

What is an IP rating?

IP stands for **I**ngress **P**rotection.

International Electrotechnical Commission - IEC 60529 "Degrees of protection provided by enclosures (IP Code)". NEMA offers a similar rating system.

Definition of degree of protection (IP code)

IEC 60529 outlines an international classification system for the sealing effectiveness of enclosures of electrical equipment against the intrusion of foreign bodies (e.g., tools, dust, fingers, and moisture) into the equipment. This classification system utilizes the letters IP (Ingress Protection) followed by two digits.

Degree of protection - First digit

The first digit of the IP code indicates the degree that the connector is protected against contact with moving parts, as well as the degree to which equipment is protected against solid foreign bodies intruding into an enclosure:

- 0 No special protection.
- 1 Protection from a large part of the body such as hand or from solid objects greater than 50 mm in diameter.
- 2 Protection against objects not greater than 80 mm in length and 12 mm in diameter.
- 3 Protection from entry by tools, wires, etc., with a diameter or thickness greater than 2.5 mm.
- 4 Protection from entry by solid objects with a diameter or thickness greater than 1.0 mm.
- 5 Protection from the amount of dust that would interfere with the operation of the equipment.
- 6 Dust-tight.

Degree of protection - Second digit

The second digit indicates the degree of protection of the equipment inside the enclosure against the harmful entry of various forms of moisture (e.g., dripping, spraying, submersion, etc.).

- 0 No special protection.
- 1 Protection from vertically dripping water.
- 2 Protection from dripping water when tilted up to 15°.
- 3 Protection from sprayed water.
- 4 Protection from splashed water.
- 5 Protection from water projected from a nozzle.
- 6 Protection against heavy seas, or powerful jets of water.
- 7 Protection against temporary immersion.
- 8 Protection against complete continuous submersion in water (up to 1 meter deep for 15 minutes).

What is an NEMA rating, and how do I cross-reference with an IP rating?

Two widely accepted rating systems are the NEMA and the IP codes. NEMA, short for **National Electric Manufacturers' Association**, is commonly specified at installations in the U.S.A. IP, which is an abbreviation for International Protection, is derived from the IEC. IP and IEC are more common in Europe and Asia. NEMA Definitions

Here are the NEMA 250 classifications:

- 1 Intended for use primarily to provide a degree of protection against limited amounts of falling dirt.
- 3 Outdoor protection against rain, sleet, windblown dust, and damage from external ice formation.
- 3R Outdoor, protection against rain, sleet, and damage from external ice formation.
- 3S Outdoor, protection against rain, sleet, windblown dust, and to provide for operation of external mechanisms when ice laden.
- 4 Indoor/Outdoor, protection against windblown dust and rain, splashing water, hose-directed water & damage from external ice formation.
- 4X Indoor/Outdoor, protection against corrosion, windblown dust and rain, splashing water, hose-directed water & damage from external ice formation.
- 6 Indoor/Outdoor, protection against hose-directed water, the entry of water during occasional temporary submersion at a limited depth & damage from external ice formation.
- 6P Indoor/Outdoor, protection against hose-directed water, the entry of water during prolonged submersion at a limited depth & damage from external ice formation.
- 12 Indoor, protection against circulating dust, falling dirt and dripping non-corrosive liquids.
- 12K Type 12 with knockouts

A Brief Comparison of NEMA 250 and IEC 60529

NEMA Enclosure	IEC Enclosure
1	IP10
3	IP54
3R	IP14
3S	IP54
4 & 4X	IP56
6 & 6P	IP67
12 & 12K	IP52

How does the AC Voltage specifications relate to the DC voltage specifications?

In general the AC voltage assumes a 50-60 Hz sinusoidal waveform and is the RMS (root mean squared) value. The DC Voltage ratings are the AC voltage values times 1.41 (usually rounded).

How does the AC Current specifications relate to the DC Current specifications?

In general heat generation and dissipation limits the maximum current for a contact. Because an AC (rms) current of the same amount as a DC current causes the same power loss for a given contact resistance, the maximum current specification is the value for DC and AC (rms).
