

For the Specification of Surge Protective Devices for Overvoltage/Surge Protection

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This document contains surge protective device master specifications for general SPD application in accordance with the prevailing UL/NEC[®] surge and data signal protection standards

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Scope:

The work required under this division shall include all materials, labor and accessories required to install complete overvoltage surge suppression for protecting building electrical and electronic systems from line- and electromagnetic-induced transient voltage surges and coupled lightning discharged transients as indicated on drawings or as specified in this section.

References:

The following standards and publications referenced in various parts of this specification shall apply:

- A. UL 1449 3rd Edition; effective September 2009, Standard for Safety for Surge Protective Devices
- B. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low Voltage AC Power Circuits
- C. IEEE C62.62, Standard Test Specifications for Surge Protective Devices
- D. CSA - CSA C22.2 No. 8-M1986, C233.1-87 for SPD
- E. UL 497B for data signal surge protective devices

Submittals:

To establish the types and operating characteristics of the surge protective devices, Bussmann is used in determining the functions and ratings of the surge protection devices. Other equipment will be considered for approval provided the following are submitted in writing to the engineer and received by the engineer 14 calendar days prior to the bid date:

1. Manufacturer's compliance to specifications
2. Dimensioned drawings of each device

Qualifications:

Type 2 Recognized DIN-Rail SPD

1. All surge protective devices shall be manufactured by an ISO-9001 registered company normally engaged in the design, development and manufacture of such devices for electrical and electronic system equipment protection. The said manufacturer shall offer a five-year (5) warranty for its DIN-Rail surge protective devices.
2. To prevent misapplication, the DIN-Rail surge protective device base and modules shall be keyed by voltage ratings and color coded by applications as listed below:
 - a. Black – UL 1449 3rd Edition for UL 508A, control panel applications with high Short-Circuit Current Ratings (SCCRs)
 - b. Yellow – Photovoltaic (DC) UL and IEC applications
 - c. Blue – UL non-SCCR AC/DC low voltage power and control applications for UL 508A and control panels
 - d. Grey- UL 497B for data signal communication applications for coax cable, RJ45/Ethernet and twisted pair instrumentation and signal applications
3. The DIN-Rail SPDs requiring SCCR shall have the following product information marked on the front of the SPD base:
 - a. Part No (SPD complete assembly part number)
 - b. Short-Circuit Current Rating
 - c. UL Type 4 Component Assembly for Type 2 applications
4. Surge protective device agency information: SPDs shall be "Recognized" by Underwriters Laboratories, Inc. and shall exhibit the UL Recognized Mark for the UL category VZCA2 for USA and/or VZCA8 for Canada, and must have CSA certification for Canada.
5. Manufacturers must provide performance test data/report for applicable UL and CSA standards.
6. DIN-Rail surge protective devices shall be located and installed in accordance with all applicable agency, NEC® and local code requirements. The SPD devices shall be installed on the downstream side of the service entrance Overcurrent Protective Device (OCPD).

7. All high SCCR DIN-Rail SPDs shall:

- a. Match voltage and system specific requirements as provided by the manufacturer
- b. Provide suppression for both normal mode (L-N [Wye], L-L [Delta]) and common mode (L+N-G [Wye])
- c. Have a Surge Current Capacity, I_{max} , of at least 40kA
- d. Have SCCRs of 200kA, except that 347wye/600V, 240/480V Highleg Delta and 347V single-phase SPDs shall have a minimum SCCR of 125kA
- e. Use MOV technology with Thermal Disconnect
- f. Be recognized to UL 1449 3rd Edition for UL Type 2 applications
- g. Be RoHS compliant

8. SPD status monitoring shall be provided by local visual indication and, if needed, by remote contact signaling using an optional Form C contact relay.

Hardwired Listed Type 1 and Type 2 SPDs for Main Switchgear and Switchboards

1. All Type 1 surge protective devices shall be manufactured by a single ISO-9001 registered company normally engaged in the design, development and manufacture of such devices for electrical distribution system/ equipment protection. Surge protective devices shall be UL Listed with a Short-Circuit Current Rating of 200kA, Nominal Discharge Current (I_n) of 20kA, and Surge Current Capacity (I_{max}) of 120kA, 200kA, 300kA or 400kA. These SPDs shall be installed in accordance with the NEC® and/or local code requirements. The said manufacturer shall offer a Ten-year (10) warranty for its Type 1 and Type 2 surge protective devices.
2. The hardwired surge protective device shall have specifications as shown below:
 - a. The Maximum Continuous Operating Voltage (MCOV) shall not exceed 25% on Wye and 40% on Delta systems of the nominal voltage (system voltage) in the configuration being used
 - b. Prewired NEMA 1 or NEMA 4X factory sealed enclosure suitable for the intended installation location
 - c. Shall have a two color LED status indicator per phase
 - d. Have an operating temperature range of at least -40°C to +50°C
 - g. When required, available with options
 - EMI/RFI filtering with a minimum of 40 db attenuation from 10kHz to 100MHz and Form C contact relay (Type 2 device acceptable)
 - Surge counter (Type 2 device acceptable)
 - h. Only use thermally protected MOV technology, such as Bussmann SurgePOD™.
3. Surge Protective Device Agency Information: SPDs shall be "Listed", cULus Listed, by Underwriters Laboratories, Inc. to UL1449 3rd Edition as a Type 1 or Type 2 device and shall exhibit the UL Listing mark for the UL category VZCA for USA and/or VZCA2 for Canada; and must have CSA certification for Canada.
4. Manufacturers must provide performance test data/report for applicable UL and CSA standards.
5. All SPDs must be RoHS compliant.
6. Surge protective devices shall be installed and located in accordance with all applicable agency, NEC® and local code requirements. The SPDs must be suitable for the particular installation, be it on the upstream side (Type 1) or downstream side (Type 1 or Type 2) of service entrance Overcurrent Protective Device (OCPD).

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7. All SPDs shall match voltage and system specific requirements as provided by the manufacturer.
8. All SPDs shall provide surge protection for both normal mode (L-N [Wye], L-L [Delta]) and common mode (L+N-G [Wye] or L-G [Delta]).
9. The SPDs shall not utilize "crow-bar" components such as Thyristors, Triacs, or Thyratrons or similar activating devices.
10. Surge protective device shall be clearly marked with specifications as required by UL 1449 3rd Edition along with UL holographic label on the SPD.
11. Each surge protective device should be serial numbered along with barcode for easy identification and traceability.

Hardwired Listed Type 1 and Type 2 SPDs for Panelboards

1. All Type 1 and Type 2 surge protective devices shall be manufactured by a single ISO-9001 registered company normally engaged in the design, development and manufacture of such devices for electrical distribution system/ equipment protection. Surge protective devices shall be UL Listed with a Short-Circuit Current Rating of 200kA, Nominal Discharge Current (I_n) of 20kA, and a Surge Current Capacity (I_{max}) of at least 50kA. The said manufacturer shall offer a minimum five-year (5) warranty for its Type 1 or Type 2 surge protective devices.
2. The hardwired surge protective device shall have specifications as shown below:
 - a. The Maximum Continuous Operating Voltage (MCOV) shall not exceed 25% on Wye systems or 40% on Delta systems of the Nominal Voltage (system voltage) in the configuration being used
 - b. A NEMA 1 or NEMA 4X enclosure suitable for the intended installation location
 - c. Shall use thermally protected MOV technology such as Bussmann SurgePOD™
 - d. Shall have two color LED status indicators for operating state status
 - e. Have an operating temperature range of -40°C to at least +50°C
 - f. When required, available with options
 - EMI/RFI filtering with a minimum of 40 db attenuation from 10kHz to 100MHz and Form C contact relay (Type 2 device acceptable)
 - Surge counter (Type 2 device acceptable)
3. Surge Protective Device Agency Information: SPDs shall be "Listed", cULus Listed, by Underwriters Laboratories, Inc. to UL 1449 3rd Edition as a Type 1 or Type 2 device and shall exhibit the UL Listing mark for the UL category VZCA for USA and/or VZCA7 for Canada; and should have CSA or cUL certification for Canada.
4. Manufacturers must provide third-party verification of performance data for UL and CSA/cUL standards.
5. All SPDs must be RoHS compliant.
6. Type 1 and Type 2 surge protective devices shall be installed and located in accordance with the all applicable agency, NEC® and local code requirements.
7. All SPDs shall match voltage and system specific requirements as provided by the manufacturer
8. All SPDs shall provide surge protection for both normal mode (L-N [Wye], L-L [Delta]) and common mode (L+N-G [Wye] or L-G [Delta]).

9. The SPDs shall not utilize "crow-bar" components such as Thyristors, Triacs, or Thyratrons or similar activating devices.

10. Surge Protective Device shall be clearly marked with specifications as required by UL 1449 3rd Edition along with UL holographic label on the SPD.

11. Each surge protective device should be serial numbered along with barcode for easy identification and traceability.

Type 1 or Type 2 SPDs for Emergency Panelboards and Switchboards (NEC® Article 700.8)

If Hardwired Listed Type 1 or Type 2 Surge Protective Devices are used:

1. Provide UL Listed surge protective devices with a Short-Circuit Current Rating of 200kA, Nominal Discharge Current (I_n) of 20kA, and a Surge Current Capacity (I_{max}) of at least 50kA.
2. The UL listed Type 1 or Type 2 SPD shall conform to the following:
 - a. The MCOV shall not exceed 25% on Wye systems and 40% on Delta systems of the Nominal Voltage (system voltage) in the configuration being used
 - b. A NEMA 1 or NEMA 4X enclosure suitable for the intended installation location
 - c. Shall use thermally protected MOV technology such as Bussmann SurgePOD™
 - d. Shall have a two color LED status indicator for operating status
 - e. Have an operating temperature range of -40°C to a minimum +50°C
 - f. Nominal Discharge Current (I_n) of 20kA
 - g. When required, available with options
 - EMI/RFI filtering with a minimum of 40 db attenuation from 10kHz to 100MHz and Form C contact relay (Type 2 device acceptable)
 - Surge counter (Type 2 device acceptable)
4. Surge protective device agency information: SPDs shall be "Listed" by Underwriters Laboratories, Inc. to UL 1449 3rd Edition as a Type 1 or Type 2 device and shall exhibit the UL Listing mark for the UL category VZCA for USA and/or VZCA2 for Canada, and should have CSA or cUL certification.
5. All SPDs must be RoHS compliant
6. Type 1 and Type 2 surge protective devices to be located and installed in accordance with the all applicable agency, NEC® and local code requirements.
7. All SPDs shall match voltage and system specific requirements as provided by the manufacturer.
8. All SPDs shall provide surge protection for both normal mode (L-N [Wye], L-L [Delta]) and common mode (L+N-G [Wye] or L-G [Delta]).
9. The SPDs shall not utilize "crowbar" components such as Thyristors, Triacs, or Thyratrons or similar activating devices.
10. Each surge protective device should be serial numbered along with barcode for easy identification and traceability and be clearly marked with specifications indicating it is suitable for UL applications with Short-Circuit Current Rating requirements.

If DIN-Rail Surge Protective Devices are used:

1. Be UL 1449 3rd Edition Recognized for UL Type 2 applications. Products at 48 volts AC/DC and below may be UL 1449 3rd Edition Recognized for Type 3 applications.
2. Provide suppression for both normal mode (L-N [Wye]) and common mode (L+N-G [Wye]).
3. Have a Surge Current Capacity (I_{max}) of at least 40kA
4. Have a Nominal Surge Current Rating (I_n) of 20kA.
5. Have SCCRs of 200kA, except that 347Y/600V, 240/480V Highleg Delta and 347V single-phase SPDs shall have a minimum SCCR of 125kA.
6. Use MOV technology with thermal disconnect.
7. Be RoHS compliant.
8. SPD status monitoring shall be provided by local visual indication and, if needed, by remote contact signaling using an optional Form C contact relay.

Data Signal SPDs for Video Surveillance Applications

Video Surveillance Application using Coax Cable and Ethernet/CAT 6/RJ45 Cable connected systems and Power over Ethernet (PoE)

Applications with:

- a. Coaxial cable connected systems

All SPDs must meet the following requirements:

1. Video camera shall be protected via indirect shielded SPD at the camera head and direct shielded SPD at the Video System end.
2. Nominal system voltage 5V with Maximum Continuous Operating Voltage (MCOV) 6.4V
3. UL 497B Listed
4. Capacitance shield – PG (physical ground) rating for the indirect shielded SPD to be $\leq 20\text{pF}$
5. Capacitance line-shield rating for both direct and indirect shielded SPD to be $\leq 25\text{pF}$
6. SPD shall be DIN-Rail or panel mountable
7. SPD shall have five year product warranty
8. SPD shall have IP10 degree of protection
9. SPD shall have an insertion loss at 300MHz of $<3\text{db}$
10. SPD enclosure shall be metallic material
11. SPD shall have an operating temperature range of -40°C to $+80^{\circ}\text{C}$
12. SPD shall provide grounding means via DIN-Rail/bracket

b. RJ45 for Power over Ethernet (PoE) systems

All SPDs must meet the following requirements:

1. Video camera shall be protected via an indirect grounded SPD at the camera head and direct grounded SPD at the video system end.
2. Maximum Continuous Operating Voltage (MCOV) 57Vdc
3. UL 497B Listed
4. Capacitance line-to-line $\leq 30\text{pF}$
5. Capacitance line-to-PG (physical ground) $\leq 25\text{pF}$
6. SPD shall be DIN-Rail or panel mountable
7. SPD shall have five year product warranty
8. SPD shall have IP10 degree of protection
9. SPD shall have an insertion loss of $\leq 3\text{db}$ with a frequency range up to 250MHz with all four (1/2, 3/6, 4/5, 7/8) pairs protected with gas discharge tubes and an adapter filter matrix.
10. SPD enclosure shall be metallic material
11. SPD shall have an operating temperature range of -40°C to $+80^{\circ}\text{C}$
12. SPD shall provide grounding means via DIN-Rail/bracket

Applications using RJ45 Connected Systems (Gigabit Ethernet, ATM, ISDN, VoIP and CAT 6)

All SPDs must meet the following requirements:

1. Application shall be protected via shielded SPD at the both ends of the RJ45 cable feeding the equipment.
2. Maximum Continuous Operating Voltage (MCOV) 48Vdc
3. UL 497B Listed
4. Capacitance line-to-line $\leq 30\text{pF}$
5. Capacitance line-to-PG (physical ground) $\leq 25\text{pF}$
6. SPD shall be DIN-Rail or panel mountable with supplied bracket
7. SPD shall have five year product warranty
8. SPD shall have IP10 degree of protection
9. SPD shall have an insertion loss of $\leq 3\text{db}$ with a frequency range up to 250MHz with all four (1/2, 3/6, 4/5, 7/8) pairs protected with gas discharge tubes and an adapter filter matrix.
10. SPD enclosure shall be made of metallic material
11. SPD shall have an operating temperature range of -40°C to $+80^{\circ}\text{C}$
12. SPD shall provide grounding means via DIN-Rail/bracket

PV SPD for Photovoltaic Applications

1. All surge protective devices shall be manufactured by an ISO-9001 registered company. The manufacturer shall offer a minimum two (2) year warranty for its DIN-Rail surge protective devices.

2. To prevent misapplication, any DIN-Rail surge protective device with modules shall be keyed by voltage ratings and color coded by applications as listed below:

Yellow = photovoltaic (PV) application

3. The DIN-Rail SPDs shall have the UL ratings (V_o , MCOV, I_n , UL Recognized logo) and IEC rating (U_c , I_n , U_p , CE logo) marked separately on the module for clear identification

4. SPD Modules should have *easyID*™ local visual indicator for SPD status check (Green: OK, Red: Replace) and optional Form C contact relay for remote monitoring.

5. Surge protective device agency information: SPDs shall be "Recognized" by Underwriters Laboratories, Inc. and shall exhibit the UL Recognized Mark for the UL category VZCA2 for the USA. It should also meet EN 50539-11 requirements for IEC applications/global applications.

6. Manufacturers must be able to provide performance test data/report for UL Recognition.

7. SPD should meet the following ratings per UL 1449 3rd Edition:

a. Minimum nominal discharge current rating (I_n) of 20kA

8. SPD should be RoHS compliant

Water/Waste Water Surge Protection Device Specification

Variable Frequency Drives

All variable frequency drives of 25Hp and above shall have surge protective devices installed per requirements below.

If using DIN-Rail Type 2 surge protective devices:

1. Be UL 1449 3rd Edition Recognized for UL Type 2 applications. Products at 48 volts AC/DC and below may be UL 1449 3rd Edition Recognized for Type 3 applications.
2. Provide suppression for both L-L and L-G modes.
3. Have a Surge Current Capacity (I_{max}) of at least 40kA.
4. Have a Nominal Surge Current Rating (I_n) of 20kA.
5. Have SCCRs of 200kA, except that 347Y600V, 240/480V Highleg Delta and 347V single-phase SPDs shall have a minimum SCCR of 125kA.
6. Use MOV technology with thermal disconnect.
7. Be RoHS compliant.
8. SPD status monitoring shall be provided by local visual indication and, if needed, by remote contact signaling using an optional Form C contact relay.

If using hardwired Listed Type 1 or Type 2 surge protective devices:

1. All Type 1 surge protective devices shall be manufactured by a single ISO-9001 registered company normally engaged in the design, development and manufacture of such devices for electrical distribution system/ equipment protection. Surge protective devices shall be UL Listed with a Short-Circuit Current Rating of 200kA, Nominal Discharge Current (I_n) of 20kA, and a Surge Current Capacity (I_{max}) of at least 50kA. The said manufacturer shall offer a minimum five-year (5) warranty for its Type 1 or Type 2 surge protective devices.
2. The hardwired surge protective device shall have specifications as shown below:
 - a. The Maximum Continuous Operating Voltage (MCOV) shall not exceed 25% on Wye systems or 40% on Delta systems of the Nominal Voltage (system voltage) in the configuration being used

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- b. A NEMA 1 or NEMA 4X enclosure suitable for the intended installation location
 - c. Shall use thermally protected MOV technology such as Bussmann SurgePOD™
 - d. Shall have two color LED status indicators for operating status
 - e. Have an operating temperature range of -40°C to at least +50°C
 - f. When required, available with options
 - EMI/RFI filtering with a minimum of 40 db attenuation from 10kHz to 100MHz and Form C contact relay (Type 2 device acceptable)
 - Surge counter (Type 2 device acceptable)
3. Surge Protective Device Agency Information: SPDs shall be Listed by Underwriters Laboratories, Inc. to UL1449 3rd Edition as a Type 1 or Type 2 device and shall exhibit the UL Listing mark for the UL category VZCA for USA and/or VZCA7 for Canada; and should have CSA or cUL certification.
4. Manufacturers must provide third-party verification of performance data for UL and CSA/cUL standards.
5. All SPDs must be RoHS compliant.
6. Surge protective devices shall be installed and located in accordance with the all applicable agency, NEC® and local code requirements. The SPDs must be suitable for the particular installation, be it on the upstream side (Type 1) or downstream side (Type 1 or Type 2) of service entrance Overcurrent Protective Device (OCPD).
7. All SPDs shall match voltage and system specific requirements as provided by the manufacturer
8. All SPDs shall provide surge protection for both L-L and L-G modes.
9. The SPDs shall not utilize "crow-bar" components such as Thyristors, Triacs, or Thyratrons or similar activating devices.
10. Surge Protective Device shall be clearly marked with specifications as required by UL 1449 3rd Edition along with UL holographic label on the SPD.
11. Each surge protective device should be serial numbered along with barcode for easy identification and traceability.

Control Panels

All Control Panels shall have Surge Protective Devices installed immediately after the main overcurrent device or immediately after the supply conductors to the panel have been terminated. The Surge Protective Device(s) shall follow IEEE C62.41 recommendation for cascading to protect all voltage levels to and including 24 volts AC/DC and shall be as follows:

DIN-Rail Surge Protective Devices shall:

1. Be UL 1449 3rd Edition Recognized for UL Type 2 applications except at 48 volts AC/DC and below may be UL 1449 3rd Edition for Type 3 applications.
2. Provide suppression for both normal mode (L-N [Wye]) and common mode (L+N-G [Wye] or L-G [Delta]).
3. Have a Surge Current Capacity (I_{max}) of at least 40kA.
4. Have a Nominal Surge Current Rating (I_n) of 20kA.
5. Have SCCRs of 200kA, except that 347Y/600V, 240/480V Highleg Delta and 347V single-phase SPDs shall have a minimum SCCR of 125kA.
6. Use MOV technology with thermal disconnect.
7. Be RoHS compliant.
8. SPD status monitoring shall be provided by local visual indication and, if needed, by remote contact signaling using an optional Form C contact relay.

Hardwired Listed Type 1 or Type 2 Surge Protective Devices Shall:

- 1 All Type 1 or Type 2 surge protective devices shall be manufactured by a single ISO-9001 registered company normally engaged in the design, development and manufacture of such devices for electrical distribution system/ equipment protection. Surge protective devices shall be UL Listed with a Short-Circuit Current Rating of 200kA, Nominal Discharge Current (I_n) of 20kA, and Surge Current Capacity (I_{max}) of 120kA, 200kA, 300kA or 400kA. These SPDs shall be installed in accordance with the NEC[®] and/or local code requirements. The said manufacturer shall offer a minimum five (5) year warranty for its Type 1 and Type 2 surge protective devices.
2. The hardwired surge protective device shall have specifications as shown below:

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- a. The Maximum Continuous Operating Voltage (MCOV) shall not exceed 25% on Wye and 40% on Delta systems of the nominal voltage (system voltage) in the configuration being used
- b. Prewired NEMA 1 or NEMA 4X factory sealed enclosure suitable for the intended installation location
- c. Shall have a two color LED status indicator per phase
- d. Have an operating temperature range of at least -40°C to +50°C
- g. When required, available with options
 - EMI/RFI filtering with a minimum of 40 db attenuation from 10kHz to 100MHz and Form C contact relay (Type 2 device acceptable)
 - Surge counter (Type 2 device acceptable)
- h. Only use thermally protected MOV technology, such as Bussmann SurgePOD™.

3. Surge Protective Device Agency Information: SPDs shall be "Listed" by Underwriters Laboratories, Inc. to UL 1449 3rd Edition as a Type 1 or Type 2 device and shall exhibit the UL Listing mark for the UL category VZCA for USA and/or VZCA2 for Canada; and must have CSA certification.

4. Manufacturers must provide verification of performance data for UL and CSA standards.

5. All SPDs must be RoHS compliant.

6. Surge protective devices shall be installed and located in accordance with the all applicable agency, NEC® and local code requirements. The SPDs must be suitable for the particular installation, be it on the upstream side (Type 1) or downstream side (Type 1 or Type 2) of service entrance Overcurrent Protective Device (OCPD).

7. All SPDs shall match voltage and system specific requirements as provided by the manufacturer.

8. All SPDs shall provide surge protection for both normal mode (L-N [Wye], L-L [Delta]) and common mode (L+N-G [Wye] or L-G [Delta]).

9. The SPDs shall not utilize "crow-bar" components such as Thyristors, Triacs, or Thyratrons or similar activating devices.

10. Surge protective device shall be clearly marked with specifications as required by UL 1449 3rd Edition along with UL holographic label on the SPD.

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11. Each surge protective device should be serial numbered along with barcode for easy identification and traceability.