Technical Information

NEMA, UL And CSA Standards

<table>
<thead>
<tr>
<th>Enclosure rating</th>
<th>Description</th>
<th>Degrees Of Protection Against Solid Objects</th>
<th>Degrees Of Protection Against Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>Indoor use primarily to provide a degree of protection against contact, with the enclosed equipment and against a limited amount of falling dirt.</td>
<td>Indicators of protection against contact with live parts.</td>
<td>No protection</td>
</tr>
<tr>
<td>Type 2</td>
<td>Outdoor use primarily to provide a degree of protection against wind, snow, and windblown dust; undamaged by the formation of ice on the enclosure.</td>
<td>Outdoor use primarily to provide a degree of protection against wind, snow, and windblown dust; undamaged by the formation of ice on the enclosure.</td>
<td>Protected against vertical falling water drops</td>
</tr>
<tr>
<td>Type 3</td>
<td>Outdoor use primarily to provide a degree of protection against wind, snow, and windblown dust; undamaged by the formation of ice on the enclosure.</td>
<td>Outdoor or indoor use primarily to provide a degree of protection against the egress of water, oil, and non-corrosive liquids.</td>
<td>Protected against spraying water</td>
</tr>
<tr>
<td>Type 4</td>
<td>Indoor and outdoor use to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against the egress of water, oil, and non-corrosive liquids.</td>
<td>Protected against spraying water</td>
</tr>
<tr>
<td>Type 5</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against water, splash, and windblown dust; undamaged by the formation of ice on the enclosure.</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against water, splash, and windblown dust; undamaged by the formation of ice on the enclosure.</td>
<td>Protected against water jets</td>
</tr>
<tr>
<td>Type 6</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Protected against water jets</td>
</tr>
<tr>
<td>Type 7</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against water, splash, and windblown dust; undamaged by the formation of ice on the enclosure.</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against water, splash, and windblown dust; undamaged by the formation of ice on the enclosure.</td>
<td>Protected against water jets</td>
</tr>
<tr>
<td>Type 8</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Protected against water jets</td>
</tr>
<tr>
<td>Type 9</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Protected against water jets</td>
</tr>
<tr>
<td>Type 10</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Indoor or outdoor use primarily to provide a degree of protection against dust, dirt, and damage from external ice formation.</td>
<td>Protected against water jets</td>
</tr>
</tbody>
</table>

NOTE: The degree of protection provided by an enclosure is indicated by the IP code in the following way:

1st characteristic numeral—e.g. protection against solid foreign objects of 12.5 mm diameter and greater
2nd characteristic numeral—e.g. protection against spraying water

For more information, contact the Rittal Technical Hotline: 1-800-637-4425.
Technical Information
Certifications & Standards

Reference Documents and Sources

NEMA Standards Publication 250, Enclosures for Electrical Equipment (1000 Volts Maximum) and NEMA Standards Publication IC36, Enclosures for Industrial Controls and Systems

National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209

Canadian Standard Association
178 Roodaal Boulevard, Etobicoke, Ontario, Canada M9W 1R3

UL 509 Industrial Control Equipment; UL 870 Wireways, Auxiliary Gutter and Associated Fittings; and UL 746 Polymeric Materials - Use in Electrical Equipment Evaluations

Underwriters Laboratories
333 Pfingsten Road
Naperville, IL 60568-2086

Underwriters Laboratories of Canada
7 Crouse Road, Scarborough, Ontario M1H 3A9 Canada

IEC 509 Classification of Degrees of Protection by Enclosures; IEC 204 Electrical Equipment of Industrial Machines

International Electrotechnical Commission
1 rue de Varembe, CH-1211 Geneva 20, Switzerland

AIBI 251, I Grey Finishes for Industrial Apparatus and Equipment

American National Standards Institute
1430 Broadway
New York, NY 10018

Information for Comparison of IEC and CSA/NEMA-UL/UUL Ratings

NEMA 259 and UL 50 specify tests for environmental conditions such as falling dirt, ice, corrosion, oil and coolants whereas IEC 529 (EN60529) does not have such requirements. Different rating requirements make comparison difficult and disagreements are common.

The IEC designation consists of the letters IP followed by two numerals. The first number indicates the degree of protection provided by the enclosure with respect to persons and solid foreign objects entering the enclosure. The second number indicates the degree of protection provided by the enclosure with respect to the harmful ingress of water.

These data contained in the following tables are provided for information; however, caution is necessary when attempting to equalize IEC and CSA/NEMA enclosure ratings because an exact equivalence is not possible. The table can only be used to compare like designations to IEC. It should not be used inversely. The cross reference is based on engineering judgement and is not approved by any standards organization.

<table>
<thead>
<tr>
<th>NEMA Enclosure Type</th>
<th>IEC Enclosure Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IP 02</td>
</tr>
<tr>
<td>2</td>
<td>IP 03</td>
</tr>
<tr>
<td>3</td>
<td>IP 04</td>
</tr>
<tr>
<td>4</td>
<td>IP 23</td>
</tr>
<tr>
<td>5</td>
<td>IP 30</td>
</tr>
<tr>
<td>6</td>
<td>IP 33</td>
</tr>
<tr>
<td>6X</td>
<td>IP 66</td>
</tr>
<tr>
<td>6Y</td>
<td>IP 67</td>
</tr>
<tr>
<td>7</td>
<td>IP 5X (Variations)</td>
</tr>
<tr>
<td>8</td>
<td>IP 54</td>
</tr>
<tr>
<td>9</td>
<td>IP 55</td>
</tr>
<tr>
<td>10</td>
<td>IP 56</td>
</tr>
</tbody>
</table>

*Comparison ratings in the table are taken from Appendix A, NEMA 259-1997. Test data may change the equivalent rating published by the enclosure manufacturer.

The IEC mark has been a feature of European Community legislation since 1987, but it was actually born out of the New Approach Resolution two years earlier. This resolution aimed to "harmonize" the various national systems of European standards, and prompted various New Approach Directives (NADs). The CE mark applies only to those NADs which include testing or certification requirements.

The precise testing and certification required for CE labeling is spelled out in each individual NAD. These requirements may vary from NAD to NAD. The reason is that, depending on industry or application, a particular NAD may address certain technologies or safety concerns that require special attention. CE marking on a product or system proceeds conformity by the manufacturer or importer that the product complies with one or more directives that relate to the product. As a result, the product may be placed on the European Community market without challenge by national administrations.

The CE mark does not reflect any level of quality or any particular form of testing or certification. It should not be confused with third-party certification marks like UL, TÜV or VDE. Appearance of the CE mark on a product simply signifies that product to be placed on the market within the EU and it gives confidence to the member national administrations that essential requirements of relevant directives have been met.

Technical Information
Enclosures & The CE Mark

Rittal CE Marked Products

The electrical related products that cannot function independently, do not need to be labeled, but require a declaration of conformity. Upon request, Rittal will supply customers with a declaration of conformity documenting the valid scope of EMC low voltage or machine guideline for the product in question. CE affected Rittal products including filter fans, enclosures, lights, and door switches–already meet CE requirements and already carry the mark. Rittal roof conditioners and air/air heat exchangers have passed all tests for conformity to the relevant guidelines and have been certified by international test laboratories including TÜV and VDE. And Rittal heaters are now moving through the final stages of CE compliance.

Additional Products
Rittal is CE marking the following products affected by the EMC directive:
- Rootmount air conditioners
- Walmount air conditioners
- Mini-cooling air conditioners
- Air/air heat exchangers
- 1S fan and filter units
- Rackmount 19" fans
- Door switches
- Power distribution products

For Additional Information...
Rittal's product management team is becoming increasingly informed about the CE mark and can help with a variety of questions regarding CE marking requirements. Call (603) 637-4425 for additional information about CE marked Rittal products.

En 50095 Standard

The object of this standard is to specify definitions, classifications, characteristics and test requirements of enclosures to be used as part of switchgear and controlgear assemblies, that do not exceed 1000 V a.c. at frequencies not exceeding 1000Hz, or 1500 V d.c. and suitable for general use for either indoor or outdoor applications. This standard applies to empty enclosures, prior to the incorporation of switchgear and controlgear components by the user, as supplied by the enclosure manufacturer. Compliance with the safety requirements of the applicable product standard is the responsibility of the final assembly manufacturer.

Enclosures meeting this standard were type tested according to clauses written in the standard. These type tests include: static load, lifting, impact code, environmental code, thermal stability, heat, abnormal heat and fire, dielectric strength, continuity of protective circuit, weathering, corrosion and marking.

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Technical Information

Enclosure Materials

Specifications for Construction Materials Used in Rittal Enclosures

Rittal offers Aluminum, Galvanized Steel, Painted Steel, Polycarbonate, Stainless Steel and Fiberglass Enclosures. The choice of material is dependent on the concentration of various corrosive present in the application environment and other physical properties necessary to meet the design specifications. Although NEMA 4X is the only enclosure fabricated and rated for resistance to corrosive agents, other enclosure materials and ratings offer a degree of corrosion resistance in less harsh environments.

To begin the selection process, one must consider all the corrosive agents which can be present in an application, but determining the concentration and corroding agents may be a complex process. Usually several corrosive elements are present and interactions are not always well documented.

Water is the most common corrosive and is usually present to some extent in every enclosure application. Adjacent processing operations or other intermittent activities such as industrial cleaning or road salt may expose the enclosure to a variety of corrosive agents and temperatures.

Each environment is unique and all possible corrosive agents should be identified for the intended enclosure application. Once the corrosive agents and concentrations are identified, information in this section can be used to select the enclosure material. Metal corrosion is influenced by surface finish, surface treatment such as painting or galvanizing, and use of materials such as stainless steel, fiberglass, polycarbonate or aluminum which are naturally corrosion resistant.

To select the best enclosure material for an application: chemical resistance, physical strength and economic data are presented in several tables beginning on the next page. In Table 1 enclosure materials are ranked on a continuum from “Recommended” to “Limited or Unacceptable” in three broad categories of chemicals. Since the chemical resistance categories in the table are extremely broad, some materials may perform well in specific corrosive environments within a general category and it is best to consult the detailed Chemical Resistance Information provided in Table 3.

Besides the enclosure material, the corrosion resistance of features such as windows, gaskets, latches, etc. must also be considered. Table 4 provides the chemical resistance information which can be used to select the commonly used materials for these features.

Most of the chemical resistance information in Tables 3 and 4 is based on total immersion testing in the chemical for a minimum of 30 days at 72°F. The information in these tables is intended as a guide only. Total immersion testing is considered quite severe and the results may not necessarily reflect the performance under actual field conditions. The user assumes responsibility for selection of the material based on the characteristics of the application environment.

Cold Rolled Steel

A low carbon, cold finished steel produced by passing bar stock through a set of rolls. Cold rolled sheets have less thickness variation and a better finish than hot rolled steel.

Galvanized Steel

A zinc coated steel which is hot dip galvanized, metal sprayed or electroplated to provide corrosion resistance. Galvanizing provides a sacrificial coating and cathodic protection.

Hot Rolled Steel

A low carbon, hot finished steel produced by passing bar stock through a set of rolls at a temperature above the re-crystallization temperature. Hot rolled steel sheet has a poorer finish than cold rolled steel.

Picked and Oiled Steel Sheets

Hot rolled steel sheets which have had the scale removed by means of a hot, weak sulfuric acid bath after which an oil film has been applied for corrosion resistance.

Polycarbonate

Thermoplastic polymer which becomes solid when temperature falls below its melting point. Can be recycled and reused. Has excellent electrical properties and high impact strength.

Stainless Steel

A highly corrosion resistant iron alloy containing between 12% and 25% chromium. For superior corrosion resistance, Rittal fabricates enclosures from both Type 304 and 316 Stainless Steel which are non-magnetic. Type 316, a low carbon stainless steel, is harder and more corrosion resistant, it is an excellent material for marine application.

Aluminum

A lightweight metal which quickly forms a natural oxide layer to resist corrosion. Rittal fabricates enclosures from Type 5052 aluminum, the highest strength non-heat treatable aluminum alloy recommended for marine applications.

Galvaneal

A hot-dip zinc coated sheet which has been heated after coating to allow interdiffusion of zinc and iron to form an alloy coating.

Fiberglass

A hot-dip zinc coated sheet which has been heated after coating to allow interdiffusion of zinc and iron to form an alloy coating.

Detailed material strength information is beyond the scope of this catalog and should be obtained from a material reference or Rittal however, Table 2 provides some relative data to help with this selection.

For more information, contact the Rittal Technical Hotline 1-800-637-4425.