

IP Code

The IP Code (or International Protection Rating, sometimes also interpreted as Ingress Protection Rating)* consists of the letters IP followed by two digits and an optional letter. As defined in international standard IEC 60529, it classifies the degrees of protection provided against the intrusion of solid objects (including body parts like hands and fingers), dust, accidental contact, and water in electrical enclosures. The standard aims to provide users more detailed information than vague marketing terms such as *waterproof*.

The digits (characteristic numerals) indicate conformity with the conditions summarized in the tables below. For example, an electrical socket rated IP22 is protected against insertion of fingers and will not be damaged or become unsafe during a specified test in which it is exposed to vertically or nearly vertically dripping water. IP22 or 2X are typical minimum requirements for the design of electrical accessories for indoor use.

**Explanation of the letters IP is given in IEC 60529 (Ed. 2.1), clause 4.1*

First Digit: Solids

The first digit indicates the level of protection that the enclosure provides against access to hazardous parts (e.g., electrical conductors, moving parts) and the ingress of solid foreign objects.

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 the 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

Second Digit: Liquids

Protection of the equipment inside the enclosure against harmful ingress of water.

Level	Protected Against	Effective Against
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 (6.3mm) against enclosure from any direction shall have no harmful effects.
6	Powerful water jets	Water projected in powerful jets (12.5mm nozzle) 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 1m	The equipment is suitable for continuous immersion in water under conditions which shall be specified by the manufacturer. 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 it produces no harmful effects.

IP Rating: Reference Chart

IP Number	First Digit - SOLIDS	Second Digit - Liquids
IP00	Not protected from solids	Not protected from liquids
IP01	Not protected from solids	Protected from condensation
IP02	Not protected from solids	Protected from water spray less than 15 degrees from vertical
IP03	Not protected from solids	Protected from water spray less than 60 degrees from vertical
IP04	Not protected from solids	Protected from water spray from any direction
IP05	Not protected from solids	Protected from low pressure water jets from any direction
IP06	Not protected from solids	Protected from high pressure water jets from any direction
IP07	Not protected from solids	Protected from immersion between 15 centimeters and 1 meter in depth
IP08	Not protected from solids	Protected from long term immersion up to a specified pressure
IP10	Protected from touch by hands greater than 50 millimeters	Not protected from liquids
IP11	Protected from touch by hands greater than 50 millimeters	Protected from condensation
IP12	Protected from touch by hands greater than 50 millimeters	Protected from water spray less than 15 degrees from vertical
IP13	Protected from touch by hands greater than 50 millimeters	Protected from water spray less than 60 degrees from vertical
IP14	Protected from touch by hands greater than 50 millimeters	Protected from water spray from any direction
IP15	Protected from touch by hands greater than 50 millimeters	Protected from low pressure water jets from any direction
IP16	Protected from touch by hands greater than 50 millimeters	Protected from high pressure water jets from any direction
IP17	Protected from touch by hands greater than 50 millimeters	Protected from immersion between 15 centimeters and 1 meter in depth
IP18	Protected from touch by hands greater than 50 millimeters	Protected from long term immersion up to a specified pressure
IP20	Protected from touch by objects greater than 12 millimeters	Not protected from liquids
IP21	Protected from touch by fingers greater than 12 millimeters	Protected from condensation
IP22	Protected from touch by objects greater than 12 millimeters	Protected from water spray less than 15 degrees from vertical
IP23	Protected from touch by objects greater than 12 millimeters	Protected from water spray less than 60 degrees from vertical
IP24	Protected from touch by objects greater than 12 millimeters	Protected from water spray from any direction
IP25	Protected from touch by objects greater than 12 millimeters	Protected from low pressure water jets from any direction
IP26	Protected from touch by objects greater than 12 millimeters	Protected from high pressure water jets from any direction
IP27	Protected from touch by objects greater than 12 millimeters	Protected from immersion between 15 centimeters and 1 meter in depth
IP28	Protected from touch by objects greater than 12 millimeters	Protected from long term immersion up to a specified pressure
IP30	Protected from tools and wires greater than 2.5 millimeters	Not protected from liquids
IP31	Protected from tools and wires greater than 2.5 millimeters	Protected from condensation
IP32	Protected from tools and wires greater than 2.5 millimeters	Protected from water spray less than 15 degrees from vertical
IP33	Protected from tools and wires greater than 2.5 millimeters	Protected from water spray less than 60 degrees from vertical
IP34	Protected from tools and wires greater than 2.5 millimeters	Protected from water spray from any direction
IP35	Protected from tools and wires greater than 2.5 millimeters	Protected from low pressure water jets from any direction
IP36	Protected from tools and wires greater than 2.5 millimeters	Protected from high pressure water jets from any direction
IP37	Protected from tools and wires greater than 2.5 millimeters	Protected from immersion between 15 centimeters and 1 meter in depth
IP38	Protected from tools and wires greater than 2.5 millimeters	Protected from long term immersion up to a specified pressure

IP ratings chart: continued

IP40	Protected from tools and small wires greater than 1 millimeter	Not protected from liquids
IP41	Protected from tools and small wires greater than 1 millimeter	Protected from condensation
IP42	Protected from tools and small wires greater than 1 millimeter	Protected from water spray less than 15 degrees from vertical
IP43	Protected from tools and small wires greater than 1 millimeter	Protected from water spray less than 60 degrees from vertical
IP44	Protected from tools and small wires greater than 1 millimeter	Protected from water spray from any direction
IP45	Protected from tools and small wires greater than 1 millimeter	Protected from low pressure water jets from any direction
IP46	Protected from tools and small wires greater than 1 millimeter	Protected from high pressure water jets from any direction
IP47	Protected from tools and small wires greater than 1 millimeter	Protected from immersion between 15 centimeters and 1 meter in depth
IP48	Protected from tools and small wires greater than 1 millimeter	Protected from long term immersion up to a specified pressure
IP50	Protected from limited dust ingress	Not protected from liquids
IP51	Protected from limited dust ingress	Protected from condensation
IP52	Protected from limited dust ingress	Protected from water spray less than 15 degrees from vertical
IP53	Protected from limited dust ingress	Protected from water spray less than 60 degrees from vertical
IP54	Protected from limited dust ingress	Protected from water spray from any direction
IP55	Protected from limited dust ingress	Protected from low pressure water jets from any direction
IP56	Protected from limited dust ingress	Protected from high pressure water jets from any direction
IP57	Protected from limited dust ingress	Protected from immersion between 15 centimeters and 1 meter in depth
IP58	Protected from limited dust ingress	Protected from long term immersion up to a specified pressure
IP60	Protected from total dust ingress	Not protected from liquids
IP61	Protected from total dust ingress	Protected from condensation
IP62	Protected from total dust ingress	Protected from water spray less than 15 degrees from vertical
IP63	Protected from total dust ingress	Protected from water spray less than 60 degrees from vertical
IP64	Protected from total dust ingress	Protected from water spray from any direction
IP65	Protected from total dust ingress	Protected from low pressure water jets from any direction
IP66	Protected from total dust ingress	Protected from high pressure water jets from any direction
IP67	Protected from total dust ingress	Protected from immersion between 15 centimeters and 1 meter in depth
IP68	Protected from total dust ingress	Protected from long term immersion up to a specified pressure
IP69k	Protected from total dust ingress	Protected from steam jet cleaning

References

1. IEC 60529, “Degrees of Protection Provided by Enclosures (IP Codes),” Ed. 2.1 (Geneva: International Electrotechnical Commission, 2001)
2. IEC 60529 (Ed 2.1), clause 4.1