

Ingress Protection (IP) Definitions

One of the well known standards is the protection against intrusion by solid foreign matter and/or to prevent water penetration i.e. the ingress protection. The standards available are the European EN 60529 = DIN VDE 0470 and the American NEMA No. 250. The IP standard is the description of measures designed for protection of both the housing and the equipment within the housing. It also makes a statement about protection from external influences or conditions, such as; mechanical impact, corrosion, caustic solutions (e.g. cutting coolant and coolant liquids), mould, pests (insects), sunlight or ice. The IP categories are:

IP xx

First digit indicates:

Protection against

Impact and foreign object penetration

- 0** No protection
- 1** Large foreign objects greater than 50 mm
- 2** Medium-sized foreign objects, greater than 12 mm
- 3** Small foreign objects greater than 2.5 mm
- 4** Granular foreign objects greater than 1 mm
- 5** Dangerous dust deposits
- 6** Penetrating dust, only for special housings

Second digit indicates:

Protection against water

- 0** No protection
- 1** Water dripping vertically
- 2** Dripping water at an angle of $\pm 15^\circ$
- 3** Water jet at an angle of $\pm 60^\circ$
- 4** Water spray from all directions
- 5** 50 l/min stream of water
- 6** 100 l/min stream of water
- 7** Immersion at 1 m for 1 min
- 8** Immersion under previously agreed conditions

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NEMA Enclosures

In the USA, often NEMA (National Electrical Manufacturer's Association) Ratings are often used.

The ratings are divide into classes:

Class 1 – general purpose

For indoor use only, mainly used as protection against contact with the internal electric circuits or heated surfaces. Used for domestic equipment and panel mounted instruments.

Class 3 – weather resistance

For indoor use only, mainly used as protection against contact with the internal electric circuits or heated surfaces. Used for domestic equipment and panel mounted instruments.

Class 4 – weather tight

Also know as hose proof. Equal to class 3, but also resistance against water spray delivered by a 1-inch nozzle with 65 gal/min water at 10ft distance from all directions for a 5 minute duration.

Class 4X – watertight

Equal as class 4, but also constructed of materials that are resistance to the corrosive conditions at the installed area. This type of enclosure is now seen as the standard for plan instrumentation.

Class 7 and 9

Used for explosion-proof enclosures, which are divided in class 1 (gases) and class 2 (dust). These are again divided into division I and II and subdivided into group A, b, C and D (gases) and group E, F and G (dust). See also 11.3.

Class 12 and 13

Enclosures are used for protection of equipment or electric components in machine shops and manufacturing plants.