

## Understanding IP Ratings

The protection of enclosures against ingress of dirt or against the ingress of water is defined in IEC529 (BSEN60529:1991). Conversely, an enclosure which protects equipment against ingress of particles will also protect a person from potential hazards within that enclosure, and this degree of protection is also defined as a standard.

The degrees of protection are most commonly expressed as "IP" followed by two numbers, e.g. IP65, where the numbers define the degree of protection. The first digit (Foreign Bodies Protection) shows the extent to which the equipment is protected against particles, or to which persons are protected from enclosed hazards. The second digit (Water Protection) indicates the extent of protection against water. The wording in the table is not exactly as used in the standards document, but the dimensions are accurate.

The first digit in the rating is the protection against contact and foreign bodies. The second digit in the rating is the water protection factor. The third digit in the impact protection factor. It is normally displayed in the format below.

### IP s l (i)

**s = solids, l=liquids and i= impact (optional)**

First Index - Foreign Bodies Protection, Solids		
Index	Protection against Human/Tool Contact	Protection against solid objects (foreign bodies)
0	No special protection	
1	Back of hand, Fist	Large foreign bodies, diam. >50mm
2	Finger	Medium-sized foreign bodies, diam. >12
3	Tools and wires etc with a thickness >2.5mm	Small foreign bodies, diam. >2.5mm
4	Tools and wires etc with a thickness >1mm	Granular foreign bodies, diam. >1mm
5	Complete protection, (limited ingress permitted)	Dust protected; dust deposits are permitted, but their volume must not affect the function of the unit.
6	Complete protection	Dust-proof

Second Index - Water Protection, Liquids		
Index	Protection against water	Protection from condition
0	No special protection	
1	Water dripping/falling vertically	Condensation/Light rain
2	Water sprayed at an angle (up to 15° degrees from the vertical)	Light rain with wind
3	Spray water (any direction up to 60° degrees from the vertical)	Heavy rainstorm
4	Spray water from all directions, (limited ingress permitted)	Splashing

5	Low pressure water jets from all directions, (limited ingress permitted)	Hose down, residential
6	High pressure jets from all directions, (limited ingress permitted)	Hose down, commercial. eg. Ship decks
7	Temporary immersion, 15 cm to 1m	Immersion in tank
8	Permanent Immersion, under pressure	For use on Titanic recovery vehicle

<b>Third Index - Impact Protection, Impact</b>		
<b>Index</b>	<b>Protection against impact</b>	<b>Equivalent mass impact</b>
0	No special protection	
1	Protected against 0.225J impact	eg. 150g weight falling from 15cm height
2	Protected against 0.375J impact	eg. 250g weight falling from 15cm height
3	Protected against 0.5J impact	eg. 250g weight falling from 20cm height
4	Protected against 2.0J impact	eg. 500g weight falling from 40cm height
5	Protected against 6.0J impact	eg. 0.61183kg weight falling from 1m height
6	Protected against 20.0J impact	eg. 2.0394kg weight falling from 1m height

**Examples:**

Umbrella-	IP-01 or IP-02 depending on umbrella
Chain link fence-	IP-10
Chicken wire-	IP-20
Screen-	IP-30
Kevlar cloth-	IP-40
Tent (camping)-	IP-42
Saran wrap-	IP-51
Bottle of wine-	IP-67
Submarine-	IP-68