



NFPA 79 Design guide

Surge protection for safety circuits and critical operations

Explanation of standards and codes

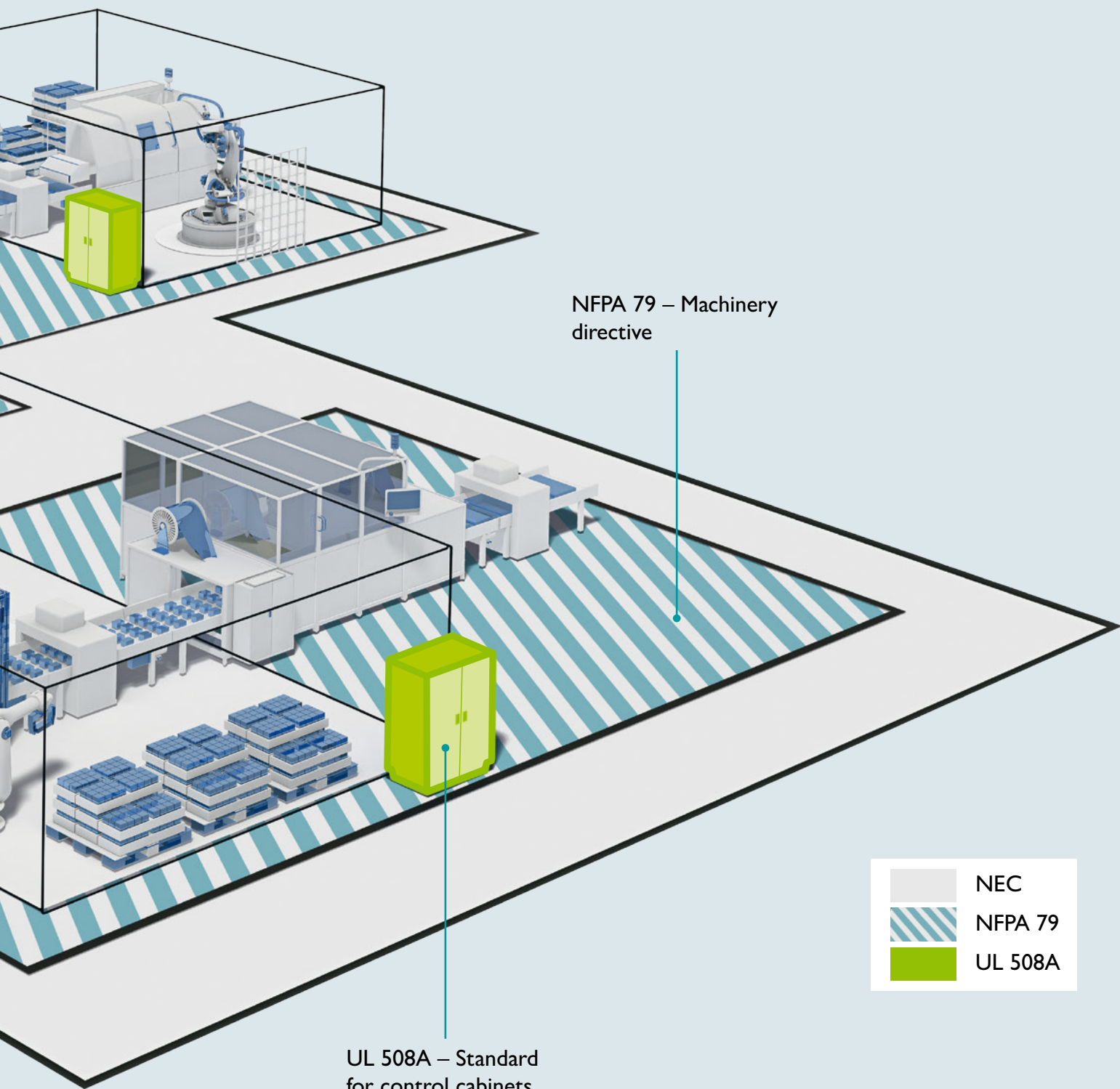
NEC – Installation
regulation

The **National Electric Code (NEC)** is the overarching code that is a regionally adoptable standard for the safe installation of electrical wiring and equipment in the United States. NEC's standards define how to protect persons and property when using electricity. It covers the entire light gray area shown in the illustration.

The **National Fire Protection Association (NFPA) 79** is the electrical standard for industrial machinery. This standard adds specific requirements for the wiring of industrial machinery to protect operators, equipment, facilities, and work-in-progress from fire and electrical hazards. This standard is indicated by the teal/gray hashed area.

Both of these standards refer to the use of UL Listed devices. Many of the listed devices are control cabinets, which are designed to comply with UL 508A, the Standard for Industrial Control Cabinets. The scope of NFPA 79 begins at the supply point of the machinery and ends at the loads in the machinery field. The scope of UL 508A begins at the supply point of the control panel and ends at the field wiring terminals in the machinery field. You can see some of the cabinets highlighted in green. This UL 508A standard provides guidelines for building control cabinets.

Lastly, we have UL 1449, the standard for Surge Protective Devices (SPDs). Products evaluated to this standard are used to protect a single device, a control cabinet, multiple control cabinets, a specific area within a building, or an entire building or plant. SPDs must be Listed to this standard to comply with the requirements of NFPA 79.



NFPA 79 – Q&A

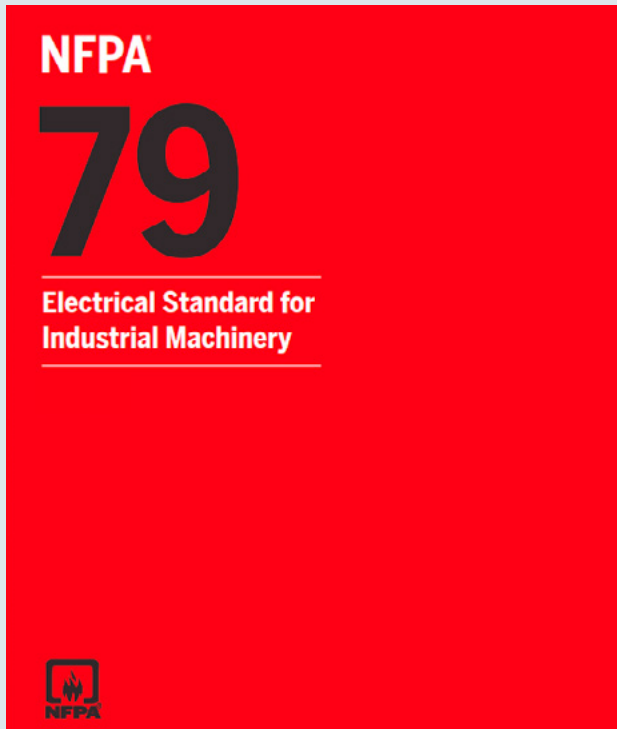
NFPA 79, Electrical Standard for Industrial Machinery, is a complementary document of the National Electrical Code (NEC) that outlines requirements for the protection of operators, equipment, facilities, and work-in-progress. NFPA 79 presents the latest criteria for all types of industrial machinery. The standard is continuously updated to address new technologies and their impact on electrical safety.

The NFPA 79 specifies the use of UL Listed surge protective devices (SPDs) in machines with safety circuits. This specification has been in effect since November 30, 2017 in those areas of the North American market that have adopted NEC 2017. It applies for all industrial machines being placed on the market.

For more information on NFPA 79 visit:

www.phoenixcontact.com/us-NFPA79





What does the NFPA 79 standard regulate?

The NFPA 79 Electrical Standard for Industrial Machinery is a United States standard that defines safety requirements for industrial machinery used in the USA. It regulates electrical and electronic concepts regarding overcurrent protection, cabling, safety circuits, and surge protection in its latest edition. The NFPA 79 is revised every two years. The latest edition was published in 2018. (Note the NEC is updated every three years.)

Where is the directive applicable and what is its scope?

This directive applies to all industrial machines utilized in the USA. The applicable edition of the NFPA 79 Standard varies from state to state and is dependent upon the edition of the National Electrical Code that the specific state/area officially recognizes.

How are the various rule and content differences in the revised Standards being implemented?

Along with the NEC and the NFPA 79 Standards, control cabinets that are installed within industrial machines must also comply with UL 508A. If there are varying demands or overlaps in the requirements called for by these three Standards, the strictest demand among them applies. When recommending overcurrent protection equipment, for example, the lowest value protection requirement that is stated by any of the three Standards must be observed.

Why is surge protection mandatory with NFPA 79?

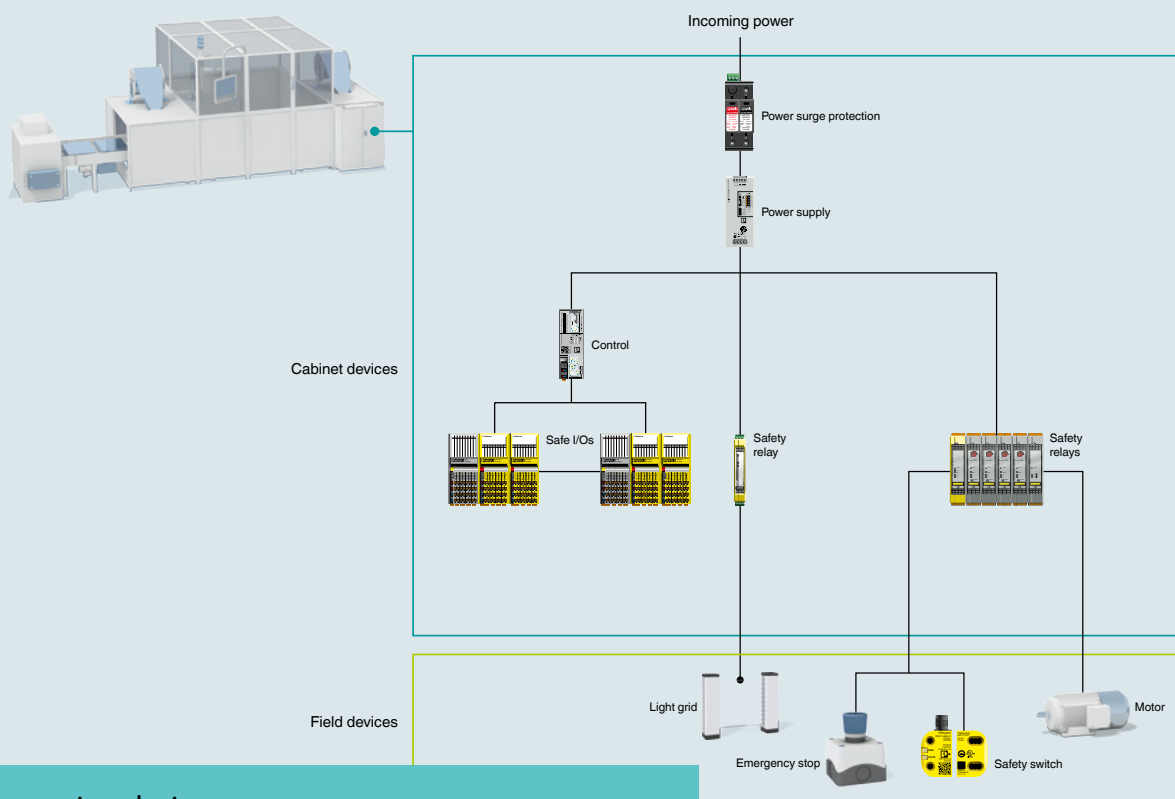
Protection of personnel is a guiding principle of NFPA 79. As such, surge voltages must be suppressed to preclude damage to the safety systems of a machine.

How do I satisfy the demands of NFPA 79 in terms of surge protection?

Power supplies for industrial machines that are equipped with safety circuits, per NEC and NFPA 79, must be fitted with surge protective devices (SPDs). These SPDs must be "UL 1449 Listed" products that feature short-circuit current ratings (SCCR) that are greater than the short-circuit current availability at the SPD's installation location within the electrical distribution.

Required surge protection to meet NFPA 79

To comply with the new requirements, it is important to take note that these standards predominantly focus on the power side of circuits. In order to meet these standards minimally, which may not be enough for some applications, any power supply feeding a safety circuit must be protected. Placing the surge protection before the power supply, as seen in the example below, helps mitigate transients coming from the power lines to the cabinet. The power supply is a point of isolation in the power circuit, therefore, the various devices downstream of the power supply are not susceptible to transients that enter through the AC power.



VAL-US surge protection devices

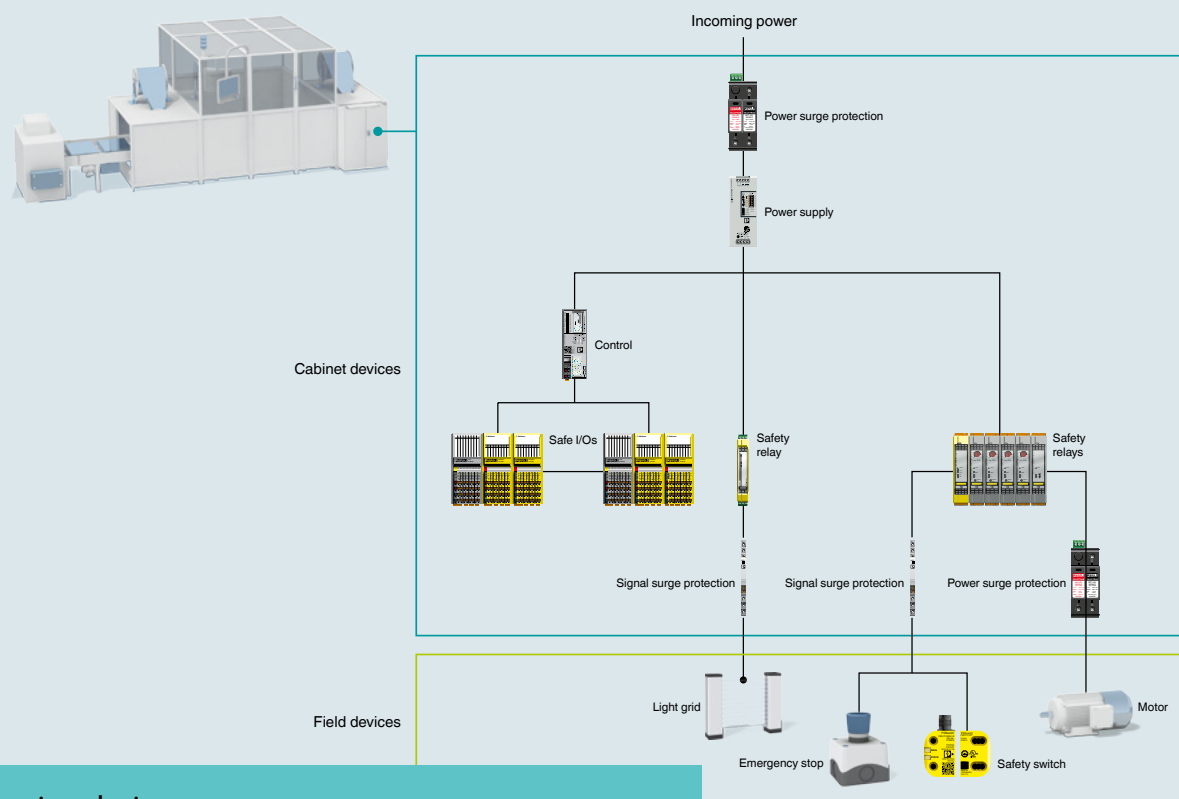
The VAL-US series of surge protection devices is Phoenix Contact's solution to make all industrial machines utilized in the USA NFPA 79-compliant. VAL-US is a UL Listed, Type 1 series of pluggable surge protective devices that utilizes high-capacity varistors to provide high-quality protection, as well as status indication contacts for remote monitoring. The plugs are hot-swappable with integrated visual status indication for easy maintenance and replacement. Ensure your equipment is ready with the VAL-US product line.

To learn more about the VAL-US series, go to: www.phoenixcontact.com/VAL-US

Best practices to protect safety circuits

The 24 V DC power system is generally only exposed to transient activity when feeding field devices. In these situations, exposure to the external environment provides a path for transients to enter the panel and damage equipment. Specifically, when the wire length exceeds 25 feet, the probability of induced transient surges increases significantly. If the 24 V DC power system is connected to field devices, an additional surge protection device should be installed to protect the 24 V DC side of the power supply. Also, if the safety relay is located in a separate enclosure from the power supply, an additional SPD should be installed near the safety relay if the conductor length between it and the power supply exceeds 25 feet. Furthermore, any sources of 24 V DC power connected to the safety relay (powering the logic circuitry, for example) require the same consideration as the primary supply.

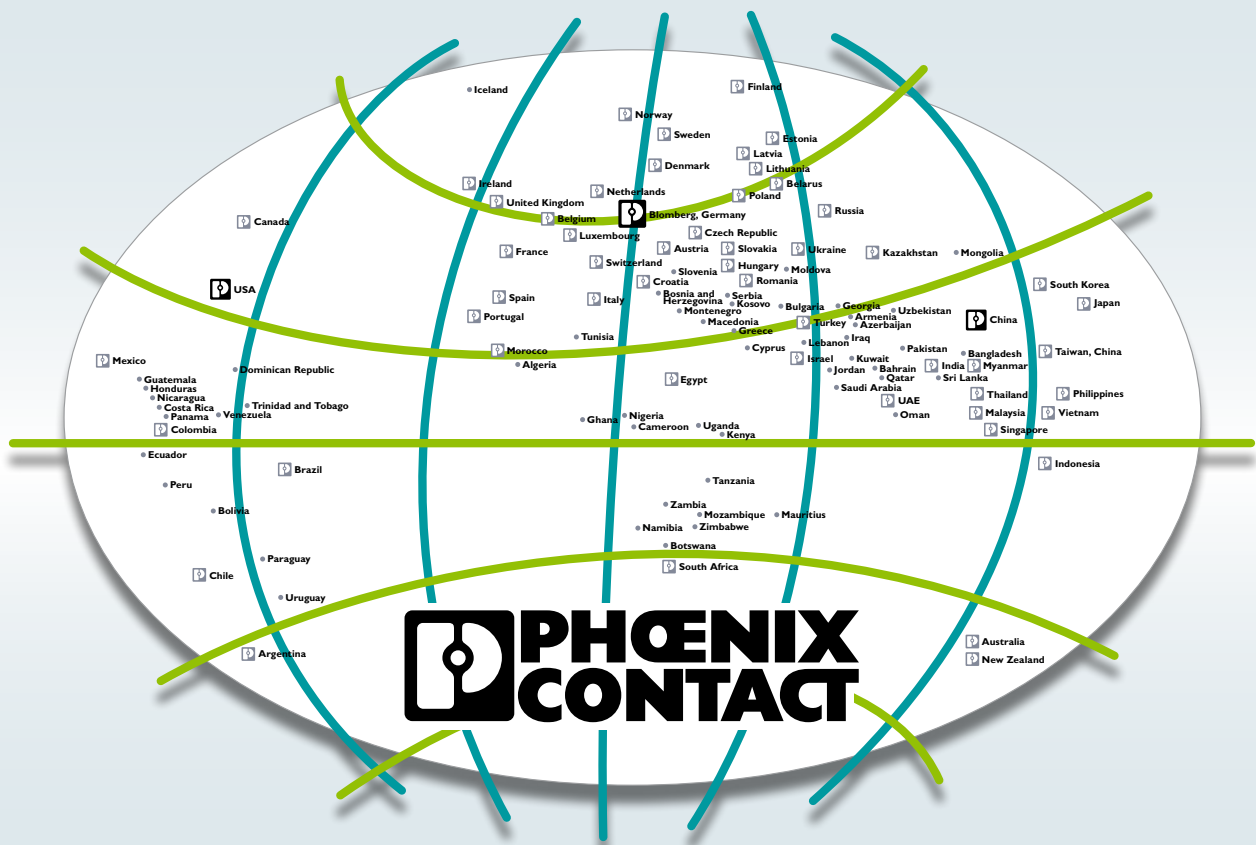
Signal and control lines have similar concerns. Transients pose the same threats to devices on these conductors as they do to power conductors. If these conductors leave the enclosure that the other safety circuit components are in, they should also be protected in a similar fashion to the power conductors using appropriate surge protection for signal conductors.



TTC surge protection devices

The TERMITRAB Complete (TTC) series provides protection from transient activity for all of the control signals in your safety circuit applications. The TTC product range is tailored for all applications in measurement and control technology. You will find the ideal surge protection for your requirements in the TTC product portfolio. Choose from simple, ultra-narrow protective devices, products with testable protective plugs, signaling, optional remote signaling modules, and more.

To learn more about the TTC series, go to: www.phoenixcontact.com/TTC



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