Additional test

for

Multi-pulses Surge protective devices connected to low-voltage power systems – Requirements and test methods
1 Scope

This is only one additional test for IEC 61643-11:2011. This additional test can be applicable to devices for surge protection against indirect and direct effects of lightning or other transient overvoltages. These devices are packaged to be connected to 50/60 Hz a.c. power circuits, and equipment rated up to 1 000 V r.m.s.

Performance characteristics, standard methods for testing and ratings are established. These devices contain at least one nonlinear component and are intended to limit surge voltages and divert surge currents.

2 Normative references

IEC 61643-11: 2011, Low-voltage surge protective device- Part11: surge protective devices connected to low-voltage power systems-requirements and test method

3 terms, definitions and abbreviations

3.1.101(MSPD) Multi-pulses surge protective device

SPD that is capable of being subjected to multiple impulse strokes at one discharge and being tested with multiple pulse combination waves

Note: if the manufacturer declare the SPD can withstand multiple impulse stokes, MSPD needs to pass the test requirement for (MCW) Multi-pulses combination wave.

3.1.102 (MCW) Multi-pulses combination wave

Impulse current waveform combined by multiple pulses according to a certain amplitude and time interval

8.3.101 test requirement for (MCW) Multi-pulses combination wave

The test is applied for MSPD which is only for connection L-PE/N in TN, TT and IT system.

For this test, three new samples shall be used and the relevant requirements for this test refer to the IEC 61643-11:2011 Clause 8.
8.3.101.1 Test parameter of (MCW) Multi-pulses combination wave

<table>
<thead>
<tr>
<th>Total impulse</th>
<th>8/20 current impulses (µs)</th>
<th>the peak values for the first and the tenth impulse (kA)</th>
<th>The peak values from the second to the 9th impulse (kA)</th>
<th>The interval time from the first to the 9th impulse (ms)</th>
<th>The interval time between the 9th and 10th impulse (ms)</th>
<th>Total duration time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>8/20µs</td>
<td>100</td>
<td>50</td>
<td>60</td>
<td>400</td>
<td>880.5</td>
</tr>
</tbody>
</table>

Note: the above table is only for the maximum parameter of MCW so far as the reference, the manufacturer can declare their own specified parameter of MCW of the MSPD in the form as the clause 8.3.101.3 shows. The interval time must be accompany with the above table shows that the interval time from the first to the last second is 60 ms, and interval time between the last two impulses is 400 ms.

8.3.101.2 Typical waveform of the multi-pulses current generator

![Typical waveform of the multi-pulses current generator](image)

interval time 60 ms
8.3.101.3 Identification of Multi-pulses combination wave parameters

e.g. MS-8/20µs-10p/20kA

MS—Multi-pulses; 8/20µs—current impulse; 10p—10 pulses; 20kA--- The peak values from the second to the 9th impulse

8.3.101.4 Test circuit diagram

Only the Uref=255 V, the prospective short-circuit current of this power source more than 100 A is required in the test. The other distribution power system is considering. If the manufacturers declare External disconnectors, the External disconnectors should apply to connect during the test, but the external disconnection should not occur.
### 8.3.101.5 Pass Criteria

<table>
<thead>
<tr>
<th><strong>Pass Criteria</strong></th>
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<tbody>
<tr>
<td>During the test, there shall be no visual evidence of burning of the sample.</td>
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<tr>
<td>SPDs with an IP degree equal to, or greater than, IP20 shall not have live parts accessible with the standardized test finger applied with a force of 5 N (see IEC 60529), except the live parts which were already accessible before the test when the SPD is fitted as in normal use.</td>
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<tr>
<td>The SPD shall be connected as for normal use according to the manufacturer’s instructions to a power supply at the reference test voltage (U&lt;sub&gt;REF&lt;/sub&gt;). The current that flows through each terminal is measured.</td>
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</tbody>
</table>
| Multi-pulse failure mode  
After the SPD fully passing the ten pulse current, the internal disconnection occurs, there shall be clear evidence of effective and permanent disconnection of the corresponding protective component(s).  
In order to check this requirement, the power frequency voltage equal to U<sub>c</sub> is applied 1 min, and the current passed shall not exceed the 0.5 mA rms | a) |
| Multi-pulse withstand mode  
During the test, the thermal stability shall be achieved. The SPD is considered to be thermally stable if the crest of the resistive component of the current flowing into the SPD or the power dissipation shows either a decreasing tendency or does not increase during 15 min of U<sub>ref</sub> voltage.  
The current shall not have changed by more than 50% compared to the initial value determined at the beginning of the relevant test sequence | b) |
| Values for measured limiting voltage after the test shall be below or equal to U<sub>P</sub>. The measured limiting voltage shall be determined, using the tests described in 8.3.3, but the test of 8.3.3.1 is performed only with a 8/20-surge current with a crest value of I<sub>imp</sub> for Test Class I or with In for Test Class II or with the test of 8.3.3.3 but only at U<sub>OC</sub> for Test class III.  
Auxiliary circuit, such as status indicator, should be in normal working condition. Visually inspect the sample and there should be no signs of damage. |   |