

NEMA Enclosure Standard

NEMA enclosure standards represent an enclosure's ability to protect against the external environment. The following represent brief summaries of the NEMA standard.

Type 1

Intended for indoor use primarily to provide a degree of protection against (hand) contact with the enclosed equipment. Sometimes known as a "finger-tight" enclosure. This is the least costly enclosure, but is suitable only for clean, dry environments.

Type 2

Intended for indoor use primarily to provide a degree of protection against limited amounts of falling dirt and water.

Type 3

Intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; undamaged by ice which forms on the enclosure.

Type 3R

Intended for outdoor use primarily to provide a degree of protection against falling rain and sleet; undamaged by ice which forms on the enclosure. This is the most common outdoors enclosure.

Type 4

Intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water; undamaged by ice which forms on the enclosure.

Type 4X

Intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose directed water; undamaged by ice which forms on the enclosure. This is the most common enclosure in "food" environments. Commonly made from stainless steel (expensive) or fiberglass (cheap).

Type 6

Intended for use indoors or outdoors which occasional temporary submersion is encountered.

Type 6P

Intended for use indoors or outdoors which occasional prolonged submersion is encountered. Corrosion protection. This type is recommended when extensive washdowns are performed.

Type 12

Intended for use indoors to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids. This is the most common type enclosure used in normal factory environments.

Type 13

Intended for use indoors to provide a degree of protection against dust, and the spraying of water, oil, and noncorrosive coolant.

IEC 529/IP Environmental Ratings

The degree of protection provided by an enclosure is indicated by the IP code in the following way: **IP 2 3**

First characteristic numeral - e.g. protection against solid foreign objects of 12.5mm diameter and greater

Second characteristic numeral - e.g. protected against spraying water

Degrees of Protection Against Solid Objects		
Description	Definition	First Characteristic Numeral
Non-protected		0
Protected against solid foreign objects of 50mm diameter and greater	The object probe, sphere of 50mm diameter shall not fully penetrate	1
Protected against solid foreign objects of 12.5mm diameter and greater	The object probe, sphere of 12.5mm diameter shall not fully penetrate	2
Protected against solid foreign objects of 2.5mm diameter and greater	The object probe, sphere of 2.5mm diameter shall not penetrate at all	3
Protected against solid foreign objects of 1.0mm diameter and greater	The object probe, sphere of 1.0mm diameter shall not penetrate	4
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	5
Dust tight	No ingress of dust	6

Degrees of Protection Against Water		
Second characteristic numeral	Description	Definition
0	No protection	
1	Protected against vertically falling water drops	Vertically falling water drops shall have no harmful effects
2	Protected against vertically falling water drops when enclosure tilted up to 15 degrees	Vertically falling water drops shall have no harmful effects when the enclosure is tilted at any angle up to 15 degrees on either side of the vertical axis
3	Protected against spraying water	Water sprayed at an angle up to 60 degrees on either side of the vertical axis 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 water 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 continuously 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 Type rating	UL Type rating	CSA Type rating	Apprx. IEC/IP classification
1	1	1	IP23
2	2	2	IP30
3	3	3	IP64
3R	3R	3R	IP32
4	4	4	IP66
4X	4X	4X	IP66
6	6	6	IP67
12	12	12	IP55
13	13	13	IP65