

SECTION 166XX SURGE PROTECTIVE DEVICES (SPD)

PART 1 GENERAL

1.01 DESCRIPTION:

- A. This section describes the materials and installation requirements for panel mounted SURGE PROTECTIVE DEVICES (SPD's, also known as Transient Voltage Surge Suppressors, or TVSS) as shown on the drawings and herein specified.

1.02 RELATED SECTIONS:

- A. General Electrical Requirements.
- B. Basic Electrical Materials and Methods.
- C. Building Wire and Cable.
- D. Switchboards.
- E. Panelboards.

1.03 REFERENCES:

- A. ANSI/IEEE C62.41-1991 and C62.45-1992.
- B. National Electrical Manufacturers Association (NEMA LS1).
- C. National Fire Protection Association (NFPA 70).
- D. Underwriters' Laboratories (UL 1449 and 1283).

1.04 SUBMITTALS:

- A. Submit shop drawings for equipment and component devices under provisions of Section []
- B. For each SPD device indicated:
 - 1. Product Data Sheets in NEMA LS-1 format - Publication for Low Voltage Surge Protection Devices (SPDs).
 - 2. Installation and Operating Instructions.
 - 3. UL 1449 Edition 2 (Feb 2007 compliance or later) Listing Certificate.
 - 4. Let-through voltage test results to ANSI IEEE C62.41 Cat B3 and C3 Combination waves (at 180 deg or without superimposed nominal AC voltage).
 - 5. Independent test report showing product meets manufactures claimed single shot surge rating.

1.05 ACCEPTABLE MANUFACTURERS:

- A. The following manufacturers meet or exceed these specifications and will be approved. Additional manufacturers will be approved upon compliance with these specifications and based on proper compliance and submittal with Section 2.01 (and all subsections) and Section 1.04 of this specification:
 - 1. Omega Power
 - 2. Other manufacturers approved by engineering in writing 10 days prior to bid date of project.

1.06 WARRANTY:

- A. The manufacturer shall warrant the panel unit SPD against defects in material and workmanship for period of 10 years.

- B. “Acts of Nature” or similar statements typically exclude warranty claims resulting from lightning damage. Since the SPD shall be exposed to such threats, any product with such warranties **shall not be accepted**. Only products with warranties that include replacement due to abnormal over-voltage, excess surge or lightning current and product aging (due to excessive transient activity) shall be accepted.

PART 2 PRODUCTS:

2.0.1 GENERAL REQUIREMENTS:

- A. SPD shall be listed to UL 1449 Edition 2 (Feb 2007 or later), cUL, and UL 1283.
- B. SPD shall protect all modes via L-N, L-G and N-G modes of protection. For Delta power systems L-L and L-G protection modes shall be provided, with the ability to configure L-G to L-L for ungrounded systems.
- C. Independent certification shall be provided proving that the SPD meets the required 8/20µs per phase single shot surge rating, without failure of any fusing, disconnects or surge module. Bypassing of any fusing/disconnects for purpose of this test is **not** acceptable.
- D. Each mode of the SPD shall be rated to exceed the life cycle testing of ANSI/IEEE C62.45 by withstand of at least 200 operations at 3kA 8/20µs without failure.
- E. Each mode of the SPD shall be rated to meet or exceed the life cycle testing of ANSI/IEEE C62.45 by withstand of at least 20 operations at 20kA 8/20µs without failure. (see In Rating definition)
- F. SPD shall be Listed for application on systems with short circuit fault currents of up to 200 kAIC. Default UL 1449, 10kAIC compliance is not acceptable.
- G. SPD shall be capable of withstanding **multiple** temporary over-voltage per UL 1449 Ed 2 Section 36 “Overvoltage Test”, & 37 “Abnormal Overvoltage Tests” without failure or need to reset or replace modules/fuses. Independent Test Lab reports will be required to prove compliance with this section.
- H. Multiple Metal Oxide Varistors (MOV) per phase shall be used, each with individual thermal disconnect devices bonded directly to the MOV substrate for rapid and automatic disconnection of any MOV exhibiting excessive temperature. The following are **not** acceptable:
 1. SPD’s without thermal fuses/disconnects.
 2. SPD’s with shared thermal devices that disconnect more than one MOV.
- I. For safety the SPD shall have a maximum continuous operating voltage (MCOV) of at least:

Power System	MCOV (L-N)
Single phase (2W+G) 120V	170V
Single phase (2W+G) 220-240V	310V
Single phase (3W+G) 120/240 WYE	170V
Three phase (4W+G) 120/208 WYE	170V
Three phase (4W+G) 220/380 WYE	310V
Three phase (4W+G) 277/480 WYE	310V
Three phase (4W +/-G) 120/240V High Leg Delta	170V L-L
Three phase (3W +/-G) 240V Delta	275V L-L
Three phase (3W +/-G) 480V Delta	528V L-L

- J. Enclosure shall:
 1. All panel mounted SPD’s shall feature all metal NEMA 4 enclosures suitable for outdoor usage. Plastic and/or non outdoor rated enclosures are **not acceptable**.
 2. SPD depth shall be less than 3.5” to allow mounting within wall cavity with optional flush mount kit.

- 3. SPD width shall be less than 5” to enable installation between adjacent electrical enclosures.

2.02 TYPE I:

SPD shall be installed at all AC service entrances of each building and/or as shown on the drawings.

- A. SPD shall incorporate 200kA 8/20µs MOV protection per phase.
- B. The status of the each **individual mode** of protection shall be separately monitored and displayed externally (without opening SPD) via a mechanical flag status indication for each mode, and a LED status indication per phase. A reduction in capacity below the manufacturer’s predetermined level shall operate a Form-C alarm contact (dry contact) and Audible Alarm.
- C. Built in disconnect with replaceable cartridge 200 kAIC fusing.
- D. Replaceable surge components (MOV modules) that can be serviced or removed without disconnecting hard wire connections.
- E. Nominal Discharge current I_N per phase – 20 – 80kA 8/20µs impulses per line.
- F. The following clamping voltages (L-N) shall not be exceeded by the SPD:

Impulse standard (no AC applied)	Voltage rating			
	120/240V 120/208V	220/380V	277/480V	347/600V
ANSI/IEEE C62.41 Cat B3 3kA	510V	1050V	1050V	1640V
ANSI/IEEE C62.41 Cat C3 10kA	710V	1240V	1240V	1520V

- G. At least 35db @100kHz EMI/RFI shall be provided L-N (L-L for Delta units). To avoid unsafe ground leakage current, no filtering shall connect to ground (sine wave tracking across ground modes is not acceptable).
- H. Omega Power FDC M Series or similar meeting these specifications.

2.03 TYPE II:

SPD shall be installed at distribution panels and/or smaller ampacity service entrances and/or as shown on drawings

- A. SPD shall incorporate 100kA 8/20µs MOV protection per phase.
- B. The status of the each **individual mode** of protection shall be separately monitored and displayed externally (without opening SPD) via a mechanical flag status indication for each mode, and a LED status indication per phase. A reduction in capacity below the manufacturer’s predetermined level shall operate a Form-C alarm contact (dry contact) and Audible Alarm.
- C. Built in disconnect with replaceable cartridge 200 kAIC fusing.
- D. Replaceable surge components (MOV modules) that can be serviced or removed without disconnecting hard wire connections.
- E. Nominal Discharge current I_N per phase – 20 – 40kA 8/20µs impulses per line.
- F. The following clamping voltages (L-N) shall not be exceeded by the SPD:

Impulse standard (no AC applied)	Voltage rating			
	120/240V 120/208V	220/380V	277/480V	347/600V
ANSI/IEEE C62.41 Cat B3 3kA	500V	1050V	1050V	1270V
ANSI/IEEE C62.41 Cat C3 10kA	690V	1270V	1270V	1470V

G. At least 25db @100kHz EMI/RFI shall be provided L-N (L-L for Delta power systems). To avoid unsafe ground leakage current, no filtering shall connect to ground (sine wave tracking across ground modes is not acceptable).

H. Omega Power FDB M series or similar meeting these specifications.

2.04 TYPE III:

SPD shall be installed at additional specific locations as shown on drawings on distribution and/or branch panels and/or circuits that feed equipment.

A. SPD shall provide 50kA or 100kA 8/20μs surge rating (I_{max}) per phase depending on the specifications and exposure levels per location and the approved drawings.

B. Replaceable cartridge 200 kAIC fusing.

C. SPD status for each phase shall be continuously monitored and displayed

D. Nominal Discharge current I_N per phase – 20 – 20kA 8/20μs impulses per line (50kA SPD) and -20- 40kA 8/20μs impulses per line (100kA SPD).

E. The following clamping voltages (L-N) shall not be exceeded by the SPD:

Impulse standard (no AC applied)	Voltage rating			
	120V 120/240V 120/208V	240V 220/380V	277/480V	347/600V
ANSI/IEEE C62.41 Cat B3 3kA	560V	920V	1200V	1420V
ANSI/IEEE C62.41 Cat C3 10kA	770V	1080V	1430V	1660V

F. Omega Power FDA C (Compact) Series (50 kA/phase) or FDB C (Compact) Series (100kA/phase) or similar meeting these specifications.

PART 3 EXECUTION:

3.01 INSTALLATION:

A. At locations indicated on drawing(s), install SPD in full accordance with manufacturer's written instructions and comply with all applicable codes and be installed by a licensed electrician.