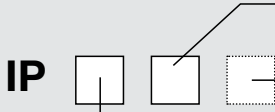


Degrees of protection according to IEC 60 529



Degree of protection of electrical equipment

Electrical equipment must be protected for safety reasons from external influences and conditions. Enclosures provide the protection of electrical equipment against access to hazardous parts and against solid foreign objects, as well as dust, humidity and water. The international standard IEC 60 529, the German standard *DIN EN 60 529 / VDE 0470 Part 1 September 2000* with the title "Degrees of protection provided by enclosures (IP Code)", form the basis for the determination and designation of the degree of protection.

The degree of protection provided by an enclosure is proven by means of standardized testing methods. The becoming "aged" of test samples before carrying out the actual type tests are part of the standardized testing methods. Ageing is made by an more-active increased thermal treatment.

The marking system consists of the code letters **IP** and two following characteristic numerals.

Example:

IP 6 7

Code letters
(International Protection)

**1st characteristic numeral:
Protection against foreign solid objects and direct contact**

Meaning for the protection of equipment against ingress of solid foreign objects and of persons against access to hazardous parts with (non-protected) back of hand, finger, tool or wire.

Protection against ingress of solid foreign objects ...	Protection against access to hazardous parts with ...	Definition
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IP 0X	non-protected	non-protected
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IP 1X	solid foreign objects ≥ 50 mm \varnothing	the back of a hand
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IP 2X	solid foreign objects ≥ 12.5 mm \varnothing	a finger
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IP 3X	solid foreign objects ≥ 2.5 mm \varnothing	a tool ≥ 2.5 mm \varnothing
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IP 4X	solid foreign objects ≥ 1.0 mm \varnothing	a wire ≥ 1 mm \varnothing
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IP 5X	dust-protected	with any auxiliary equipment (wire)
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IP 6X	dust-tight	contact with any auxiliary equipment (wire)
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The access probe, sphere of 50 mm \varnothing , shall have adequate clearance from hazardous parts. The object probe, sphere of 50 mm \varnothing , shall not fully penetrate.
The jointed test finger, 12 mm \varnothing , 80 mm length, shall have adequate clearance from hazardous parts. The object probe, sphere of 12.5 mm \varnothing shall not fully penetrate.
The object probe / access probe of 2.5 mm \varnothing shall not penetrate at all.
The object probe / access probe of 1.0 mm \varnothing shall not penetrate at all.
Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety. The access probe of 1.0 mm \varnothing , shall not penetrate.
No ingress of dust. The access probe of 1.0 mm \varnothing shall not penetrate at all.

Additional letter

Additional letter where the actual protection against access to hazardous parts is higher than that indicated by the 1st characteristic numeral (e.g. IP 20C)

Short form: Protection against access with ...	Definition
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A	the back of the hand	The access probe, sphere of 50 mm \varnothing , shall have adequate clearance from hazardous parts.
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B	a finger	The jointed test finger of 12 mm \varnothing , 80 mm length, shall have adequate clearance from hazardous parts.
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C	a tool ≥ 2.5 mm \varnothing	The access probe of 2.5 mm \varnothing , 100 mm length, shall have adequate clearance from hazardous parts.
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D	a wire ≥ 1 mm \varnothing	The access probe of 1.0 mm \varnothing , 100 mm length, shall have adequate clearance from hazardous parts.
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Meaning of the first characteristic numeral

The first characteristic numeral indicates, to what extent the enclosure provides protection for persons against the access to (affecting of) hazardous parts. This protection is reached, when the penetration into an enclosure of a part of the body or a foreign object, which is held by a person, is prevented or limited. At the same time the enclosure provides protection of equipment against the penetration of solid foreign objects. This is the reason for having two descriptions and two definitions to each first characteristic numeral.

Meaning of the second characteristic numeral

The second characteristic numeral indicates the protection of the enclosure against ingress of water with harmful effects on the electrical equipment.

2nd characteristic numeral: Protection against ingress of water with harmful effects

	IP X0	IP X1	IP X2	IP X3	IP X4	IP X5	IP X6	IP X7
Brief description	non-protected	Protection against vertical dripping water	Protected against dripping water. when the housing is tilted up to 15°.	Protection for occasional cleaning procedures. not direct spraying of the equipment (spraying water)	Protection for occasional cleaning procedures. not direct spraying of the equipment (splashing water)	Protection of operational processes. not direct spraying of the equipment (water jets)	Protection of operational processes. not direct spraying of the equipment (powerful water jets)	Protection against the effects of temporary immersion in water
Test requirement		Vertically falling drops shall have no harmful effects	Vertically falling drops shall have no harmful effects when the enclosure is tilted up to 15° on either side of the vertical	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects	Water splashed against the enclosure from any direction shall have no harmful effects	Water splashed from any direction in jets against the enclosure shall have no harmful effects	Water splashed from any direction in powerful jets against the enclosure shall have no harmful effects	Water must not enter in such quantity as to cause harmful effects if the housing is temporarily submerged in water under standardized pressure and time conditions.
Short form		vertically dripping water	dripping water (15° tilted)	spraying water	splashing water	jetting water	powerful jetting water	temporary immersion
Symbol		☰	☰	☒	☒	☒☒	☒☒	☒☒
	IP 20							
	IP 30	IP 31						
	IP 40	IP 41	IP 42	IP 43	IP 44			
					IP 54	IP 55		
						IP 65	IP 66	IP 67

Additional letters to the IP Code

The IP Code can be still extended by additional letters. Additional letters indicate the degree of protection against access to hazardous parts. Additional letters follow the two characteristic numerals. Additional letters are only used, - if the actual protection against access to hazardous parts is higher than by the first characteristic numeral indicated; or - if only the protection against access to hazardous parts is indicated and the degree of protection against solid foreign objects is not considered. The first characteristic numeral being then replaced by an X. An enclosure shall only be designated with a stated degree of protection indicated by the additional letter if the enclosure also complies with all lower degrees of protection.