

What's in a rating?

As a way of standardizing enclosure performance, organizations like NEMA, UL, CSA, IEC, VDE, and TÜV use rating systems to identify an enclosure's ability to resist external environmental influences. Resistance to everything from dripping liquid to hose-down to total submersion is defined by the ratings systems. While these ratings are all intended to provide information to help you make a safer, more informed product choice, there are differences between them.

NEMA

In North America, NEMA, UL, and CSA are the organizations commonly recognized. Their ratings are based on similar application descriptions and expected performance. UL and CSA both require enclosure testing by qualified evaluators in their labs. They also send site inspectors to make sure a manufacturer adheres to prescribed manufacturing methods and material specifications. NEMA, on the other hand, does not require independent testing and leaves compliance completely up to the manufacturer.

UL

North American enclosure rating systems also include a 4X rating that indicates resistance to corrosion. This rating is based on the enclosure's ability to withstand prolonged exposure to salt water spray. While a 4X rating is a good indicator that an enclosure can resist corrosion, it does not provide information on how a specific corrosive agent will affect a given enclosure material. It is best to conduct a full analysis of the specific application and environment to determine the best enclosure choice.

CE

In Europe, IEC ratings are based on performance criteria similar to NEMA. Nevertheless, there are differences in how enclosure performance is interpreted. For example, UL and CSA test requirements specify that an enclosure fails the watertight test if even a single drop of water enters the enclosure. In the IEC standards for each protection level (IP) a certain amount of water is allowed to enter the enclosure.

IEC

IEC does not specify degrees of protection against risk of explosions or conditions such as moisture or corrosive vapors. NEMA, on the other hand, does specify for most environmental conditions. For this reason, and because the tests and evaluations for other characteristics are not identical, the IEC enclosure classification designations cannot be exactly equated with NEMA enclosure Type numbers.

CE Classifications

The CE Mark is a European Union (EU) compliance symbol and acronym for *Conformite Européenne*. The CE Mark indicates that a product complies with all European directives and essential harmonized standards for health, safety, environment, and consumer protection that may apply to that product. In addition, the CE Mark promotes free trade movement from outside and within the EU.

For industrial control equipment, the CE Mark is not intended to be applied to empty enclosures because such enclosures are inactive components of a final assembly.

The responsibility of insuring compliance to all applicable EU Directives and Harmonized Standards belongs with the final equipment manufacturer.

Enclosures are available designed in compliance with European standards and are eligible to receive a Manufacturer's Declaration of Conformity. The certificate assists the final equipment manufacturer in obtaining the CE Mark. Contact our Applications Engineering for further information. Enclosures available meet the requirements of the applicable European standards specified below.

Applicable European Directives

73/23/EEC Low Voltage Directive for Electrical Equipment within Certain Voltage Limits

89/336/EEC EMC Directive Relating to Electromagnetic Compatibility

Note: The EMC Directive is only secondarily applicable since an empty enclosure does not produce electromagnetic interference.

Applicable European Standards

EN60529-1 (IEC529-1) Degrees of Protection Provided by Enclosures

EN60204-1 (IEC204-1) Electrical Equipment of Industrial Machines

IEC International Standards' IP Protection Classification

IEC Publication 529 Classification of Degrees of Protection by Enclosures provides a system for specifying enclosures of electrical equipment on the basis of the degree of protection required. IEC 529 does not specify degrees of protection against risk of explosions or conditions such as moisture (produced, for example, by condensation), corrosive vapors, fungus, or vermin. NEMA Standards Publication 250 does test for environmental conditions such as corrosion, rust, icing, oil, and coolants. For this reason, and because the tests and evaluations for other characteristics are not identical, the IEC enclosure classification designations cannot be exactly equated with NEMA enclosure Type numbers.

The table on page **099102** provides a cross-reference from NEMA enclosure Type numbers to IEC enclosure classification designations. This cross-reference is an approximation based on the most current available information on enclosure test performance and is not sanctioned by NEMA, IEC, VDE, or any affiliated agency.

To use the table first find the appropriate NEMA rating along the vertical axis and then read across the horizontal axis for the corresponding IP rating. Do not use this table to convert IEC classification designations to NEMA Type numbers.

Protection against touch and foreign bodies		Protection		Protection against water
Touch	Foreign body	first figure IP	second figure IP	
no protection	no protection	0	0	no protection
with large areas of the body (back of hand)	large foreign bodies, diameter greater than 50mm	1	1	vertically-falling drops of water
with the finger	medium-sized foreign bodies, diameter greater than 12mm	2	2	drops of water falling at up to 15° from the vertical
with tools and wires, diameter greater than 2.5mm	small foreign bodies, diameter greater than 2.5mm	3	3	spray water falling at up to 60° from the vertical
with tools and wires, diameter greater than 1mm	round foreign bodies, diameter greater than 1mm	4	4	projected water from all directions
complete protection	dust deposits	5	5	jets of water
complete protection	entry of dust	6	6	heavy streaming water
			7	short-term immersion
			8	immersion

The IP classification is shown as two figures. Example: IP 21

The first figure indicates: Protection against touch with the finger and solid bodies with a diameter greater than 12mm.

2

The second figure indicates: the equipment in protected against vertically-falling drops of water.

1

IP 2 1

Cross Reference (Approximate) - NEMA, UL, and CSA Ratings

(Cannot be used to convert IEC Classifications to NEMA Type Numbers)

Enclosure Rating	IP23	IP30	IP32	IP55	IP64	IP65	IP66	IP67
Type 1	●							
Type 2		●						
Type 3					●			
Type 3R			●					
Type 3S					●			
Type 4							●	
Type 4X							●	
Type 6								●
Type 12				●				
Type 13						●		




IEC 529 has no equivalents to NEMA enclosure Types 7, 8, 9, 10, or 11.

● Indicates compliance.

NEMA, UL, and CSA Ratings

NEMA, UL, and CSA are standard writing organizations commonly recognized in North America. Their ratings are based on similar application descriptions and expected performance. UL and CSA both require enclosure testing by qualified evaluators. They also send site inspectors to make sure a manufacturer adheres to prescribed manufacturing methods and material specifications. NEMA, on the other hand, does not require independent testing and leaves compliance completely up to the manufacturer.

Enclosure Types, Non-Hazardous Location

Enclosure Rating	 National Electrical Manufacturers Association (NEMA Standard 250) and Electrical and Electronic Mfg. Association of Canada (EEMAC)	 Underwriters Laboratories Inc. (UL 50 and UL 508)	 Canadian Standards Association (Standard C22.2 No. 94)
Type 1	Enclosures are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment or locations where unusual service conditions do not exist.	Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dirt.	General purpose enclosure. Protects against accidental contact with live parts.
Type 2	Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling water and dirt.	Indoor use to provide a degree of protection against limited amounts of falling water and dirt.	Indoor use to provide a degree of protection against dripping and light splashing of non-corrosive liquids and falling dirt.
Type 3	Enclosures are intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; undamaged by the formation of ice on the enclosure.	Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain, snow, and windblown dust; undamaged by the external formation of ice on the enclosure.
Type 3R	Enclosures are intended for outdoor use primarily to provide a degree of protection against falling rain and sleet; undamaged by the formation of ice on the enclosure.	Outdoor use to provide a degree of protection against falling rain; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain, snow, and windblown dust; undamaged by the external formation of ice on the enclosure.
Type 4	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water; undamaged by the formation of ice on the enclosure.	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain, snow, windblown dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure.
Type 4X	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion.	Indoor or outdoor use; provides a degree of protection against rain, snow, windblown dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure; resists corrosion.
Type 6	Enclosures are intended for use indoors or outdoors where occasional submersion is encountered. limited depth; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use to provide a degree of protection against entry of water during temporary submersion at a limited depth; undamaged by the external formation of ice on the enclosure; resists corrosion.	Indoor or outdoor use; provides a degree of protection against the entry of water during temporary submersion
Type 12	Enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping non-corrosive liquids.	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of non-corrosive liquids.	Indoor use; provides a degree of protection against circulating dust, lint, fibers, and flyings; dripping and light splashing of non-corrosive liquids; not provided with knockouts.
Type 13	Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and non-corrosive coolant.	Indoor use to provide a degree of protection against lint, dust seepage, external condensation and spraying of water, oil, and non-corrosive liquids.	Indoor use; provides a degree of protection against circulating dust, lint, fibers, and flyings; seepage and spraying of non-corrosive liquids, including oils and coolants.

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Comparison of Specific Non-Hazardous Applications - Outdoor locations

Provides a Degree of Protection Against the Following Environmental Conditions	Type of Enclosure						
	3	3R**	3S	4	4X	6	6P
Incidental contact with the enclosed equipment	●	●	●	●	●	●	●
Rain, snow, and sleet §	●	●	●	●	●	●	●
Sleet ††			●				
Windblown dust	●		●	●	●	●	●
Hosedown				●	●	●	●
Corrosive agents					●		●
Occasional temporary submersion						●	●
Occasional prolonged submersion							●

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

†† External operating mechanisms are operable when the enclosure is ice covered.

** These enclosures may be ventilated.

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Comparison of Specific Non-Hazardous Applications - Indoor locations

Provides a Degree of Protection Against the Following Environmental Conditions	Type of Enclosure											
	1*	2*	4	4X	5	6	6P	11	12	12K	13	
Incidental contact with the enclosed equipment	●	●	●	●	●	●	●	●	●	●	●	●
Falling dirt	●	●	●	●	●	●	●	●	●	●	●	●
Falling liquids and light splashing		●	●	●		●	●	●	●	●	●	●
Dust, lint, fibers, and flyings †			●	●	●	●	●		●	●	●	●
Hosedown and splashing water			●	●		●	●					
Oil and coolant seepage									●	●	●	
Oil or coolant spraying and splashing												●
Corrosive agents				●			●	●				
Occasional temporary submersion						●	●					
Occasional prolonged submersion							●					

* These enclosures may be ventilated. However, Type 1 may not provide protection against small particles of falling dirt when ventilation is provided in the enclosure top. Consult Factory Engineering for more information.

† These fibers and flyings are non-hazardous materials and are not considered Class II type ignitable fibers or combustible flyings. For Class III type ignitable fibers or combustible flyings see the National Electrical Code Section 500-6(a).

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