



Arc Voltage for fuses rated higher than System Voltage

The phenomenon of arcing voltage is well documented for current-limiting fuses. The forced reduction of the first loop of short circuit current is what causes this arc voltage. Similar to the ignition points opening on an ignition circuit and the high voltage spike caused by the collapsing magnetic field in the coil.

Generally, the faster the current limitation, the higher the arc voltage. It has been generally assumed that the arc voltage developed during fuse operation is purely dependent on the voltage rating of a fuse, regardless of what system voltage is present at the time.

While fuses with higher voltage ratings typically have more arcing zones in series, and hence tend to interrupt faster because of the increased rate of internal resistance during operation, this effect is mitigated somewhat by the lower energies dissipated at each arcing zone.

The end result is that while the arc voltage developed by a higher voltage class fuse is somewhat higher than that of a fuse matched to the system voltage, it is much less than the overvoltage produced by the same fuse when operating at its rated maximum voltage. Please refer to the graph below for typical arcing voltages for popular fuse classes used on systems below their rated voltage.

It should also be noted that these higher arcing voltages are only produced if there is a forced reduction of the first loop of AC current – in other words, only if the fuse exhibits current limitation. If the fuse operates below its current limitation threshold, there is still arcing voltage produced, but tests have demonstrated that it is much lower and directly related and proportional to the system voltage with variances occurring due to power factor and point on wave opening considerations.

The arc voltage for non-current limiting devices tends to be in the region of 2-2.2X the system voltage, regardless of the voltage rating of the operating device.

If insulation levels are evaluated on the basis of a device's rated voltage in current limiting mode, this will be a worst case scenario. Generally for fuses, this is approximately 2.5-3X times the fuse's rated voltage and is usually well within typical BIL ratings for electrical gear.



Switching Voltages related to Fuse voltage class and applied system voltage

