

SURGE PROTECTIVE DEVICE FOR SERVICE ENTRANCE

Part 1—General

1.1 Description/Scope

- A. The Surge Protective Device (SPD) covered under this section includes all service entrance type surge protective devices suitable for use as Type 1 or Type 2 devices per UL1449 4th Edition, applied to the line or load side of the utility feed inside the facility.
- B. A SPD located at service entrance and distribution and branch panels, Switchgear, Motor Control Centers, and Switchboard assemblies (EDIT AS REQUIRED).
- C. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to finish and install surge protection devices.

1.2 Quality Assurance

- A. Reference Standard: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise stated in this document:
 - 1. UL 1449 4th Edition 2014 Revision (effective 3/26/2015).
 - 2. UL 1283.
 - 3. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
 - 4. ANSI/IEEE C62.45, Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.
 - 5. UL96A
 - 6. IEEE 1100 Emerald Book.
 - 7. National Fire Protection Association (NFPA 70: National Electrical Code).

1.3 Submittals/Quality Assurance – Submit the following:

- A. Package must include shop drawings complete with all technical information, unit dimensions, detailed installation instructions, maintenance manual, recommended replacement parts list and wiring configuration.
- B. Copies of manufacturer's catalog data, technical information and specifications on equipment proposed for use.
- C. Copies of documentation stating that the Surge Protective Device is listed by UL to UL1449 4th Edition, category code VZCA.
- D. Copies of actual let through voltage data in the form of oscillograph results for both ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (Ring wave) tested in accordance with ANSI/IEEE C6245.
- E. Copies of Noise Rejection testing as outlined in NEMA LS1-1992 (R2000) Section 3.11. Noise rejection is to be measured between 50kHz and 100MHz verifying the devices noise attenuation. Must show multiple attenuation levels over a range of frequencies.
- F. Copies of test reports from a recognized independent testing laboratory, capable of producing 200kA surge current waveforms, verifying the suppressor components can survive published surge current rating on a per mode basis using the ANSI/IEEE C62.41 impulse waveform C3 (8 x 20 microsecond, 20kV/10kA). Test data on an individual module is not acceptable.
- G. Copy of warranty statement clearly establishing the terms and conditions to the building/facility owner/operator.

Part 2—Products

2.1 Approved Manufacturer:

- A. Current Technology – Select3 or SL3 Series **[100kA] [150kA] [200kA] [250kA] [300kA]** per mode surge rating.
- B. Approved equivalent. Submission package must be received by engineer two weeks prior to bid date shall fully comply with all performance characteristics included in this specification.

2.2 Manufactured Units/Electrical Requirements

- A. Refer to drawing for operating voltage, configuration and surge current capacity per mode for each location, or you may list locations and information here.
- B. Declared Maximum Continuous Operating Voltage (MCOV) shall be greater than 115 percent of the nominal system operating voltage and in compliance with test and evaluation procedures outlined in the nominal discharge surge current test of UL1449, section 37.7.3. MCOV values claimed based on the component's value or on the 30-minute 115% operational voltage test, section 38 in UL1449 will not be accepted.
- C. Unit shall have no more than 10% deterioration or degradation of the UL1449 4th Edition Voltage Protection Rating (VPR) when exposed to a minimum of 14,000 repeated category C3 (20kV/10kA) surges. The SPD manufacturer must provide a test report validating the repetitive surge test was performed.

- D. Protection Modes UL1449 4th Edition VPR(6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277), (208Y/120), (600Y/347). 3-Phase, 4 wire circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449, section 37.6:

System Voltage	Mode	MCOV	B3	C3 Comb.	UL 1449
			Ringwave 6kV, 500A	Wave 20kV, 10kA	Fourth Edition VPR Rating
120/240	L-N	150	490	980	700
120/208	L-G	150	570	980	700
	N-G	150	640	1170	700
	L-L	300	500	1600	1200
277/480	L-N	320	450	1420	1200
	L-G	320	540	1540	1200
	N-G	320	570	1600	1000
	L-L	552	530	2600	2000

- E. Electrical Noise Filter: each unit shall include a high performance EMI/RFI noise rejection filter with a maximum attenuation of 54dB per MIL-STD-220B.
- SPD shall include a EMI/RFI noise rejection filter for all L-N modes as well as a removable filter in the N-G mode.
- F. The unit shall be able to prevent common temporary overvoltages and high impedance faults from damaging the MOVs, increasing their longevity and ability to protect the critical load. Limited and intermediate current TOVs (as specified in UL 1449 article 39.3 and 39.4) can be caused by a loss of the neutral conductor in a split phase or three phase power system. The available fault current will be determined by the impedance of the loads connected to the phases opposite the SPD and are typically in the range of 30A to 1000A. The Selenium elements must limit voltage to the MOV as a percent of nominal as outlined below:

Overvoltage seen by MOVs as % of Nominal				
Time	Available current			
	30A	100A	500A	1000A
1 cycle	120%	130%	150%	160%
10 cycles	130%	150%	160%	160%
30 cycles	140%	150%	160%	160%

*To verify damage to the MOVs has been mitigated, the percent overvoltage seen at the MOV must be less than 200% for split-phase applications or 173% for three-phase applications (100% is nominal).

- G. The unit shall be able to withstand multiple TOVs without damage to the MOVs by shunting current away from the MOVs during the overvoltage. SPD must have the ability to withstand >100 TOVs with a source current of 30A, duration of 30 cycles, with 10s between TOV events.
- H. The service entrance protector shall incorporate a combination of TPMOV and Selenium technology allowing for transient surge and temporary over voltage protection.
- I. Integral Disconnect Switch (IF REQUIRED)
- The device shall have an optional NEMA compliant safety interlocked integral disconnect switch with an externally mounted metal manual operator.
 - The switch shall disconnect all ungrounded circuit conductors from the distribution system to enable testing and maintenance without interruption to the facility's distribution system.
 - The switch shall be rated for 600Vac.
 - The SPD device shall be tested to UL1449 4th Edition listed with the integral disconnect switch and the UL1449 VPR ratings shall be provided.
 - The integral disconnect switch shall be capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.
 - The line side of the integral disconnect shall be blocked off so that when the SPD is opened there is no direct access to the voltage present on the line side of the disconnect.
- J. The UL1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.
- K. The UL1449 Nominal Discharge Surge Current Rating shall be 20kA
- L. The SCCR rating of the SPD shall be 200kAIC without the need for upstream over current protection.
- M. The SPD shall be listed as Type1 SPD, suitable for use in Type1 or Type2 applications.
- N. The SPD shall have the following monitoring options.
- Time/Date stamp, duration and magnitude for the following power quality events (sags, swells, surges, dropouts, outages, THD, frequency, Volts RMS per phase)
 - SPD monitoring shall track surge protection and display it as a percentage of remaining protection.
 - SPD shall provide a surge counter with three categories to be defined as

- Low Level surge (100A-500A) Medium Level surge (500A-3,000A) High Level surge (>3,000A)
4. Remote communications via ModBus or Ethernet

Part 3—Execution/Installation

- 3.1 The SPD manufacturer's technician shall perform a system checkout and start-up in the field to assure proper installation, operation and to initiate the warranty of the system. The technician will be required to do the following:
 - A. Verify voltage clamping levels utilizing a diagnostic test kit, comparing factory readings to installed readings.
 - B. Verify N-G connection.
 - C. Record information to a product signature card for each product installed.
- 3.2 Unit may be installed on either the line or load side of the main service disconnect. If installed on the line side unit shall be installed with an integral disconnect. If installed on the load side the unit shall be installed on the largest breaker size available. If installed lead length exceeds 5' installer shall use a low impedance (HPI) cable to reduce the lead lengths effect on the installed performance of the SPD.

Part 4— Product Warranty

- 4.1 Warranty on defective material and workmanship shall be for 20 years.
- 4.2 Copy of warranty to be sent with submittal.