

Technical Information

Environmental Ratings, UL, CSA Cross Reference



Type Designation	National Electrical Manufacturers' Association (NEMA Standard 250)	Underwriters' Laboratories Inc. (UL 50 and UL 508)	Canadian Standards Association (Standard C22.2, Nos. 14, 40, and 94)
1	Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment to provide a degree of protection against falling dirt.	Indoor use primarily to provide a degree of protection against limited amount of falling dirt	General purpose enclosure in ordinary locations.
2	Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment, to provide a degree of protection against falling dirt, and to provide a degree of protection against dripping and light splashing of liquids.	Indoor use primarily to provide a degree of protection against limited amounts of falling water and dirt.	An enclosure for Indoor use, constructed so as to provide a degree of protection against dripping and light splashing of no noncorrosive liquids, and falling dirt.
3	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with enclosed equipment 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.	Outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust, and damage from external ice formation.	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against rain, snow, and windblown dust; undamaged by the external formation of ice on the enclosure.
3R	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with enclosed equipment to provide a degree of protection against falling dirt, rain, sleet, snow and that will be undamaged by the external formation of ice on the enclosure.	Outdoor use primarily to provide a degree of protection against rain, sleet; and damage from external ice formation.	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against rain, and snow, undamaged by the external formation of ice on the enclosure.
4	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment: to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.	Indoor or outdoor use primarily to provide a degree of protection against windblown dust, and rain, splashing water, hose-directed water; and damage from external ice formation.	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against rain, snow, windblown dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure.
4X	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; 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 undamaged by the external formation of ice on the enclosure.	Indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water; and damage from external ice formation.	An enclosure for either indoor or outdoor use, constructed so as to provide 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.
12	Enclosures constructed (without knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibres and flyings; and against dripping and light splashing of liquids.	Indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids.	An enclosure for indoor use, constructed so as to provide a degree of protection against circulating and settling dust, lint, fibres, and flyings; dripping and light splashing of non-corrosive liquids; not provided with knockouts.
13	Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibres, and flyings; and against the spraying, splashing, and seepage of water, oil, and noncorrosive coolants.	Indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and noncorrosive coolant.	An enclosure for indoor use, constructed so as to provide a degree of protection against circulating and settling dust, lint, fibres, and flyings; seepage and spraying of noncorrosive liquids including oils and coolants.

Note: The specifications on this page are for comparative reference only and are not intended to provide the complete requirements or test qualifications published by various associations and agencies. Complete information may be obtained by contacting the appropriate organization.

IEC publication 529, Classification of Degrees of Protection Provided by Enclosures, provides a system for specifying electrical equipment for enclosures on the basis of degree of protection provided by the enclosure. IEC 529 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. 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 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 characteristic numeral indicates the degree of protection provided by the enclosure with respect to the harmful ingress of water.

The IEC has established an enclosure grading system that produces an IP rating. (For example, IP 54 - 5 is the first character - refer to tables I & II. 4 is the second character - refer to table III - following page).

The following is provided for information only.

Table I

Degrees of Protection against Hazardous Parts

Degree of protection is indicated by the first characteristic numeral

First Characteristic Numeral	Protection of Persons	Protection of Equipment
0	Non Protected	Non-Protected
1	Protected against access to hazardous parts with the back of a hand.	Protected against objects of 50mm diameter and greater.
2	Protected against access to hazardous parts with a finger.	Protected against objects of 12.5mm diameter and greater.
3	Protected against access to hazardous parts with a tool of 2.5mm in diameter and greater.	Protected against objects of 2.5mm diameter and greater.
4	Protected against access to hazardous parts with a wire of 1.0mm in diameter and greater.	Protected against objects of 1.0mm diameter and greater.
5	Protected against access to hazardous parts with a wire of 1.0mm in diameter and greater.	Protected against dust. Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety.
6	Protected against access to hazardous parts with a wire of 1.0mm in diameter and greater.	Protected against dust. No ingress of dust.

Note: In the case of the first characteristic numerals 3, 4, 5 and 6, protection against access to hazardous part is satisfied if adequate clearance is kept. The full diameter of the object probe shall not pass through an opening of the enclosure.

Table III

Degrees of Protection against Water

Degree of protection is indicated by the second characteristic numeral

First Characteristic Numeral	Description	Definition
0	Non Protected	
1	Protected against vertically falling water drops	Vertically falling drops shall have no harmful effects.
2	Protected against vertically falling water drops when enclosure tilted up to 15	Vertically falling drops shall have no harmful effects ° when the enclosure is tilted at any angle up to 15° on either side of the vertical.
3	Protected against spraying water.	Water sprayed at any angle up to 60° on either side of the vertical shall have no harmful effects.
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects.
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects.
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.
7	Protected against the effects of temporary immersion in water.	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time.
8	Protected against the effects of continuous immersion in water.	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7.

NEMA TO IEC Enclosure Rating Cross-Reference¹

NEMA TYPE	IP23	IP30	IP32	IP55	IP64	IP65	IP66	IP67
1	x							
2		x						
3					x			
3R			x					
4							x	
4X							x	
6								x
12				x				
13						x		

¹ This cross reference is an approximation of NEMA and IEC classifications for reference only. Please consult the appropriate JIC agencies for requirements and test qualifications for complete information.

Purge/Pressurization Systems

Purge/pressurization systems allow the use of general-purpose enclosures in hazardous locations as an alternative to NEMA Type 7 or 9 enclosures or those rated for zone classification-. Purge/pressurization accessories are attached to an enclosure to prevent explosions in hazardous locations by purging combustible gases or dust and then maintaining a positive pressure with clean dry air, or other inert gas.

Purged and Pressurized Enclosures

1. Purged/pressurized Enclosures for Class I Hazardous Locations Purging is defined as the process of supplying an enclosure with clean air or an inert gas, at sufficient flow and positive pressure to reduce to an acceptable safe level the concentrations of any flammable gases or vapors initially present, and to maintain this safe level by positive pressure with or without continuous flow.
2. Pressurized Enclosures for Class II Hazardous Locations Pressurizing is similar to purging except that pressurizing is used to prevent the entrance of hazardous dusts and cannot be used to clean out dust that already exists inside an enclosure.

Purged or pressurized enclosures are acceptable alternatives for use in hazardous location as permitted by Article 500 of the National Electrical Code and the inspection authority having jurisdiction provided that the requirements and safeguards specified by NFPA 496, "Purged and Pressurized Enclosures for Electrical Equipment in Hazardous Locations" are strictly followed.

Schaefer's Electrical Enclosures, Inc. does not supply purged/pressurized enclosures. The above descriptions are provided for information only.

Modification Services

Schaefer's Electrical Enclosures, Inc. offers a series of standard options to complement our wide range of catalog products. These options meet common industry and application requirements and are designed to offer a wide range of flexibility to meet many different needs.

By utilizing standard catalog enclosure types and standard accessories or options, you can keep your price and delivery times to a minimum.

Wall-Mount Enclosures

- Finish options
- Dimension changes
- Hole and cutout options
- Hinge options
- Studs, nuts and tapped holes
- Sub-panel options
- Ventilation options

- Window options
- Floor mounting options
- Assembled accessories
- Disconnect options
- Special latching

Large Mild Steel Enclosures

- Finish options
- Dimensional changes
- Hole and cutout options
- Component mounting options
- Sub-panel options
- Ventilation options
- Window options
- Floor mounting options
- Hinge options
- Wire management choices
- Structural changes
- Assembled accessories
- Disconnect options
- Special latching

Stainless Steel Enclosures

Type 304 or 316 stainless steel

- Hole and cutout options
- Studs, nuts and tapped holes
- Sub-panel options
- Ventilation options
- Window options
- Mounting options
- Drip shields
- Assembled accessories
- Disconnect options
- Hinge options
- Special latching

CAD Drawing Requirements

- Drawings to be AutoCad .DXF or .DWG
- Provide CAD Drawing scaled 1:1 (1" = 1 Drawing Unit / 1mm = 1 Drawing Unit) [Please specify on drawing 'Inch' or 'Metric' accordingly]
- Provide only Pertinent Information required to Modify the Enclosure. Electronic/component layout drawings not required.

Layer Control

- Turn Off / Freeze Layers in which modifications are necessary (Have all other Layers Turned On/Thaw)
- Erase/Omit all unnecessary drawing information
- Turn On/Thaw Layers in which modifications are necessary (should be only information on drawing)
- Purge all unnecessary Blocks / Layers / Line types / Text Styles / Dimension Styles
- Clearly identify on the drawing, your company name and drawing number.
- Clearly identify revisions.

Email drawings

- Clearly state "Quote request" or "Engineering Drawings" in subject line. Provide brief explanation of revision or change if appropriate.

Minimum Requirements For Engineering/Estimating

- 1) Clearly specify what you are sending (i.e. Order, RFQ, Information Request, Credit Information, Change).
- 2) Specify complete customer name, address, city, state, and zip.
- 3) Specify phone and fax number of customer.
- 4) Specify customer contact.
- 5) Specify exactly who is to receive a copy of the quote (i.e. Customer/Rep/Both).
- 6) Specify shipping information.
- 7) Specify requested ship date. Do not specify ASAP, Rush, or impossible dates.
- 8) Indicate on repeat orders when a change is taking place. Follow up with Engineering and Estimating to verify change.
- 9) Specify quantities required and indicate if a blanket order will be placed.
- 10) Specify part number if item is a repeat.
- 11) When referencing competitors part numbers, cross-reference them before submitting RFQ.

- 12) Clearly describe product including environment (Nema), type, height, width, depth, number of doors, special construction (i.e. shelves, brackets, etc....), description of application is helpful.
- 13) Clearly specify if UL Environmental rating Labels are required. If so, specify type or indicate none.
- 14) Clearly specify paint, paint type, paint color, paint part number, paint manufacture, and any special requirements if other than standard.
- 15) Specify type of finish for stainless enclosures (i.e. brushed, scotch brite). Indicate special requirements if other than standard.
- 16) Specify material requirements (i.e. stainless, mild steel).
- 17) Indicate if sub-panel is required.
- 18) When sending drawings, specify clear and complete information.
 - Engineering - specify customer name, job number, and revision if applicable.
 - Estimating – specify customer name and reference RFQ or quote number if applicable.
- 19) Specify any special requirements (i.e. penalty clauses, accessories, mil specs).