cause the ratio, or crest factor, to be high. Depending on the width of the pulse and its frequency, you can see crest factors of 10:1 or higher. In real power distribution systems, crest factors of greater than 3:1 are rarely seen. So as you can see, crest factor is an indication of a signal's distortion.

A crest factor specification will be found only in specifications for meters that can make True-rms measurements. It indicates how much distortion a signal can have and still be measured within the meter's accuracy specification. Most true-rms reading clamp meters have crest factor specifications of 2:1 or 3:1. That will handle most electrical applications.