IP Ratings

The IP Code defined in international standard IEC 60529 classifies the degrees of protection provided against the intrusion of:

- Solid objects (including body parts like hands and fingers)
- Dust
- Accidental contact
- Water in electrical enclosures

It consists of the letters IP (for “International Protection Rating” or “Ingress Protection Rating”) followed by two digits and an optional letter. The standard aims to provide users more detailed information than vague marketing terms such as “waterproof”.

Level	Object size protected against	Effective against
0	-	No protection against contact and ingress of objects
1	>50 mm	Any large surface of the body, such as the back of a hand, but no protection against deliberate contact with a body part
2	>12.5 mm	Fingers or similar objects
3	>2.5 mm	Tools, thick wires, etc.
4	>1 mm	Most wires, screws, etc.
5	dust protected	Ingress of dust is not entirely prevented, but it must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment; complete protection against contact
6	dust tight	No ingress of dust; complete protection against contact

Level	Protected against	Details
0	not protected	-
1	dripping water	Dripping water (vertically falling drops) shall have no harmful effect.
2	dripping water when tilted up to 15°	Vertically dripping water shall have no harmful effect when the enclosure is tilted at an angle up to 15° from its normal position.
3	spraying water	Water falling as a spray at any angle up to 60° from the vertical shall have no harmful effect.
4	splashing water	Water splashing against the enclosure from any direction shall have no harmful effect.
5	water jets	Water projected by a nozzle against enclosure from any direction shall have no harmful effects.
6	powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.
7	immersion up to 1 m	Ingress of water in harmful quantity shall not be possible when the enclosure is immersed in water under defined conditions of pressure and time (up to 1 m of submersion).
8	immersion beyond 1 m	The equipment is suitable for continuous immersion in water under conditions which shall be specified by the manufacturer. NOTE: Normally, this will mean that the equipment is hermetically sealed. However, with certain types of equipment, it can mean that water can enter but only in such a manner that produces no harmful effects.

IP 69K

German standard DIN 40050-9 extends the IEC 60529 rating system described above with an IP 69K rating for high-pressure, high-temperature wash-down applications.
Such enclosures must not only be dust tight (IP 6X), but also able to withstand high-pressure and steam cleaning.
The test specifies a spray nozzle that is fed with 80 °C (176 °F) water at 8–10 MPa (80–100 bar) and a flow rate of 14–16 L/min.
The nozzle is held 10–15 cm (3.94” - 5.91”) from the tested device at angles of 0°, 30°, 60° and 90° for 30 seconds each.
The test device sits on a turntable that rotates once every 12 s (5 rpm).

The IP 69K test specification was initially developed for road vehicles, especially those that need regular intensive cleaning (dump trucks, cement mixers, etc), but also finds use in other areas (e.g., food industry, railroad, marine, etc.)

The most commonly used protection methods are IP and NEMA, whereas:
- IP Classification – addresses the European market
- NEMA Classification – addresses the North American market