White Paper

NEMA Enclosure Standards and Surge Protective Devices

ASCO Power Technologies®

NEMA Enclosure Standards and Surge Protective Devices

Surge Protective Devices (SPDs) are available with various types of enclosures designed for indoor or outdoor use. Selecting the most appropriate enclosure type helps ensure that an SPD will provide reliable performance for its designed service life, while conforming to job and industry specifications. This document reviews the scope of the National Electrical Manufacturers Association (NEMA) enclosure standards that are typically sold with SPDs. This document also describes differences between common NEMA types.

NEMA 250 — Enclosures for Electrical Equipment (1000 Volts Maximum) sets forth construction and test standards that are used in North America, certain countries in Central and South America, and other select locations. The standard addresses both physical protection and environmental conditions. The scope of the NEMA standards is shown in Table 1.

Based on the standards, NEMA 250 specifies Types for indoor and indoor/outdoor applications. For locating SPDs indoors, Types 1 and 12 enclosures are most often used. Conversely, enclosures for both indoor and outdoor use include Type 3R as well as Types 4 and 4X. Table 2 below shows the degrees of protection for the respective enclosure types that are typically offered with SPDs.

Table 1: Scope of Enclosure Standards

Characteristic	NEMA 250
Protection from Human Contact	X
Protection from Solids Ingress	X
Protection from Water Ingress	X
Environmental Requirements	
Design Requirements	X
Construction Requirements	X
Mechanical Impact	X
Sheet Metal Thickness	X
Gasket Aging	X
Oil Resistance	X
Materials/Finishes/Corrosion Resistance	X

Table 2: SPD Enclosure Applications[1]

Degree of Protection Against	Types				
	Indoor		Indoor or Outdoor		
	1	12	3R	4	4X
Access to hazardous parts	X	X	X	X	X
Falling dirt	X	X	X	X	X
Dripping & Light splashing		X	X	X	X
Circulating dust		X		X	X
Rain, snow, sleet			X	X	X
Windblown dust				X	X
Settling dust		X		X	X
Hosedown and splashing water				X	X
Oil and coolant seepage		X			
Corrosive agents					X

SELECTING AN SPD ENCLOSURE

The NEMA Types most commonly used to enclose SPDs for indoor or outdoor uses are described below.

INDOOR TYPES

NEMA Type 1

NEMA Type 1 enclosures are often standard on equipment located in indoor settings that have no additional environmental concerns. These are low-cost enclosures suited to protecting equipment from dirt and objects, as well as people from equipment hazards. Figure 1 shows an *ASCO Model 350* SPD in a NEMA Type 1 enclosure.

Figure 1:
Model 350 in NEMA Type 1 Enclosure

NEMA Type 12

NEMA Type 12 enclosures offer premium benefits for indoor applications. Manufactured without knockout openings, they provide extra protection against solid foreign objects as well as dripping and light splashing of water. In addition, Type 12 protects against oil and coolant seepage into the encased equipment. Consequently, these enclosures can be deployed where mechanical machinery are present or light industrial processes occur. Figure 2 shows an *ASCO Model 520* SPD in a NEMA Type 12 enclosure.

Figure 2:
Model 520 in NEMA Type 12 Enclosure

INDOOR/OUTDOOR TYPES

NEMA Type 3R

NEMA Type 3R enclosures are constructed for cost-effective indoor or outdoor service. As such, they are designed to protect people from equipment hazards, and equipment from normal environmental and weather elements, including dirt, objects, incidental dust, as well as rain, snow and sleet. They are well-suited for serving at residential, commercial, institutional, and industrial facilities where no additional environmental or operation exposures are expected. Figure 3 shows an *ASCO Model 460* in a NEMA Type 3R enclosure.

Figure 3:
Model 460 in NEMA Type 3R Enclosure

NEMA Type 4 and 4X Enclosures

One of the most popular SPD enclosures is NEMA Type 4. This type can be used indoors or outdoors and offers protection against windblown dust and force-directed water, such as water for hosedown activities. Consequently, these are suitable for location where equipment cleaning, liquid handling, or vehicle washing operations occur. Available in polymer, fiberglass and steel, they provide some protection against solid foreign objects such as dust, and from ingress of rain, sleet, snow, and splashing water. Type 4X can also withstand corrosive elements in the environment. Figure 4 shows an *ASCO Model 425* SPD with a NEMA 4X polymer enclosure.

Figure 4:
Model 425 in NEMA Type 4X Enclosure

SUMMARY

The environment where the SPD will be installed most often dictates the type of enclosure to be used. Readers should note that while an enclosure protects SPD components, they also protect nearby personnel from inadvertent contact with SPD components.

NEMA Type 1 enclosures are good at providing cost effective protection for general indoor use. Type 12 enclosures provide more comprehensive protection, including protection against incidental dusts, liquids, and oils. Type 3R offers for outdoor protection where there are no extraordinary environmental or site use conditions. Types 4 and 4X offers the best protection in indoor and outdoor wet or corrosive environments. Qualified SPD manufacturers can provide technical support for selecting the most appropriate SPD enclosures for specific applications.

References

1. National Electrical Manufacturers Association, NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum), 2018

ASCO Power Technologies - Global Headquarters
160 Park Avenue
Florham Park, NJ 07932
Tel: 800 800 ASCO
customercare@ascopower.com

Surge Protection
14450 58th Street North
Clearwater, FL 33760
Tel: 800 237 4567 (U.S & Canada Only)
727 535 6339 (Outside U.S.)
Fax: 727 539 8955

WP-30029 (r- 12/18)

surge.ascopower.com

whitepapers.ascopower.com
www.ascoapu.com

©2018 ASCO Power Technologies. All Rights Reserved.

ASCO. Innovative Solutions.