

Technical Information

Certifications & Standards

The enclosure selection process includes the following five considerations:

1. Examination of the Application

Industrial applications usually require strong mechanical enclosures which are durable. Electronic and communication applications are more diverse, but space and security are usually the more dominant considerations.

2. Environment Protection

The environment where the equipment will be located (i.e., outdoors, factory floor, office, laboratory, chemical plant, etc.) establishes the degree of protection required. The NEMA enclosure ratings provide the information needed to select the enclosure for your application requirements.

The application environment is a significant factor in specifying the enclosure material. For mild steel enclosures, painting is the most basic protection; stainless steel, aluminum, fiberglass, or polycarbonate should be considered for more corrosive applications. Electromagnetic interference (EMI) and radio frequency interference (RFI) are additional environmental factors which impact enclosure material selection.

3. Space Requirements

Space requirements include size and equipment arrangement as well as aesthetics. Accessories such as windows, back panels, swingout panels, swing frames, system bars, chassis, lights, wiring terminals, as well as EMI/RFI shielding and climate control solutions also influence size and appearance.

4. Climate Control Solutions

Especially in electronic enclosure applications, climate control is becoming an important issue because technology advances continue to reduce component size. Smaller components increase heat generation by placing more components in the same enclosure volume. Also in some applications, heaters are required to prevent condensation.

5. Security

The monetary value of equipment placed within enclosures has increased. The safety of personnel can be jeopardized by unauthorized access and operation of equipment. Enclosure security can be enhanced by the selection of hinges, latches, locks and fasteners.

The five steps in this enclosure selection process are not new, but numerous enclosure and design options are available to meet a diversity of needs in each area. In addition almost any enclosure in this catalog can be modified to meet unique application requirements in a specific environment.

Application

The products in this catalog are designed for electrical and electronic enclosure applications in commercial or industrial locations.

The enclosure products in this publication should be applied, installed and used only by qualified engineers, technicians or electricians knowledgeable of the standards, laws, regulations and ordinances associated with the respective application.

Installation

Enclosures must be mounted to structures which will support the weight and sustain all other forces which the enclosure and its associated equipment may impose. Before any circuits are energized, all electrical and mechanical clearances must be checked to confirm that the equipment functions safely and properly. Assemblers and installers should consult with manufacturers and observe all regulatory procedures and practices to assure electrical and mechanical conformance in each application.

Industry Standards

The following information is provided with permission of the respective organizations to assist in the selection of an enclosure:

Enclosure Ratings

CSA, IEC, NEMA and UL use rating classifications which establish performance requirements for enclosures. CSA, NEMA and UL are the recognized organizations in North America. IEC standards fulfill a similar function in Europe and other parts of the world. Efforts to harmonize enclosure standards are underway, however several years are anticipated before the effort is complete.

In North America, both UL and CSA are accredited by the Standard Council of Canada (SCC) as Certification Organizations (CO) and Testing Organizations (TO). With its SCC accreditation, UL is able to evaluate products for use in Canada. Approved products carry the cUL mark. Both UL (cUL) and CSA perform follow-up services to assure that manufacturers continue to comply with material and process specifications.

In Europe, the CE Marking signifies that a product complies with all European Union (EU) directives and with applicable health, safety, environmental and consumer protection standards. The mark also promotes free trade into and within the EU. The CE marking is not applied to empty enclosures because they are considered only as inactive parts of the final equipment assembly. The equipment integrator is responsible for compliance with applicable EU directives and standards.

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The IEC rating system uses different evaluation criteria and has more classifications than the UL and CSA standards. Because the classification ratings differ, equating IEC classifications with NEMA Type enclosures can be controversial and depends on individual interpretation of ratings.

The National Electrical Manufacturers Association (NEMA) publishes ratings, but does not test or list enclosures. The NEMA enclosure designations are the standard reference for enclosures in this publication, and regardless of type, all enclosures provide protection to personnel against incidental contact with the enclosed equipment. To assist in the proper selection of an enclosure, the NEMA types are differentiated by the environmental conditions as listed below:

NEMA 1 Indoor use to provide a degree of protection against falling dirt.

NEMA 2 Indoor use to provide a degree of protection against falling dirt; dripping and light splashing of liquids.

NEMA 3 Indoor or outdoor use to provide a degree of protection against falling dirt, rain, sleet, snow and windblown dust; and that will be undamaged by the external formation of ice on the enclosure.

NEMA 3R Indoor or outdoor use to provide a degree of protection against falling dirt, rain, sleet and snow; and that will be undamaged by the external formation of ice on the enclosure.

NEMA 3S Indoor or outdoor use to provide a degree of protection against falling dirt, rain, sleet, snow and windblown dust; and in which the external mechanism(s) remain operable when ice laden.

NEMA 4 Indoor or outdoor use to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.

NEMA 4X Indoor or outdoor use to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water and corrosion; and that will be un-damaged by the external formation of ice on the enclosure.

NEMA 5 Indoor use to provide a degree of protection against falling dirt; settling airborne dust, lint, fibers and flyings; and dripping and light splashing of liquids.

NEMA 6 Indoor or outdoor use to provide a degree of protection against falling dirt; hose-directed water and the entry of water during occasional temporary submersion at a limited depth; and will be undamaged by the external formation of ice on the enclosure.

NEMA 6P Indoor or outdoor use to provide a degree of protection against falling dirt; hose-directed water and the entry of water during prolonged submersion at a limited depth; and will be undamaged by the external formation of ice on the enclosure.

NEMA 12 Indoor use to provide a degree of protection against falling dirt; circulating dust, lint, fibers and flyings; and dripping and light splashing of liquids.

NEMA 13 Indoor use to provide a degree of protection against falling dirt; circulating dust, lint, fibers and flyings; and spraying, splashing and seepage of water, oil and non-corrosive coolants.

Comparison of Enclosure Types for Non-Hazardous Locations

Provides a Degree of Protection Against the Following Environmental Conditions	TYPE OF ENCLOSURE											
	1	2	3	3R	4	4X	5	6	6P	12	13	
Incidental Contact with Enclosed Equipment	X	X	X	X	X	X	X	X	X	X	X	X
Indoor	X	X	X	X	X	X	X	X	X	X	X	X
Outdoor			X	X	X	X		X	X			
Falling Dirt	X	X	X	X	X	X	X	X	X	X	X	X
Dripping and Light Splashing Liquids		X	X	X	X	X	X	X	X	X	X	X
Rain, Sleet* and Snow			X	X	X	X		X	X			
Circulating Dust, Lint, Fibers and Flyings			X		X	X		X	X	X	X	X
Settling Dust, Lint, Fibers and Flyings			X		X	X	X	X	X	X	X	X
External Ice*			X	X	X	X		X	X			
Hosedown and Splashing Water					X	X		X	X			
Oil and Coolant Seepage										X	X	
Oil and Coolant Spraying and Splashing												X
Corrosive Agents						X			X			
Occasional Temporary Submersion								X	X			
Occasional Prolonged Submersion									X			

*External operating mechanisms are not required to be operable when the enclosure is ice covered.