

SOUTH CAROLINA ELECTRIC COOPERATIVES SECONDARY TYPE 1 SURGE PROTECTIVE DEVICE SPECIFICATIONS

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1.0 SCOPE

This secondary Type 1 surge protective device specification covers the general and specific minimum acceptable requirements for construction, design and testing applicable to low-voltage secondary, Type 1, surge-protective devices (SPDs) designed to be installed in self-contained meter sockets between the meter and meter socket (meter-based, socket mount SPDs) or connected to service conductors (hard-wired, surface mount SPDs), for 1Ø, three wire service applications at 60 Hz and 120/240 V_{RMS} or less. All other components that are an integral part of the arrestor shall be Listed or Recognized for Purpose by a Nationally Recognized Testing Lab.

2.0 REFERENCES AND RELATED STANDARDS

This secondary Type 1 surge protective device specification shall be used in conjunction with, and ratings, definitions and terminology shall be in accordance with, the latest revision of the following publications:

ANSI/UL 1449-2006 3rd edition (or later), Standard for Surge Protective Devices

IEEE Std. C62.11-2012, IEEE Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits

IEEE Std. C62.33-1994, IEEE Standard Test Specifications for Varistor Surge-Protective Devices

IEEE Std. C62.34-1996, IEEE Standard for Performance of Low Voltage Surge-Protective Devices (Secondary Arresters)

IEEE Std. C62.41-1991, IEEE Recommended Practice for Surge Voltages in Low-Voltage (1000 V and less) AC Power Circuits

IEEE Std. 62.41.1-2002, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits

IEEE Std. 62.41.2-2002, IEEE Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits

IEEE Std. 62.45-2002, Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits

IEEE Std. C62.72-2007, IEEE Guide for the Application of Surge-Protective Devices for Low-Voltage AC Power Circuits

UL 414-2009, UL Standard for Meter Sockets

3.0 LABELING and MARKING

- 3.1** Each secondary Type 1 surge protective device shall have an indelible and easily legible label, or labels, with letters printed in indelible ink and at a minimum 3 mm in height and clearly visible to the end consumer after the device and meter are installed, which includes the information listed below:
- a. Label with manufacturer's name and device's identifying designation (i.e. model or product number, serial number, etc.)
 - b. A Nationally Recognized Testing Laboratory's (NRTL) authorized listing mark with the NRTL's name and/or symbol and the word "Listed" (i.e. ETL by Intertek, UL by Underwriters Laboratories, etc.)
 - c. For socket mount SPDs, a conspicuous label or marking indicating the correct orientation of the device for installation must be noticeable during installation (i.e. "TOP" or "UP with arrow symbol")
 - d. Nominal voltage rating, frequency, continuous current rating, maximum continuous operating voltage (MCOV) rating, short circuit current rating (SCCR), Nominal Discharge Current (In) rating, and Voltage Protection Ratings (VPR)
 - e. Any applicable caution(s) and/or warning(s)
 - f. Month and Year the surge guard device was manufactured must be printed, stamped, or written in permanent lettering on the housing
 - g. Other specific markings as required by ANSI/UL 1449 3rd edition
- 3.2** Each surge protector device shall be packaged with installation instructions that include the following information:
- a. Safety warnings, cautions, and limitations
 - b. Position of normal use
 - c. Proper lead dress and length considerations

4.0 PERFORMANCE REQUIREMENTS

Performance requirements for secondary, Type 1, surge protective devices shall be in accordance with ANSI/UL 1449 3rd edition (or later) and UL 414.

5.0 CONSTRUCTION

- 5.1 Meter-Based, Socket Mount Surge Protective Devices** shall be designed and constructed as follows:
- a. The device shall not have any sharp edges or protrusions that may cause a puncture or wound to personnel, damage protective gloves during the handling or installation of the device, or violate the integrity of the electric meter. In particular, the meter surge contacts must be of a rolled over design.

- b. Device housing design must be tamper resistant and accommodate both ring-less and ring-type meter sockets, with provisions for a meter seal.
- c. The surge circuitry must be Listed to ANSI/UL 1449, and the housing must meet UL 414 and be a gray color. It must be constructed of high quality, flame-retardant (i.e. either non-flammable or self-extinguishing) and explosion proof polycarbonate material with UV stabilized polymer materials resistant to ultraviolet radiation. Any exposed metal part must be non-corrosive, and non-current carrying part tied to ground per ANSI.
- d. Device design must be such that the integrity of the meter socket is not compromised thus encouraging power diversion. This also includes that there will not be any component or conductor of any type connecting the line AND load sides of the device that will allow power to flow unmetered.
- e. Device cannot extend the utility meter more than four inches (4") from the meter socket.
- f. For low profile device designs, a clear integrated protective safety shield should cover all internal live components.
- g. Device, including all status indicators, should be suitable for outdoor application and operation, and must be weather and rain tight. Housing should be rated to NEMA 3R or better.
- h. LED(s) "unit good" lights for power and protection status (i.e. disconnect of either MOV) and located for easy viewing.
- i. For 200 Amp devices, the internal copper bus bars and surge protector jaws shall be tin or silver plated copper and rated and certified at a minimum of 200 Amps continuous when installed and tested on a 200 Amp rated continuous meter socket. The device itself must not cause a derating of the meter socket (200 Amps). Specify the actual maximum attained certified (Listed) continuous current rating, per UL 414, in a 200 Amp meter socket.
- j. For 320 Amp devices, the internal copper bus bars and surge protector jaws shall be tin or silver plated copper and rated and certified at a minimum of 320 Amps continuous when installed and tested on a 320 Amp rated continuous meter socket. The device itself must not cause a derating of the meter socket (320 Amps). Specify the actual maximum attained certified (Listed) continuous current rating, per UL 414, in a 320 Amp meter socket.
- k. The device must use, at minimum, 150 V_{RMS} maximum continuous operating voltage components.
- l. The device must use a single MOV per each 120 V_{RMS} leg, with a diameter measuring not less than *32 mm on the shortest side and

having a MCOV voltage rating not less than 150 V_{RMS} nor exceeding 180 V_{RMS}.

*The bigger the MOV size (i.e. 40 mm), the more energy it can handle and the maximum surge current it can divert. In addition, larger MOV elements will have a longer in-service lifetime.

- m. The device's MOVs must have a minimum surge current rating of 40 kA peak capability, per each 120 V_{RMS} leg.
- n. The device's MOV's should be connected on the load-side terminals for the safety of the installation personnel. If the MOV's are connected on the source-side terminals, then the device's housing must have a safety barrier/shield to protect the installation personnel from flying debris, should the MOV(s) fail during installation.
- o. The device must be equipped with dual safety fusing for:
 - Thermally Protected – low amp sustained over-voltages and open neutral protection
 - Current Limited – fault current
- p. The ground conductor pigtail lead must exit the device on the load side, preferably attached internally to the ground side of the MOVs. The ground lead must not be attached in a manner that could cause by accident or otherwise a short circuit during installation, removal, or operation. It shall be either green or white in color and composed of two (2) pieces of #10 or #12 AWG, 600 Volt insulated, stranded copper wire. The piece permanently attached to the device should extend approximately five to six inches (5"-6") from the back of the device housing, and end be terminated with an insulated male "Fast-on" type connector. The other piece should have one end terminated with an insulated female "Fast-on" type connector and be approximately ten to twelve inches (10"-12") in length, and the opposite end with approximately three-quarter inch (3/4") of insulation pre-stripped* and exposed copper wire tinned (or approved optional configuration). *May leave insulation slug on.
- q. For 120/208 Volt (Form 12S) applications requiring the 5th jaw as a neutral, the standard device should have provisions, though not required, for adding this optional 5th jaw in the field. This 5th jaw, when installed in the device, shall be located at the nine o'clock position in relation to the meter socket. The 5th jaw's flying lead shall be white or green in color and composed of #12 AWG minimum, 600 Volt insulated, stranded copper wire with a crimped eyelet terminal on the end and tied to ground.
- r. The device must continue the ground continuity from the meter ring to the meter socket.
- s. No audible noise under normal operating conditions.

5.2 Hard-Wired, Surface Mount Surge Protective Devices shall be designed and constructed as follows:








- a. The device shall not have any sharp edges or protrusions that may cause a puncture or wound to personnel, or damage protective gloves during the handling or installation of the device.
- b. Device housing design must be tamper resistant.
- c. The surge circuitry and housing must be Listed to ANSI/UL 1449 and UL 50 (the housing can be made of either high grade plastic or metal, or a combination of both). Any exposed metal part must be non-corrosive, and non-current carrying part tied to ground per ANSI.
- d. Device design must be such that the integrity of the meter socket is not compromised thus encouraging power diversion.
- e. Device cannot extend more than eight inches (8") from the meter base.
- f. Suitable for mounting in a 3/4" knockout hole (or other size as required by the application) and be an acceptable weather tight connection.
- g. Device, including all status indicators, should be suitable for outdoor application and operation, and must be weather and rain tight. Housing should be rated to NEMA 4x or better.
- h. LED(s) "unit good" lights for power and protection status (i.e. disconnect of either MOV) and located for easy viewing.
- i. Designed for 200 Amp to 600 Amp continuous AC service.
- j. (Not presently used.)
- k. The device must use, at minimum, 150 V_{RMS} maximum continuous operating voltage components.
- l. The device must use a single MOV per each 120 V_{RMS} leg, with a diameter measuring not less than *32 mm on the shortest side and having a MCOV voltage rating not less than 150 V_{RMS} nor exceeding 180 V_{RMS} .
*The bigger the MOV size (i.e. 40 mm), the more energy it can handle and the maximum surge current it can divert. In addition, larger MOV elements will have a longer in-service lifetime.
- m. The device's MOVs must have a minimum surge current rating of 40 kA peak capability, per each 120 V_{RMS} leg.
- n. The device must be equipped with dual safety fusing for:
 - Thermally Protected – low amp sustained over-voltages
and open neutral protection
 - Current Limited – fault current


- o. The ground conductor pigtail lead must exit the device with the 120 V_{RMS} legs, preferably attached internally to the ground side of the MOVs. It shall be either green or white in color and composed of #10 or #12 AWG, 600 Volt insulated, stranded copper wire. Other 120 V_{RMS} conductors shall be black in color and composed of #10 or #12 AWG, 600 Volt insulated, stranded copper wire. The wiring permanently attached to the device should extend approximately thirty inches (30") from the device housing, and the opposite end of the 120 V_{RMS} conductors with two inches (2") of insulation pre-stripped*, and opposite end of the ground conductor with approximately three-quarter inch (3/4") of insulation pre-stripped*, and exposed copper wire tinned (or approved optional configuration). *Insulation slug may be left on at the factory to prevent the wire from fraying during handling before installation.
- p. No audible noise under normal operating conditions.

6.0 PRODUCT WARRANTY

The surge protector shall have a minimum of ten (10) year manufacturer's warranty. Manufacturer's standard form in which manufacturer agrees to full replacement of surge protector that fails in material or workmanship within ten (10) years from date of installation by electric company.

APPLICABLE ABBREVIATIONS

1. AIC Amperes Interrupting Capacity
2. ANSI American National Standards Institute 
3. ASTM American Society for Testing and Materials 
4. ATS Acceptance Testing Specifications
5. AWG American Wire Gauge
6. CSA Canadian Standards Association 
7. EMI Electromagnetic Interference
8. ETL Electrical Testing Laboratories, now Intertek 
9. FIPS Federal Information Processing Standard
10. IEEE Institute of Electrical and Electronic Engineers 
11. In Nominal Discharge Current
12. MBSA Meter Base Socket Adapter
13. MCOV Maximum Continuous Operating Voltage
14. MOV Metal Oxide Varistor
15. MSA Meter Socket Adapter
16. NEC National Electrical Code
17. NEETRAC National Electric Energy Testing Research & Application Center
18. NEMA National Electrical Manufacturers Association
19. NESC National Electrical Safety Code
20. NFPA National Fire Protection Association 
21. NRTL Nationally Recognized Testing Laboratory 
22. OSHA Occupational Safety and Health Administration

- 23. PDU Power Distribution Unit
- 24. RFI Radio Frequency Interference
- 25. SAD Silicon Avalanche Diode
- 26. SCCR Short-Circuit Current Rating
- 27. SOV Silicon Oxide Varistor
- 28. SPD Surge Protective Device (formerly known as TVSS)
- 29. SVR Suppressed Voltage Rating (UL1449 2nd edition test rating)
- 30. TOV Temporary Overvoltage
- 31. TVSS Transient Voltage Surge Suppressor (now known as SPD)
- 32. UL Underwriters Laboratories 
- 33. VPL Voltage Protection Level
- 34. VPR Voltage Protection Rating (UL1449 3rd edition test rating)