

IP	6	8
“Ingress Protection”	First Digit: Solids Protection	Second Digit: Liquids Protection

## Ingress Protection (IP) and what it means

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	Not protected	No protection against contact and ingress of objects
1	>50mm	Any large surface of the body, such as the back of the hand, but no protection against deliberate contact with a body part.

Level	Object size protected against	Effective against
2	>12.5mm	Fingers or similar objects.
3	>2.5mm	Tools, thick wires, etc.
4	>1mm	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	Object size 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.

Level	Object size protected against	Effective against
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 1m	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

Below is an easy to follow reference chart to help you decide which IP rating you need or have.

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.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
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 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.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
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 a specified pressure.
IP20	Protected from touch by fingers and objects greater than 12 millimeters.	Not protected from liquids.
IP21	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from condensation.
IP22	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from water spray less than 15 degrees from vertical.
IP23	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from water spray less than 60 degrees from vertical.
IP24	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from water spray from any direction.
IP25	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from low pressure water jets from any direction.
IP26	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from high pressure water jets from any direction.
IP27	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from immersion between 15 centimeters and 1 meter in depth.
IP28	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from long term immersion up a specified pressure.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
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 a specified pressure.
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.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
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 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.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
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 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 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, 2011)
2. IEC 60529 (Ed. 2.1), clause 4.1.

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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 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.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
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 a specified pressure.
IP20	Protected from touch by fingers and objects greater than 12 millimeters.	Not protected from liquids.
IP21	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from condensation.
IP22	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from water spray less than 15 degrees from vertical.
IP23	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from water spray less than 60 degrees from vertical.
IP24	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from water spray from any direction.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
IP25	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from low pressure water jets from any direction.
IP26	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from high pressure water jets from any direction.
IP27	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from immersion between 15 centimeters and 1 meter in depth.
IP28	Protected from touch by fingers and objects greater than 12 millimeters.	Protected from long term immersion up 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.
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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.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
IP38	Protected from tools and wires greater than 2.5 millimeters.	Protected from long term immersion up a specified pressure.
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 a specified pressure.
IP50	Protected from limited dust ingress.	Not protected from liquids.
IP51	Protected from limited dust ingress.	Protected from condensation.

IP Number	First Digit - SOLIDS	Second Digit - LIQUIDS
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.
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