

Ingress Protection

The IP (Ingress Protection) code or ingress protection ratings are defined in international standard EN 60529 (British BS EN 60529:1992, European IEC 60529). They are used to define levels of sealing effectiveness of electrical enclosures against intrusion from foreign bodies (tools, dirt etc) and moisture.

An IP number is used to specify the environmental protection of enclosures around electronic equipment. These ratings are determined by specific tests.

The IP number is composed of two numbers, the first referring to the protection against solid objects and the second against liquids. The higher the number the better the protection.

First Number

- 0** - No protection (Sometimes X)
- 1** - Protected against solid objects up to 50mm²
- 2** - Protected against solid objects up to 12mm²
- 3** - Protected against solid objects up to 2.5mm²
- 4** - Protected against solid objects up to 1mm²
- 5** - Protected against dust, limited ingress (no harmful deposit)
- 6** - Totally protected against dust

Second Number

- 0** - No protection (Sometimes X)
- 1** - Protection against vertically falling drops of water (e.g. condensation)
- 2** - Protection against direct sprays of water up to 15° from vertical
- 3** - Protection against direct sprays of water up to 60° from vertical
- 4** - Protection against water splashed from all directions
 - limited ingress permitted
- 5** - Protected against low pressure jets of water from all directions
 - limited ingress permitted
- 6** - Protected against powerful jets of water or heavy seas,
 - limited ingress permitted (example, ship deck)
- 7** - Protected against the effect of immersion
 - between 15cm and 1m for 30 minutes
- 8** - Protected against long periods of immersion under pressure -
 - user should state immersion requirements

Ingress Protection

Grades of Protection Against Contact or Penetration of Solid Foreign Matter

Number	Protection	Explanation
0	No Protection	People are not protected against accidental contact with charged or moving parts. Contents are not protected against penetration of solid foreign matter.
1	Protection against penetration by large solid matter	Protects large surfaces from accidental contact with charged or moving parts inside the enclosure but does not protect against voluntary contact with these parts. Protects against penetration by solid matter with diameter >50mm
2	Protection against penetration by medium sized solid matters	Protects fingers from accidental contact with charged or moving parts inside the machine. Protects against penetration by solid matter with diameter >12mm
3	Protection against penetration by small solid matter	Protects tools, conductors, and similar objects with a thickness >2.5mm from contact from charged or moving parts inside the machine. Protects against penetration by solid matters with a diameter >2.5mm
4	Protection against penetration by very small solid matter	Protects tools, conductors and similar objects with a thickness >1mm from contact inside the machine. Prevents solid bodies with a diameter >1mm such as small tools and wires from entering the enclosure.
5	Protection against dust deposits	Completely protects from contact with charged or moving parts inside the machine. Protects against dust deposits. The quantity of dust allowed to enter is reduced to ensure proper functions.
6	Protection against penetration of dust particles	Completely protects from contact with charged or moving parts inside the machine. Totally prevents dust from entering machine.

Grades of Protection Against Liquid Penetration

Number	Protection	Explanation
0	No protection	No particular protection
1	Protection against water drops moving in a perpendicular direction	Water drops that fall perpendicularly must not damage the machine.
2	Protection against water drops moving in an oblique direction	Water drops that fall at any angle up to 15° from the vertical must not damage the machine.
3	Protection against dripping water	Water that falls at any angle up to 60° from the vertical must not damage the machine.
4	Protection against spraying water	Water sprayed from any direction against the machine must not cause damage.
5	Protection against jets of water	Jets of water launched from any direction against the machine must not cause damage.
6	Protection against flooding	Water, which penetrates the machine because of temporary flooding, such as rough sea, must not damage the machine.
7	Protection against immersion	When the machine is immersed for a predetermined time, water must not enter in such quantities as to cause damage.
8	Protection against submersion	When the machine is submerged at a predetermined pressure for an undetermined period of time, water must not enter the machine in such quantities as to cause damage.

Some of the United States NEMA enclosure ratings have IP rating equivalents:
NEMA 12 = IP52; NEMA 13 = IP54; NEMA 4 and 4X = IP66