

# IP Ratings and Definitions

## April 2006



IP Ratings or International Protection Code is a standard rating system that indicates the type of environments a particular instrument is capable of operating. The IP rating takes the form of IP-\*\*. Where each \* is replaced by a number corresponding to a particular rating. The following chart explains each of the numbers.

IP-\*\*

## IP Protection Number Summary

### FIRST NUMBER - Protection against solid objects

- 0 No protection
- 1 Protected against solid objects up to 50mm e.g. accidental touch by hands
- 2 Protected against solid objects up to 12mm e.g. fingers
- 3 Protected against solid objects up to 2.5mm (tools and wires)
- 4 Protected against solid objects up to 1mm (small tools and wires)
- 5 Protected against dust, limited ingress (no harmful deposit)
- 6 Totally protected against dust

### SECOND NUMBER - Protection against liquids

- 0 No protection
- 1 Protection against vertically falling drops of water e.g. condensation
- 2 Protection against direct sprays of water up to 15 degrees from vertical
- 3 Protection against direct sprays of water up to 60 degrees from vertical
- 4 Protection against water sprayed from all directions - limited ingress permitted
- 5 Protected against low-pressure jets of water from all directions - limited ingress permitted
- 6 Protected against low pressure jets of water (such as use on ship decks) - limited ingress permitted
- 7 Protected against the effect of immersion between 15cm and 1m
- 8 Protected against long periods of immersion under pressure

Note that there is a third number, which is commonly omitted, which refers to protection against mechanical impacts.

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There are many NEMA ratings available for enclosures. Below, is a brief explanation of each NEMA rating.

### NEMA 1 General Purpose - Indoors

Type 1 enclosures are intended for general purpose indoor use primarily to provide a degree of protection against contact with the enclosed equipment or locations where unusual service conditions do not exist.

### NEMA 2 Drip Proof - Indoors

Type 2 enclosures are intended for general purpose indoor use primarily to provide a degree of protection against limited amounts of falling water and dirt.

### NEMA 3 Dust Tight, Rain Tight, & Ice/Sleet resistant - Outdoors

Type 3 enclosures are intended for general purpose outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; and to be undamaged by the formation of ice on the enclosure.

### NEMA 3R Rain Proof & Ice/Sleet Proof - Outdoors

Type 3R enclosures are intended for general purpose outdoor use primarily to provide a degree of protection against falling rain; and to be undamaged by the formation of ice on the enclosure.

### NEMA 3S Dust Tight, Rain Tight, & Ice/Sleet Proof - Outdoors

Type 3S enclosures are intended for general purpose outdoor use primarily to provide a degree of protection against sleet; and to be undamaged by the formation of ice on the enclosure.

### NEMA 4 Water Tight & Dust Tight - Indoors

Type 4 enclosures are intended for general purpose indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water; and to be undamaged by the formation of ice on the enclosure.

### NEMA 4x Water Tight, Dust Tight, & Corrosion Resistant - Indoors

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Type 4X enclosures are intended for general purpose indoor and outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose-directed water; and to be undamaged by the formation of ice on the enclosure.

NEMA 5 Superseded by NEMA 12 for Control Apparatus

Type 5 see NEMA 12

NEMA 6 Submersible, Water Tight, Dust Tight, & Ice/Sleet Resistant - Indoors & Outdoors

Type 6 enclosures are intended for general purpose indoor or outdoor use primarily to provide a degree of protection against the entry of water during temporary submersion at a limited depth; and to be undamaged by the formation of ice on the enclosure.

NEMA 7 Underwriters Lab Class 1-Groups C&D -Explosion Proof - Indoors

Type 7 enclosures are for indoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the National Electrical Code.

Type 7 enclosures shall be capable of withstanding the pressures resulting from an internal explosion of specified gases, and contain such an explosion sufficiently that an explosive gas-air mixture existing in the atmosphere surrounding the enclosure will not be ignited. Enclosed heat generating devices shall not cause external surfaces to reach temperatures capable of igniting explosive gas-air mixtures in the surrounding atmosphere. Enclosures shall meet explosion, hydro-static, and temperature design tests.

NEMA 8 Underwriters Lab Class 1-Groups C&D -Explosion Proof - Indoors

Type 8 is same as NEMA 7, except the unit is oil-immersed

NEMA 9 Underwriters' Lab Class II - Groups E,F,G - Indoors

Type 9 enclosures are intended for special purpose indoor use in locations classified as hazardous (Class II, Groups E, F, or G, as defined in the National Electrical Code).

Type 9 enclosures shall be capable of preventing the entrance of dust. Enclosed heat generating devices shall not cause external surfaces to reach temperatures capable of igniting or discoloring dust on the enclosure or igniting dust-air mixtures in the surrounding atmosphere. Enclosures shall meet dust penetration and temperature design tests, and aging of gaskets (if used).

NEMA 10 Bureau of Mines

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NEMA 11 Corrosion Resistant & Drip Proof - Oil Immersed - indoors

NEMA 12 Industrial Use - Dust Tight & Drip Tight - Indoors

Type 12 enclosures are intended for industrial indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids.

NEMA 13 Oil Tight & Dust Tight - Indoors

Type 13 enclosures are intended for industrial indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and noncorrosive coolant.

This is a cross reference for comparing NEMA and IP enclosure ratings. This comparison is only approximate, and it is the responsibility of the user to verify the enclosure rating necessary for the given application.

Enclosure type	IP23	IP30	IP32	IP55	IP64	IP65	IP66	IP67
1	◆							
2		◆						
3					◆			
4							◆	
4X							◆	
6								◆
12				◆		◆		
13						◆		

Examples:

Umbrella	IP-01 or IP-02 (depending on umbrella type)
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