North America

Typical North American Marking

<table>
<thead>
<tr>
<th>Marking Method</th>
<th>Zone Scheme (US)</th>
<th>Zone Scheme (Canada)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex p, d, i, c</td>
<td>Zone 0, 1, 2, 20, 21, 22</td>
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Protection Concepts [NEC & CEC]

- Ex p, d, i, c: Intrinsic Safety
- Encapsulation: Protects the equipment from external influences and provides a barrier against the entry of dust, water, and other contaminants.
- Pressurization: Increases the internal pressure to prevent the ingress of gases or liquids.
- Outdoor: Protection against atmospheric conditions.
- Indoor: Protection against atmospheric conditions.
- Explosion-Proof: Provides high levels of protection against the ignition of explosive atmospheres.
- Non-Explosion-Proof: Provides protection against the ignition of explosive atmospheres but is not as stringent as Explosion-Proof.

Classification of Divisions and Zones

- Division 1: Areas where ignitable mixtures are likely to occur in normal operation.
- Division 2: Areas where ignitable mixtures may occur as a result of abnormal conditions.
- Zone 0: Areas where ignitable mixtures are likely to occur in normal operation.
- Zone 1: Areas where ignitable mixtures may occur occasionally in normal operation.
- Zone 2: Areas where ignitable mixtures are not likely to occur in normal operation.

Other CE Directives That May Also Apply

- Machinery Directive (CEP) 2006/42/EC
- Low Voltage Directive (LVD) 2014/35/EU
- RoHS Directive (2011/65/EU)
- Medical Devices Directive (MDD) 93/42/EEC
- Personal Protective Equipment Directive (PPE) 2016/42/EU
- Protective Equipment Directive (PED) 97/23/EC
- Equipment of Electrical Emission (EM) 2014/30/EU

Equipment Categories & Protection Levels

- Category 1: Protection against limited energy of sparks and short-circuit currents.
- Category 2: Protection against magnetic fields and restricted breathing.
- Category 3: Protection against restricted breathing and forced ventilation.
- Category 4: Protection against magnetic fields and forced ventilation.

Equipment Categories vs Zones of Use

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>Mining, Processing,</td>
</tr>
<tr>
<td>Category 2</td>
<td>Utilities, Marine,</td>
</tr>
<tr>
<td>Category 3</td>
<td>Mining, Distribution,</td>
</tr>
<tr>
<td>Category 4</td>
<td>Mining, Distribution,</td>
</tr>
</tbody>
</table>

Ingress Protection Codes (IEC 60529)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPX0</td>
<td>No protection</td>
</tr>
<tr>
<td>IPX1</td>
<td>Protection from falling droplets</td>
</tr>
<tr>
<td>IPX2</td>
<td>Protection from spraying water</td>
</tr>
<tr>
<td>IPX3</td>
<td>Protection from splashing water</td>
</tr>
<tr>
<td>IPX4</td>
<td>Protection from strong jets of water</td>
</tr>
</tbody>
</table>

Equipment Groups [ATEX]

- Group A: Petroleum, fuels and gases
- Group B: Natural gas, fuel, and air
- Group C: Hydrogen and hydrogen compounds
- Group D: Other gases and vapors
- Group E: Conductive dust and other solids
- Group F: Inherently safe apparatus suitable for installation in a hazardous area

Functional Safety (IEC 61508 Safety Systems)

- Category 1: Safety-related functions with limited failure consequences.
- Category 2: Safety-related functions with potential serious consequences.
- Category 3: Safety-related systems with high risk.
- Category 4: Safety-related systems with very high risk.

ATEX Categories

- ATEX Category 0: Equipment with no discernible risk of ignition.
- ATEX Category I: Equipment with a low risk of ignition.
- ATEX Category II: Equipment with a medium risk of ignition.
- ATEX Category III: Equipment with a high risk of ignition.

Equipment Categories

- Equipment Group 0: Non-explosive equipment.
- Equipment Group A: Petroleum and similar gases.
- Equipment Group B: Natural gas, fuel, and air.
- Equipment Group C: Hydrogen and hydrogen compounds.
- Equipment Group D: Other gases and vapors.
- Equipment Group E: Conductive dust and other solids.
- Equipment Group F: Inherently safe apparatus suitable for installation in a hazardous area.

About V.J. Pamseny

- V.J. Pamseny is an expert in hazardous locations and explosion protection.
- He provides training, consultation, and product marking solutions.
- He maintains a database of equipment markings and compliance information.\n
Note:

- This information is subject to change and is intended for general guidance.
- Always consult the manufacturer or supplier for specific information about a particular product.
- The information provided is not a substitute for professional advice or certification.