

IP Codes Explained

First IP Code Numeral

This describes the degree to which the equipment is protected against penetration by **solid objects** and the degree of protection for people in contact with the equipment as follows:

- **X** No protection is specified
- **0** No protection is provided
- **1** Solid objects **50 mm** in diameter or more will not enter, back of hand will *not contact hazardous parts*
- **2** Solid objects **12.5 mm in diameter or more will not enter, protection for fingers up to 80 mm long**
- **3** Solid objects **2.5 mm** in diameter or more will not enter, protection against entry by tools, wires etc. more than 2.5 mm diameter
- **4** Solid objects **1 mm in diameter or more will not enter, protection against entry by tools, wires etc. more than 1 mm diameter**
- **5 DUSTPROOF** Dust will not enter in sufficient quantities to interfere with safety or proper operation, protection against entry by tools, wires etc. more than 1 mm diameter.
- **6 DUST-TIGHT** Dust will not enter. Protection against entry by tools, wires etc. more than 1 mm diameter.

Second IP Code Numeral

This describes the degree of protection against ingress of water as follows:

X No protection is specified

0 No protection is provided

- **1** Protection against drops of water falling vertically
- **2** Protection against drops of water falling vertically when enclosure is tilted up to 15° from vertical
- **3** Protection against rain falling at any angle up to 60° from vertical
- **4** Protection splashes of water from any direction
- **5** Protection against water jets from any direction
- **6** Protection against powerful water jets from any direction.(**watertight**)
- **7** Protection against immersion in water to specified depths (up to 1 m) for specified times.
- **8** Protection against continuous submersion in water to a specified depth (more than 1 m)

As a rough guide* the old terms describing resistance to penetration by water correspond to the following IP ratings (* Source IEE Guidance Note 1, Selection and Erection)

- Drip Proof IP X2
- Rain Proof IP X3
- Splash Proof IP X4
- Jet Proof IP X5
- Protected against immersion IP X7

IP Codes Explained

First Additional IP Code Letter

In respect of protection against electric shock, reference is made in the IET Wiring Regulations to **IPXXB** and **IPXXD** as alternatives to IP2X and IP4X respectively.

B *If a standard test finger 80mm long and 12mm in diameter can enter the enclosure there will be adequate clearance from **live parts***

D *If a probe 100mm long and 1mm in diameter can enter the enclosure there will be adequate clearance from live parts*

Test for IP2X

Two tests are required for IP 2X

1 Rigid sphere 12.5 mm in diameter is pressed against the opening with a force of 10N $\pm 10\%$. The full diameter of the sphere must not pass through the opening.

2 The live parts in the enclosure are all connected with wire.

Any live parts covered by paint, varnish, lacquer etc. should be covered in metal foil then connected to the test circuit. The live parts are connected in series with a lamp, a suitable ELV supply and a metal test finger. The metal test finger is 80 mm long, 12mm in diameter, and has two knuckle joints like a real finger. At the hand end of the finger there is an insulated stop face. The test finger is pressed against the opening with a force of 10N $\pm 10\%$. If the test finger enters there must be adequate clearance between the test finger and the live parts i.e. the test lamp will not light up.

Tests will be made with the test finger in all positions possible by bending the knuckles.

The lamp must not light up.

The stop face at the hand end of the finger must not be able to penetrate the opening.

Test for IP4X

A rigid steel wire of 1 + 0.05-0 mm diameter with a straight cut end free from burrs is pressed against the opening with a force of 1 N $\pm 10\%$. The wire must not pass through the opening.

Test for IPXXB

The test is made with the metal test finger as for IP2X.

Test for IPXXD

A probe is required. The probe consists of an insulated handle about 100 mm long and about 10 mm in diameter which ends in an insulated sphere (stop face) of 35 ± 0.2 mm diameter. On the opposite side of the sphere is a metal rod 100 mm long and 1 + 0.05-0 mm in diameter. The live parts in the enclosure relate to wire and connected in series with a lamp, a suitable ELV supply and the 1mm diameter metal rod of the probe. The tip of the metal rod is pressed gently against the opening. If the rod goes in there must be adequate clearance between the rod and the live parts i.e. the lamp should not light up. Tests must be made with the rod in all possible positions. The lamp must not light up. The full diameter of the insulated sphere (stop face) must not be able to pass through the opening.