

Guidelines for the Surge Protective Devices Used in ICP UL Certification Requirement Decision

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Standard Number: 508A

Standard Title: Standard for Industrial Control Panels

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Section / Paragraph Reference: Sections 2.48-2.52, 36.3, 47.1, 75.44, 75.8, Table SA1.1, Table SA1.2 and SB4.2

Subject: Surge Protective Devices (SPDs) for use in Industrial Control Panels

DECISION:

2.48 SURGE PROTECTIVE DEVICE (SPD) – A device composed of at least one non-linear component and intended for limiting surge voltages on equipment by diverting or limiting surge current and is capable of repeating these functions as specified. SPDs were previously known as Transient Voltage Surge Suppressors or secondary surge arresters.

2.49 ONE-PORT SPD – A SPD having provisions (terminals, leads, plug) for connection to the ac power circuit but no provisions (terminals, leads, receptacles) for supplying current to ac power loads.

2.50 TWO-PORT SPD – A SPD having provisions (terminals, leads, plug) for connection to the ac power circuit and provisions [terminals, leads, receptacles(s)] for supplying current to one or more ac power loads. SPDs provided with a minimum of two adjacent terminals for each circuit conductor may be considered and tested as a two-port SPD.

2.51 SURGE PROTECTIVE DEVICE (SPD) TYPE DESIGNATIONS – SPD Type designations are as follows:

TYPE 1 – Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service equipment overcurrent device, as well as the load side, including watt-hour meter socket enclosures and intended to be installed without an external overcurrent protective device.

TYPE 2 – Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device - including SPDs located at the branch panel.

TYPE 3 – Point of utilization SPDs, installed at a minimum conductor length of 10 meters (30 feet) from the electrical service panel to the point of utilization, for example cord connected, direct plug-in, receptacle type and SPDs

installed at the utilization equipment being protected. The distance of 10 meters (30 feet) is exclusive of conductors provided with or used to attach SPDs.

TYPE 4 COMPONENT ASSEMBLIES – Component assembly consisting of one or more Type 5 components together with a disconnect (integral or external) or a means of complying with the limited current tests.

TYPE 1, 2, 3 COMPONENT ASSEMBLIES – Consists of a Type 4 component assembly with internal or external short circuit protection. These types are tested and rated based on the intended application as either Type 1, 2 or 3 SPD's.

TYPE 5 – Discrete component surge suppressors, such as MOVs that may be mounted on a PWB, connected by its leads or provided within an enclosure with mounting means and wiring terminations.

2.52 SURGE PROTECTIVE DEVICE (SPD) ELECTRICAL RATINGS

2.52.1 NOMINAL DISCHARGE CURRENT (In) – Peak value of the current, selected by the manufacturer, through the SPD having a current waveshape of 8/20 where the SPD remains functional after 15 surges.

2.5.2.2 MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV) rating - The maximum continuous operating voltage that may be applied between the terminals of a surge protective device (SPD).

2.5.2.3 NORMAL OPERATING VOLTAGE RATING – The voltage rating assigned to a SPD by the manufacturer. For a SPD, other than a Component-SPD, it is generally equal to the nominal value of the voltage of the circuit (for example, 120, 208, 240, 347, 480, or 600 Vrms).

36.3 Surge protective devices (SPDs)

36.3.1 An SPD shall comply with the requirements in the Standard for Surge Protective Devices, UL 1449.

36.3.2 The normal operating voltage rating and MCOV of the SPD shall not be less than the rated circuit Line-to-Line (full phase) voltage.

36.3.4 Where provided, a SPD shall be connected to each ungrounded conductor. The conductors used to connect the SPD to line and to ground shall not be longer than required and shall not have more bends than required by the construction. Line and ground connecting conductors to a SPD shall not be smaller than 14 AWG (2.1 mm²).

36.3.4 A SPD marked with a slash voltage rating shall only be used in a circuit where the source is solidly grounded as noted in 16.3 when voltage is from transformer or power supply provided within the industrial control panel, or by marking the slash voltage rating on the industrial control panel nameplate in accordance with 49.6(a), as appropriate. A SPD marked for use on a delta system, such as "600V delta", can be used on either a wye or a delta system.

47.1 Surge protective devices (SPDs)

47.1.1 A SPD used for overvoltage protection shall comply with the requirements in the Standard for Surge Protective Devices, UL 1449.

47.1.1.1 The normal operating voltage rating and MCOV of the SPD shall not be less than the rated circuit Line-to-Line (full phase) voltage.

47.1.1.2 A protector for data communications and fire-alarm circuits shall comply with the Standard for Protectors for Data Communications and Fire-Alarm Circuits, UL 497B.

47.1.2 An electromagnetic interference filter, such as an EMI, RFI, or line filter, shall comply with the Standard for Electromagnetic Interference Filters, UL 1283.

47.1.3 A dry-type capacitor that is placed across the line, without other impedances in series, shall comply with the Dielectric Voltage Withstand Test in the Standard for Industrial Control Equipment, UL 508.

47.1.4 A capacitor, an axial lead diode, a transient voltage surge suppressor, and an electromagnetic interference filter shall have a rated voltage not less than the rated circuit voltage. An electromagnetic interference filter shall have a current rating that is not less than the sum of the current ratings of all connected loads or not less than the ampacity of the internal wiring conductors.

75.4.4 A disconnecting means for SPDs, ground fault equipment, and the control circuit for power operated disconnecting means shall not be counted towards the number of disconnecting means allowed by 75.4.3.

75.8 Components on the supply side of the disconnecting means

75.8.1 Other than as specified in 75.8.2 – 75.8.4, components shall not be located on the line side of the service disconnecting means.

75.8.2 A meter socket shall comply with the Standard for Meter Sockets, UL 414 and is able to be located on the line side of the service disconnecting means.

75.8.3 Control circuits for power operable service disconnecting means, or for ground fault protection covered by 75.6, are able to be connected to the line side of the service disconnecting means when provided with disconnecting means and overcurrent protection.

75.8.4 A Type 1 SPD shall comply with the requirements in the Standard for Surge Protective Devices, UL 1449.

Table SA1.1 (Only that part of the table being revised is shown)

Section 36 – Miscellaneous power devices meeting component selection requirements				
36.3.1	Recognized Surge Protective Devices	UL 1449	VZCA2	SPDs that are outside the guidelines of Table SA1.2 must be procedure described.
36.3.1	Listed Surge Protective Devices	UL 1449	VZCA	Type 1, 2 or 3. SPDs that are outside the guidelines of Table SA1.2 must be procedure described

Section 47 - Surge control devices meeting component selection requirements				
47.1.1	Recognized Surge Protective Devices	UL 1449	VZCA2	SPDs that are outside the guidelines of Table SA1.2 must be procedure described.
47.1.1	Listed Surge Protective Devices	UL 1449	VCZA	Type 1, 2 or 3. SPDs that are outside the guidelines of Table SA1.2 must be procedure described
47.1.1.2	Listed Isolated Loop Circuit Protectors	UL 497B	QVGQ	
47.1.1.2	Recognized Isolated Loop Circuit Protectors	UL 497B	QVGQ2	Procedure described

Service Equipment Use – components meeting specific selection requirements				
75.8.4	Surge Protective Devices	UL 1449	VZCA	Type 1 SPD Only.

**Table SA1.2
Use of Surge Protective Devices**

		Type of Surge Protective Device (SPD) – One port only ^a :				
		Listed Type 1	Listed Type 2	Listed Type 3	R/C Type 4 Component Assembly	R/C Type 5
		R/C Type 1 Component Assembly	R/C Type 2 Component Assembly	R/C Type 3 Component Assembly	-	-
					-	-
Location of SPD :						
Service Equipment Supply Side of Overcurrent Protection		w	z	z	z	z
Service Equipment Load Side of Overcurrent Protection		w	w	z	z	z
Non-Service Equipment Feeder or Branch Circuits		w	w	w	z	z
Isolated Control Circuits		w	w	w	w	w
Ratings :						
Service Equipment Supply Side of Overcurrent Protection	V ^b	x	z	z	z	z
	I _n ^c	y	z	z	z	z
Service Equipment Load Side of Overcurrent Protection	V ^b	x	x	z	z	z
	I _n ^c	y	10 kA	z	z	z
Non-Service Equipment Feeder or Branch Circuits	V ^b	x	x	x	z	z
	I _n ^c	y	y	y	z	z
Control Circuits	V ^b	x	x	x	x	x
	I _n ^c	y	y	y	3 kA	3 kA
NOTES: 1. A “w” indicates an allowable location for the SPD. 2. An “x” indicates a Normal Operating Voltage Rating is required as specified in footnote “b” below. 3. A “y” indicates a Nominal Discharge Current Rating as specified in footnote “c” below is not required. 4. A “z” indicates the SPD needs further evaluation to determine suitability and Procedure description is required.						
^a A Two-Port SPD shall be Listed and comply with the ratings specified above for the intended application. In addition, it shall have an appropriate short circuit current rating (SCCR) rating.						
^b V - Normal Operating Voltage Rating - Operating Voltage and MCOV ratings shall be equal to or greater than the applied circuit Line-to-Line (full phase) voltage.						
^c I _n (NDC) - Nominal Discharge Current - Amount of peak current "forced" through the device during Surge Testing.						

SB4.2 Short circuit current ratings of individual power circuit components

SB4.2.1 All power circuit components, including disconnect switches, branch circuit protective devices, branch circuit fuseholders, load controllers, motor overload relays, terminal blocks, and bus bars, shall have a short circuit current rating expressed in amperes or kiloamperes and voltage.

Exception No. 1: Power transformers, reactors, current transformers, dry-type capacitors, resistors, one-port SPDs, and voltmeters are not required to have a short circuit current rating.

RATIONALE FOR DECISION

The Standard for Surge Protective Devices (SPDs), UL 1449 created a new rating system for all SPDs, including TVSS, MOVs and surge arresters. The new rating system categorizes SPDs as Types 1 through 5. UL product categories XUHT (2) and OWHX were eliminated and replaced with VZCA (2) which cover devices using the new rating system.

ANSI/IEEE Standard C62.11 covers surge arresters rated over 1kV. Since the scope of UL 508A is limited to 1kV, the references to ANSI/IEEE Standard C62.11 and surge arresters are deleted.

IEEE Standard C62.1 has been withdrawn and there is no replacement. However, since this standard covers Gapped Silicon-Carbide Surge Arresters which would be used in applications where the voltage is greater than 1kV, it can be deleted from UL 508A with no need for replacing it.

The revisions clarify the use of SPDs in industrial control panels as they are not specifically addressed in the current edition (second) of UL508A. The revisions also address the changes to UL 1449 by adding new definitions and requirements for SPDs used in power circuits, control circuits and service equipment.

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