

## Standards and certifications

CSA and UL adopt expanded Memorandum of Understanding and complete first phase of mutual component acceptance program on March 1, 2004.

This agreement, which is designed to assist manufactures of electrical equipment in getting their products to Canadian and

U.S. markets more quickly, without redundant testing, was the result of several months of negotiation between UL and CSA.

Industrial control panels are included in the first Phase list of components. A complete listing can be obtained at the UL and

CSA web sites:

[www.ul.com/components](http://www.ul.com/components)

This Memorandum of Understanding has generated additional marking that will be appearing on electrical components. Below is a summary of the markings.

## UL certifications



### UL listed Mark

This is the most common UL mark. A product carrying this mark means UL has certified that it meets UL's safety requirements.

### Underwriters Laboratories Inc.

<http://www.ul.com>

333 Pfingsten Road,  
Northbrook, IL, 60062, USA



### C-UL Listing Mark

is applied to products for the Canadian market. This products with this mark have been evaluated to meet Canadian safety

requirements, which may be somewhat different from the U.S. safety requirements.



### C-UL-US Listed Mark

This mark indicates compliance with both Canadian and U.S. requirements. This Canadian /U.S. UL mark is optional, but UL

encourages its use for manufactures with products certified for both countries.

The Underwriters Laboratories (UL) independently test products in their laboratories to ensure compliance with standard. Furthermore, UL sends site

inspectors to our facilities to check our manufacturing process and to verify proper material specifications. The performance rating established by UL are simi-

lar to those of CSA and NEMA. See our rating reference sheet for details.

## CSA certifications



### For Canada

A CSA mark on its own, without indicators, means that the product is certified primarily for

the Canadian market to the applicable Canadian standards.



### For the US

A CSA mark with the indicator "US" means that the product is

certified for the U.S. market to the applicable U.S. standards.



### For the U.S. and Canada

A CSA mark with the indicators "C" and "US" means that the product is certified for both the

U.S. and Canadian markets, to the applicable U.S. and Canadian standards.

**CSA International** (CSA) independently test products in their laboratories to ensure compliance with standards. Furthermore, CSA sends site inspectors to our facilities to

check our manufacturing process and to verify proper material specifications. The performance ratings established by CSA are similar to those of UL and NEMA. See our ratings reference sheet

for details.

### CSA International

<http://www.csa.ca>

178 Rexdale Boulevard  
Etobicoke, ON, M9W 1R3  
Canada

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### NEMA

NEMA provides a forum for the standardization of electrical equipment, enabling consumers to select from a range of safe,

effective, and compatible electrical products.

NEMA does not require independent testing and leaves compliance up to the manufacturer.

The performance ratings established by NEMA are similar to

those of UL and CSA. See our ratings reference sheet for details.

**National Electrical Manufacturers' Association**

<http://www.nema.org>

1300 North 17th Street  
Rosslyn, VA, 22209, USA

### EEMAC

EEMAC provides a forum for the standardization of electrical equipment, enabling consumers to select from a range of safe,

effective, and compatible electrical products.

EEMAC does not require independent testing and leaves compliance up to the manufacturer.

The performance ratings established by EEMAC are similar to

those of UL and CSA. See our ratings reference sheet for details.

**Electrical Equipment Manufacturers Advisory Council**

<http://www.electrofed.com>

5800 Explorer Drive, Unit 200  
Mississauga, ON, L4W 5K9

### IEC

The performance ratings established by IEC, known as IP rat-

ings, are different from those of NEMA, UL and CSA because of different testing conditions.

Therefore, IP ratings cannot be

exactly equated to NEMA ratings. See our ratings reference sheet for details.

**International Electrotechnical Commission (IEC)**

## CE and IEC Classifications



The CE Marking is a European Union (EU) compliance symbol. It is not a standard. The intent is for the CE Marking to be applied by the final equipment manufacturer to the end product, indicating that the product complies with all the European Directives and essential Harmonized standards.

The final equipment manufacturer is the one responsible for insuring compliance to all the applicable EU Directives and Harmonized standards.

A listing of Directives and associated Harmonized standards can be found at:

[www.newapproach.org](http://www.newapproach.org)

A directive in the European Community is a European law that is legally binding for every member state and is above the laws of the individual member

states. This new European legislation has created a uniform market within Europe. The goals of these legislations are primarily safety related, with the protection of the public and consumer being a primary concern. A further goal is the harmonization of related National regulations.

The Directives stress what is to be attained; how to attain it is left to the producers.

Empty enclosures for industrial control equipment are inactive components of the final assembly. By building their enclosures to the applicable Directives and applicable Harmonized standards, the manufacturer of the enclosures is eligible to receive a manufacturer's Declaration of Conformity. The certificate assists the final equipment manufacturer in obtaining the CE Marking.

The applicable European Directives and European standards that apply to enclosures are as listed below.

### Applicable European Directives

**2006/95/EC** Low Voltage Directive for electrical equipment within certain Voltage limits previous amended versions 72/23/EEC & 96/68/EEC

**2004/108/EC** EMC Directives relating to electromagnetic compatibility previous amended versions 89/336/EEC, 92/31/EEC, 93/68/EEC

**Note:** the EMC directive is only secondarily applicable since an empty enclosure does not produce electromagnetic interference.

**98/37/EC** Machinery Safety Directive

### Applicable European Standards

**EN 60529:1991** (IEC 529-1) degree of protection provided by enclosures (IP code)

**EN 60204-1:** 2006 Safety of Machinery (Electrical equipment of Machines)

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# RoHS

2002/95/EC Compliant

The RoHS Directive stands for "the restriction of the use of certain hazardous substances in electrical and electronic equipment". This Directive bans the placing on the EU market of new electrical and electronic equipment containing more than

agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants.

California has passed SB 20: Electronic Waste Recycling Act of 2003, or EWRA. This law prohibits the sale of electronic devices after January 1, 2007, that are prohibited from being sold under the EU RoHS directive, but across a

much narrower scope that includes LCDs, CRTs, and the like and only covers the four heavy metals restricted by RoHS. EWRA also has a restricted material disclosure requirement. Other US states and cities are debating whether to adopt similar laws, and there are several states that have mercury and PBDE bans already. Federal RoHS-like regulation in the US is unlikely in the near to medium term.

# CEA

The CEA Mention refers to the CEA-310-E Mounting Flange standard defined by the Consumer Electronic Association;

it supersedes the EIA-310-D defined by the Electronic Industries Association. The configuration of specific items in this document is based upon a 19-inch rack design as defined in the CEA-310-E Standard. This design applies to the front internal

mounting surface within a Cabinet Enclosure or Rack that provides a mounting surface for Computer Servers, electrical equipment, structure guides, slide rails, and/or panels.

# cULus

This new UL Recognized Component Mark, which became

effective April 1, 1998, may be used on components certified by UL to both Canadian and U.S. requirements. Although UL had not originally planned to introduce a combined Recognized Component Mark, the popularity

of the Canada/U.S. Listing and Classification Marks among clients with UL certifications for both Canada and the United States has led to the new Mark.

### Comparison Between NEMA Enclosures Type Numbers and IEC Enclosure Classification Designations

IEC Publication 60529 Classification of Degree of Protection Provided by Enclosures provides a system for specifying the enclosures of electrical equipment on the basis of the degree of protection provided by the enclosure. IEC 60529 does not specify degrees of protection against mechanical damage of equipment, risk of explosions, or conditions such as moisture (produced for example by condensation), corrosive vapors, fungus, or vermin. The NEMA Standard for Enclosures for Electrical Equipment does test for environmental

conditions such as corrosion, rust, icing, oil, and coolants. For this reason, and because the test and evaluations for other characteristics are not identical, the IEC Enclosure Classification Designations cannot be exactly equated with the NEMA type numbers.

The IEC designation consists of the letters IP followed by two numerals. The first characteristic numeral indicates the degree of protection provided by the enclosure with respect to persons and solid foreign objects entering the enclosure. The second character-

istic numeral indicates the degree of protection provided by the enclosure with respect to the harmful ingress of water.

Table A-1 provides an equivalent conversion from the NEMA enclosure Type number to the IEC Enclosure Classification Designations. The NEMA enclosure type numbers meet or exceed the test requirements for the associated IEC Classification; for this reason Table A-1 cannot be used to convert from IEC classifications to NEMA enclosure Type numbers.

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**Table A-1**  
**CONVERSION OF NEMA ENCLOSURE TYPE RATINGS**  
**TO IEC 60529 ENCLOSURE CLASSIFICATION DESIGNATIONS ( IP )**  
 ( Cannot Be Used to Convert IEC Classification Designations to NEMA Type Ratings )

IP FIRST CHARACTER	NEMA Enclosure type																IP SECOND CHARACTER		
	1	2	3,3X, 3S, 3SX	3R, 3RX	4, 4X	5	6	6P	12, 12K, 13	A	B	A	B	A	B	A		B	
IP0																			IP 0
IP1																			IP 1
IP2																			IP 2
IP3																			IP 3
IP4																			IP 4
IP5																			IP 5
IP6																			IP 6
																			IP 7
																			IP 8
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	

A = A shaded block in the "A" column indicates that the NEMA Enclosure Type exceeds the requirements for the respective IEC 60529 IP First Character Designation. The IP First Character Designation is the protection against access to hazardous parts and solid foreign objects. B = A shaded block in the "B" column indicates that the NEMA Enclosure Type exceeds the requirements for the respective IEC 60529 IP Second Character Designation. The IP Second Character Designation is the protection against ingress of water.

### EXAMPLE OF TABLE USE

An IEC IP 45 Enclosure Rating is specified. What NEMA Type Enclosure meet and exceed the IP 45 rating?

Referencing the first character, 4, in the IP rating and the row designated "IP4\_" in the leftmost column in the table; the blocks in Column "A" for NEMA Types 3, 3X, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K and 13 are shaded. These NEMA ratings meet and exceed the IEC protection requirements against access to hazardous parts and solid foreign objects.

Referencing the second character, 5, in the IP rating and the row designated "IP\_5" in the rightmost column in the table; the blocks in Column "B" for NEMA Types 3, 3X, 3S, 3SX, 4, 4X, 6, and 6P are shaded. These NEMA ratings meet and exceed the IEC requirements for protection against the ingress of water.

The absence of shading in Column "B" beneath the "NEMA" Enclosure Type 5: indicates that Type 5 does not meet the IP 45 protection requirements against ingress of water. Likewise the absence of shading in Column "B" for NEMA type 12, 12K and 13 enclosures indicates that these enclosures do not meet the IP 45 requirements for protection against the ingress of water.

Only Types 3, 3X 3S, 3SX, 4, 4X, 6, and 6P have both Column "A" in the "IP4\_" row and Column "B" in the "IP\_5" row shaded and could be used in an IP45 application. The NEMA Enclosure Type 3 not only meets the IP 45 Enclosure Rating, but also exceeds the IEC requirements because the NEMA Type requires an outdoor corrosion test; a gasket aging test; a dust test; an external icing test; and no water penetration in the rain test. Slight differences exist between the IEC and NEMA test methods, but the IEC rating permits the penetration of water if "it does not deposit on insulation parts, or reach live parts." The IEC rating does not require a corrosion test; gasket aging test; dust test or external icing test. Because the NEMA ratings include additional test requirements, this table cannot be used to select IP Designations for NEMA rating enclosure specifications.

IEC 60529 specifies that an enclosure shall only be designated with a stated degree of protection indicated by the first characteristic numeral if it also complies with all lower degrees of protection.

Furthermore IEC 60529 states that an enclosure shall only be designated with a degree of protection indicated by the second characteristic numeral if it also complies with all lower degrees of protection up to and including the second characteristic numeral 6.

An enclosure designated with a second characteristic numeral 7 or 8 only is considered unsuitable for exposure to water jets (designated by second characteristic numeral 5 or 6) and need not comply with requirements for numeral 5 or 6 unless it is dual coded. Since the IEC protection requirements become more stringent with increasing IP character value up through 6, once a NEMA Type rating meets the requirements for an Ip designation up through 6, it will also meet the requirements for all lower IP designations.

This is apparent from the shaded areas shown in the table.

The NEMA and IEC comparison section is a re-work of an article from the **National Electrical Manufacturers Association**.

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