

## Definition of Protection Grades IEC 529 IEC (International Electro technical Commission)

The IEC has established an enclosure grading system that produces an IP rating. (For example, IP 54 – “5” is the first character – refer to tables I & II. “4” is the second character – refer to table III – following page).

**Table I**  
**Degrees of Protection against Hazardous Parts**  
Degree of protection is indicated by the first characteristic numeral

First Characteristic Numeral	Brief Description	Definition
0	Non protected	
1	Protected against access to hazardous parts with the back of a hand	The access probe, sphere of 50 mm $\Phi$ , shall have adequate clearance from hazardous parts
2	Protected against access to hazardous parts with a finger	The jointed test finger of 12 mm $\Phi$ , 80 mm length, shall have adequate clearance from hazardous parts
3	Protected against access to hazardous parts with a tool	The access probe of 2.5 mm $\Phi$ shall not penetrate
4	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm $\Phi$ shall not penetrate
5	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm $\Phi$ shall not penetrate
6	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm $\Phi$ shall not penetrate

Note: In the case of the first characteristic numerals 3, 4, 5 and 6, protection against access to hazardous parts is satisfied if adequate clearance is kept. Due to the simultaneous requirement specified in Table II the definition “shall not penetrate” is given in Table I.

**Table II**  
**Degrees of Protection against Solid Foreign Objects**  
Degree of protection is indicated by the first characteristic numeral

First Characteristic Numeral	Brief Description	Definition
0	Non Protected	
1	Protected against solid foreign objects of 50 mm $\Phi$ and greater	The object probe, sphere of 50 mm $\Phi$ , shall not fully penetrate <sup>1</sup>
2	Protected against solid foreign objects of 12.5 mm $\Phi$ and greater	The object probe, sphere of 12.5 mm $\Phi$ , shall not fully penetrate <sup>1</sup>
3	Protected against solid foreign objects of 2.5 mm $\Phi$ and greater	The object probe of 2.5 mm $\Phi$ , shall not penetrate at all <sup>1</sup>
4	Protected against solid foreign objects of 1.0 mm $\Phi$ and greater	The object probe of 1.0 mm $\Phi$ , shall not penetrate at all <sup>1</sup>
5	Dust protected	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.
6	Dust-tight	No ingress of dust

<sup>1</sup> The full diameter of the object probe shall not pass through an opening of the enclosure.

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**Table III**  
**Degrees of Protection against Water**  
Degree of protection is indicated by the second characteristic numeral

Second Characteristic Numeral	Brief Description	Definition
0	Non Protected	
1	Protected against vertical falling water drops	Vertically falling drops shall have no harmful effects
2	Protected against vertical falling water drops when enclosure tilted up to 15°	Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical
3	Protected against spraying water	Water sprayed at any angle up to 60° on either side of the vertical shall have no harmful effects
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects
7	Protected against the effects of temporary immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7

### NEMA to IEC Enclosure Rating Cross-Reference<sup>1</sup>

NEMA	IP20	IP22	IP54	IP55	IP66	IP67
1	•					
2		•				
3				•		
3R		•				
4					•	
4X					•	
6						•
12			•			
13			•			

<sup>1</sup> This cross-reference is an approximation of NEMA classifications for reference only. Please consult the appropriate agencies for requirements and test qualifications for complete information.