

APPLICATION NOTE

Enabling High Reliability Fire Alarm Systems with Advanced Surge Protective Devices



Bourns® Model 1210 Series
Surge Protective Device



Bourns® Model 1250A Series
Surge Protective Device



Bourns® Model 1260 Series
Surge Protective Device



Bourns® Model 1270 Series
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Bourns® Model 1280 Series
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Bourns® Model 1420A Series
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Introduction

Fire Alarm Systems (FAS) are indispensable safety features in buildings, designed to detect and respond to fires swiftly. These systems consist of interconnected components, including the Fire Alarm Control Panel (FACP), detectors, sensors, manual call points, and alarm signaling devices. Given their critical function, it is imperative that these systems remain operational at all times, especially during emergencies. To enhance the reliability of these mission-critical systems, adding surge protection is an essential requirement.

This application note outlines the many reasons why FAS need effective surge protection. It also provides helpful guidelines for selecting appropriate Surge Protective Devices (SPDs) for each part of the system, where they should be installed, and certification and standard compliance requirements.

Why Surge Protection is Needed

- **Vulnerability to Power Surges:** FAS components are often spread across large areas within a building, and are frequently installed with wiring extending over significant distances. This makes them susceptible to transient overvoltage threats caused by lightning strikes, switching operations, or other electrical disturbances in the power network. These power surges can damage the delicate electronics within the FAS, potentially resulting in system malfunctions or complete failure.
- **Critical Nature of FAS:** The primary function of a Fire Alarm System is to detect fires promptly and activate alarms to safeguard lives and property. Any system downtime caused by surge-induced damage could have devastating consequences. Therefore, protecting the FAS against surges to ensure its continuous and reliable operation needs to be a basic element of its design.
- **Compliance with Safety Standards:** Building codes and fire safety regulations frequently mandate the use of surge protection for vital systems like FAS. Adhering to these standards not only ensures the safety of the building's occupants but also ensures compliance with legal requirements, mitigating potential liabilities.

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Steps in Selecting the Right Surge Protective Device

When selecting the appropriate Surge Protective Devices for a Fire Alarm System, several factors must be considered:

1. Identify the Components that Need Protection

- What are the FAS components that require protection? It is typically recommended that SPDs be installed to protect the Fire Alarm Control Panel (FACP), detectors, signaling devices, and any other critical electronics connected to the system.

2. Determine the Type of Power Supply

- **AC Power Supply:** If the FAS components are powered by an AC supply, choose an SPD rated for the appropriate voltage and current levels. For instance, the FACP and alarm signaling devices often use AC power.
- **DC Power Supply:** If any part of the FAS operates on DC power, such as detectors and sensors, an SPD designed for DC circuits must be selected. It is important that the SPD's nominal voltage and current ratings match those of the DC circuits.

3. Verify the SPD Type for the Installation

- **Type 1 SPD:** Installed at the service entrance to protect against the most severe surges, such as those caused by direct lightning strikes.
- **Type 2 SPD:** Installed at distribution panels to protect against residual surges. Protection at this location is critical to ensure continuous operation of the FACP and other FAS components.
- **Type 3 SPD:** Installed close to sensitive equipment to protect against low-level surges. Type 3 SPDs are well-suited to protect individual detectors, sensors, and manual call points.

4. Consider the Nominal Discharge Current (I_n) and Maximum Discharge Current (I_{max})

- For AC systems, select SPDs with an I_n of at least 10 kA or 20 kA and an I_{max} rating that suits the expected surge environment.
- For DC systems, the SPD should have the appropriate level of I_n and I_{max} to ensure the sensitive components are adequately protected.

5. Compliance with Standards

- Confirm the selected SPDs comply with relevant standards such as UL 1449 for North America designs or IEC/EN 61643 for international applications.

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FAS Installation Guidelines for SPDs

Proper installation of SPDs is essential for their effectiveness in protecting the Fire Alarm System. Below are a few helpful guidelines:

1. Service Entrance Protection

- **Type 1 SPDs:** Install at the building's service entrance. Protection at this location is the primary defense against surges originating outside the building.

2. Distribution Panel Protection

- **Type 2 SPDs:** Install at distribution panels, especially those supplying power to the Fire Alarm Control Panel (FACP). This helps safeguard the FACP from surges that may have bypassed the primary protection at the service entrance.

3. Point-of-Use Protection

- **Type 3 SPDs:** Place Type 3 SPDs near sensitive components, such as detectors, sensors, and manual call points.
- **Minimize Let-Through Voltage:** These devices need to be installed within a short distance from the equipment they are protecting to reduce the risk of let-through voltage.

4. Wiring and Grounding

- **Use Proper Conductors:** Employ short, straight, and thick conductors to connect the SPD to the system. Avoid sharp bends and keep the lead length minimal to reduce impedance, which can diminish the surge protection effectiveness.

5. Regular Inspection and Maintenance

- **Periodic Inspections:** Conduct regular inspections of SPDs for signs of wear or damage. Some SPDs feature failure indicators or remote signaling contacts to notify maintenance personnel of any issues.

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Certifications Required for AC and DC SPDs

SPDs used in FAS must comply with various international and regional standards. Here are the key certifications designers need to know:

UL 1449 (5th Edition)

This certification is recognized in North America and ensures that SPDs meet specific performance requirements for surge protective devices.

IEC/EN 61643-11

This international standard provides requirements for SPDs including installation, testing, and performance criteria intended for use in low-voltage AC power circuits.

IEC/EN 61643-31

This international standard is specific to SPDs used in DC circuits. It is particularly relevant for protecting DC-powered components within the FAS.

CE Marking

This mark indicates that a product complies with European Union health, safety, and environmental requirements.

Other Regional Standards

Depending on where the FAS will be installed, designers may also need to consider regional standards such as CSA (Canadian Standards Association) or AS/NZS (Australian/New Zealand Standards).

Note: Always consult local building codes and fire safety regulations to determine the specific certification required for SPDs in a given jurisdiction.

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FAS SPD Diagram

Below is a diagram illustrating the placement of SPDs within a FAS, including the recommended SPD types for each area of the design.

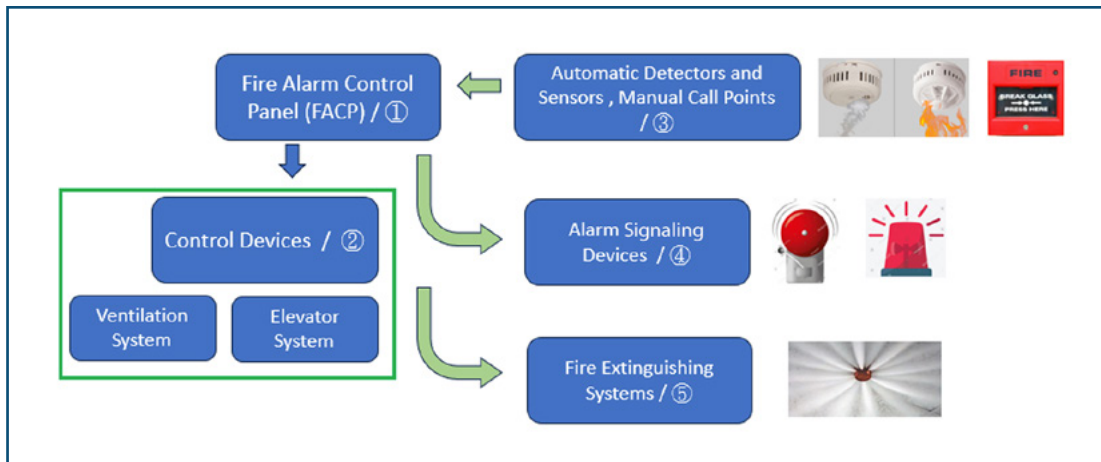


Table 1. | Where SPDs are Installed in a Fire Alarm System

Key Components / Location	Function Description	Suggested Bourns® SPD Series	Standards
1. Fire Alarm Control Panel (FACP)	Central control unit for the fire alarm system; monitors inputs and controls outputs based on the signals received.	1210 Series	UL 1449 5th Ed. Type 1
		1250A Series	UL 1449 5th Ed. Type 2CA
		1260 Series	IEC/EN 61643-11 Class I + II / T1 + T2
2. Control Devices	Manages the operation of other systems (e.g., ventilation, elevators) in response to a fire alarm.	1270 Series	IEC/EN 61643-11 Class I / T1
		1280 Series	IEC/EN 61643-11 Class II / T2
3. Automatic Detectors and Sensors, Manual Call Points	Detects signs of fire (e.g., smoke, heat) and sends a signal to the FACP to trigger the alarm. Allows manual triggering of the fire alarm by building occupants in case of fire.	1420A Series	UL 1449 5th Ed. Type 2CA
		1430 Series	IEC/EN 61643-31 Class I / T1
		1440 Series	IEC/EN 61643-31 Class II / T2
4. Alarm Signaling Devices	Activates audible and visual alarms to alert occupants of a fire.	1250A Series	UL 1449 5th Ed. Type 2CA
		1270 Series	IEC/EN 61643-11 Class I / T1
5. Fire Extinguishing Systems	Activates the fire extinguishing system to suppress the fire automatically.	1280 Series	IEC/EN 61643-11 Class II / T2

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Conclusion

The tips and guidelines provided in this application note are provided to help designers of Fire Alarm Systems specify the appropriate SPDs that will allow them to reduce system failure due to power surges, thereby ensuring continuous protection for life and property.

Bourns' advanced line of SPD products are engineered by leveraging the Company's extensive expertise in the development of discrete circuit protection devices. This allows designers to select from a broad portfolio of SPD solutions designed to protect AC systems, DC power systems, signal and data line circuits, as well as coaxial networks and CATV.

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