



Where to install SPD types 1-2-3 in accordance with UL 1449

Matt Hemphill, Product Marketing Manager – TRABTECH, Phoenix Contact USA

Transient surge events...

They are a problem as old as time itself. Thankfully, our technology has come a long way since the ancient Greeks offered sacrifices to the thunder god, Zeus. Just as our ability to mitigate the damage caused by lightning strikes has advanced, so too have the potential consequences of a surge incident. Today's electronics are especially susceptible to damage caused by both atmospheric- and non-atmospheric-generated surges, and we need to take appropriate measures to safeguard against them.

While lightning-induced surge activity “steals the show” as it draws our attention to it in spectacular fashion, most surge events originate from switching transients that are covertly generated internally within today's modern facilities.

Heavy-duty electrical motors driving elevators, conveyor systems, robotic assembly lines, and other demanding electrical equipment loads are notorious surge generators. Even domestic electrical gadgets, such as vacuum cleaners, hairdryers, coffee pots, copiers, and countless other electrical appliances that we rely on every day, and which most of us take for granted, produce a steady stream of unwanted and disruptive surges. Industries that rely on expensive or sensitive devices, including communications network equipment, programmable logic controllers (PLCs), industrial machines, and other types of highly calibrated machinery are particularly at risk to these surge threats.

Perhaps the magnitude of the disruptive potential of electrical surge events is best stated in an article by EMC Insurance titled “Loss Control Insights: Protect Your Facility from Power Surges.”¹ EMC Insurance says, “Power

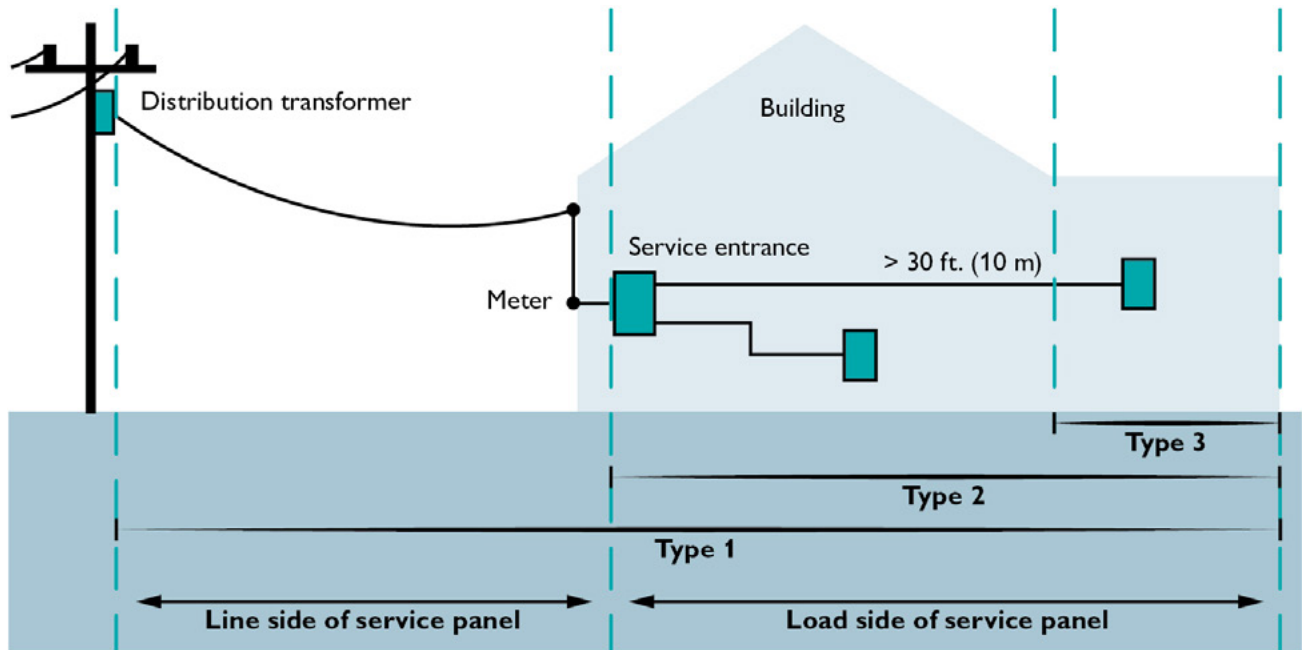
INSIDE:

Type 1	2
Type 2	2
Type 3	2
Conclusion	3
References	3

surges are one of the most severe, common, and immediate dangers to electronic equipment. In fact, Businessweek estimates that power surges cost \$26 billion a year in lost time, equipment repair, and replacement costs.”

That’s why enterprises around the world use surge protective devices (SDP) to protect their assets.

Let’s examine the three primary types of surge protectors that are defined by the ANSI/UL 1449 Standard for Surge Protective Devices.



Type 1

Type 1 SPDs are the most versatile of the bunch. They are constructed with an integral disconnecting mechanism that allows them to install downstream from a transformer on either the line or load sides of the electrical service’s main fuse or circuit breaker. Basically, this means that if they feature the electrical circuit’s required Short Circuit Current Rating (SCCR), they can go anywhere between the AC power source and our equipment loads.

Their job, as with all surge protective devices, is to equalize the surge current between the power conductors to preclude differences in voltage potential from developing between any two points within the protected power circuit.

Type 2

Type 2 SPDs function like their Type 1 counterparts, but they must install downstream of the protected circuit’s main fuse or circuit breaker. They typically connect to the AC power source via dedicated external disconnecting mechanisms.

Type 3

The third primary SPD Type is the one with which you’re probably already familiar. Type 3 surge protective devices are analogous to those “surge strips” you may have at home protecting your desktop computer. They’re compact, localized devices that are installed at least 30 feet (10 meters) downstream from the electrical service’s power distribution panel.

In an industrial context, Type 3 SPDs are used to protect at the power inputs to individual equipment loads. They should be installed as physically close to the protected load device as possible to garner their maximum protection capabilities.

Type 1, 2, and 3 SPDs are UL Listed surge protective devices that can be installed as standalone suppressors within their specified application locations.

ANSI/UL1449 also defines four classes of SPD Component Assemblies.

Type 1, 2, and 3 SPD Component Assemblies are UL Recognized devices that are intended to be installed inside distribution end-use equipment at the factories manufacturing the equipment requiring protection.

While these component assemblies are subject to the same safety testing parameters as their Listed Type, 1, 2, and 3 counterparts, they will be constructed with exposed connection terminals or other “live” components that present touch safety concerns for surrounding personnel. Therefore, they **MUST** be installed inside equipment cabinets or other types of UL Listed assemblies and enclosures the keep them out of harm’s way

Type 4 SPD Component Assemblies can also be used to protect inside UL Listed end-use equipment that is intended to operate in Type 1, 2, or 3 defined service locations. But, they may be subject to additional design parameters and testing requirements to be approved for use in specific service locations.

Type 4 SPDs must be UL rated appropriately for their intended application requirements. For example, an SPD might be constructed and tested to be UL Recognized as a Type 4 Component Assembly that is suitable for use in a Type 2 service location.

Conclusion

Although we want to build redundancy into our systems, we also shouldn’t overdo it. We eventually reach a point of diminishing returns where we only add extra cost without any tangible benefit. We need to find the right balance: not too much, nor too little.

A “best practice” to maximize protection against the surge anomalies that plague high-risk equipment loads is to protect those devices individually with dedicated SPDs that are installed as physically close to the protected load device as possible. By doing so, equipment users can implement lower-cost SPDs main or branch power distribution panels require – but without sacrificing reliability.

If a facility is plagued by intense surge environments, it may require additional layers of protection. In this case, appropriately rated Type 1 and Type 2 surge protective devices can be installed at the main and sub distribution panels, as needed.

References:

1. “Loss Control Insights: Protect Your Facility from Power Surges.” EMC Insurance, <https://www.emcins.com/losscontrol/insights-d/2016/06/power-surges/>. Accessed 17 March 2022.

ABOUT PHOENIX CONTACT

Phoenix Contact develops and manufactures industrial electrical and electronic technology products that power, protect, connect, and automate systems and equipment for a wide range of industries. Phoenix Contact GmbH & Co. KG, Blomberg, Germany, operates 50 international subsidiaries, including Phoenix Contact USA in Middletown, Pa.

For more information about Phoenix Contact or its products, visit www.phoenixcontact.com, call technical service at **800-322-3225**, or e-mail info@phoenixcon.com.