



Multiple Pulse, Repetitive Impulse Testing

Multiple pulse or repetitive impulse testing is generally performed using IEEE C62.45-2002 recommendations using waveforms described in IEEE C62.41.2-2002. Often referred to as “pulse life”, “repetitive surge current capacity”, “surge life” or “endurance” testing, the purpose of the testing is to demonstrate device survivability.

Some manufacturers of surge protective devices have taken IEEE suggestions to a different level in that they have greatly increased the number of surges. Part of this is manufacturers leapfrogging each other for bragging and marketing rights. (Over the years, this has evolved into endless escalation, rather than meaningful testing. Surge generators and contactors suffer more than SPDs/TVSS.) At right is an excerpt from IEEE C62.45-2002, page 67. Note that the upper limit is 1,000 Cat C 6kV, 3kA impulses.

Some have also combined MOV failure status into the evaluation criteria. One should be careful when comparing manufacturers “number of hits”, as the testing procedures and criteria may be significantly different from one manufacturer to the next. Other than these IEEE suggestions, this type of testing is not outlined by any standard including NEMA LS1(rescinded August 19th, 2009).

B.38 Repetition rate

A maximum allowable surge repetition rate cannot be determined without the evaluation of the *EUT* protection design. For this reason, it is strongly recommended that the maximum allowable repetition rate for pulse trains of varying length be incorporated into the test plan. In the absence of other requirements, it is suggested that the wait times of Table B.2 be incorporated in the test protocol.

Table B.2—Suggested wait times

Location category	Waveform type	Power parameters	Numbers of applied surges	Wait time (seconds)
A	0.5 μs–100 kHz Ring Wave	6 kV OCV ^a 200 A SCI ^b	10 to 1000	6 to 20
B	0.5 μs–100 kHz Ring Wave	6 kV OCV 500 A SCI	10 to 1000	10 to 30
C	Combination Wave	6 kV OCV 3 kA SCI	10 to 1000	30 to 120

^aOCV—Open-circuit voltage
^bSCI—Short-circuit current

Test samples are attached to the output terminals of the surge generator and subjected to a Category C High combination wave. A timing system is designed so that the device fuse will, if blown due to device failure, shut down the entire test setup. This essentially allows the test system to operate continuously and safely since the large number of test impulses takes days to complete. A wavecapture is printed at the beginning of the test and at random intervals during the test. By industry convention, an MOV has failed when its clamp voltage has degraded by more than 10%. Results from the testing indicate less than a 1% variance of clamp voltages between the test samples. None of the samples exhibited a clamp voltage degradation of more than 7% over the course of 5000 impulses for 480V devices and less than 3% degradation over the course of 5000 impulses for 208V devices. Tests of the APT units proved a degradation level much lower than the 10% level after 5000 hits at C High level. No device failures occurred.

Stay in touch with APT Engineering Sales at 800-237-4567, visit our website, www.aptspd.com, or email us at info@apttvss.com.

APT Engineering Sales