



# CodeFacts

AIDC (Automated Identification and Data Collection) Technical & Informational Documents  
Written for Everyone

## NEMA, IP and Durability Ratings – What They Mean

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Many of the “ruggedized” devices we provide—such as hand-held computers and shop floor data collection terminals—have ratings associated with them that are a bit of a mystery to some. This document addresses and explains them. They are essentially specifications regarding the *enclosure* that contains the device and its relative impermeability to solids and liquids.

First off, the acronym NEMA stands for National Electrical Manufacturers Association and IP stands for ingress protection. (The word *ingress* means “a going in or entering” and refers to how impervious a given device is to liquids and solids.) In many ways, the NEMA and IP schemes overlap somewhat and the following chart illustrates the various ratings and their definitions:

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NEMA Rating	IP Equivalent	NEMA Definition	IP Definition
1	IP10	Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dirt	1 = Protected against solid foreign objects of 50mm in diameter and greater  0 = Not Protected
2	IP11	Enclosures constructed for indoor used to provide a degree of protection to personnel against incidental contact with the enclosed equipment, to provide a degree of protection against falling dirt, and to provide a degree of protection against dripping and light splashing of liquids	1 = Protected against solid foreign objects of 50mm in diameter and greater  1 = Protected against vertically falling water drops

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3	IP54	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and that will be undamaged by external formation of ice on the enclosure	5 = Protected against dust - Limited to ingress (no harmful deposit) 4 = Protected against water sprayed from all directions - Limited to ingress permitted.
3R	IP14	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, and snow; and that will be undamaged by external formation of ice on the enclosure	1 = Protected against vertically falling water drops 4 = Protected against water sprayed from all directions - Limited to ingress permitted.
3S	IP54	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and in which the external mechanism(s) remain operable when ice laden.	5 = Protected against dust - Limited to ingress (no harmful deposit) 4 = Protected against water sprayed from all directions - Limited to ingress permitted.
4	IP56	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water, and corrosion; and that will be undamaged by the external formation of ice on the enclosure	5 = Protected against dust - Limited to ingress (no harmful deposit) 6 = Protected against strong jets of water from all directions - Limited to ingress permitted.
4X	IP56	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, and corrosion; and that will be undamaged by the external formation of ice on the enclosure	5 = Protected against dust - Limited to ingress (no harmful deposit) 6 = Protected against strong jets of water from all directions - Limited to ingress permitted.

5	IP52	Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against settling airborne dust, lint, fibres, and flyings; and to provide a degree of protection against dripping and light splashing of liquids.	5 = Protected against dust - Limited to ingress (no harmful deposit)  2 = Protected against direct sprays of water up to 15° from the vertical.
6	IP67	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during occasional temporary submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.	6 = Totally protected against dust  7 = Protected against the effects of temporary immersion between 15cm and 1m. Duration of test 30 minutes.
6P	IP67	Enclosures constructed for either indoor or outdoor use to provide a degree of protection to the personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during prolonged submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure	6 = Totally protected against dust  7 = Protected against the effects of temporary immersion between 15cm and 1m. Duration of test 30 minutes.
12 & 12K	IP52	Enclosures constructed (without knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibres, and flying; and against dripping and light splashing of liquids	5 = Protected against dust - Limited to ingress (no harmful deposit)  2 = Protected against direct sprays of water up to 15° from the vertical.
13	IP54	Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibres, and flyings; and against the spraying, splashing, and seepage of water, oil, and non-corrosive coolants.	5 = Protected against dust - Limited to ingress (no harmful deposit)  4 = Protected against water sprayed from all directions - Limited to ingress permitted.

Put more succinctly:

<b>NEMA No.</b>	<b>Description</b>
1	General Purpose (Indoor)
2	Water Drip Proof (Indoor)
3R	Dust Tight, Rain Tight, and Ice Resistant (Outdoor)
4	Water Tight and Dust Tight (Indoor/Outdoor)
4X	Water Tight, Dust Tight, and Corrosion Resistant (Indoor/Outdoor)
9	Indoor Hazardous Locations (Not Applicable to EMS Equipment)
12	Industrial Use - Dust Tight and Drip Tight (Indoor)
13	Oil Tight and Dust Tight (Indoor)

Example: NEMA 2 is intended for indoor use and is impermeable to dripping liquids

<b>First IP Number – Solids Ingress</b>	<b>Second IP Number – Liquids Ingress</b>
0: No special protection	0: No special protection
1: Protected against solid objects > 50mm in diameter	1: Protected against dripping water
2: Protected against solid objects > 12mm in diameter	2: Protected against dripping water when tilted up to 15 degrees from normal position
3: Protected against solid objects > 2.5mm in diameter	3: Protected against spraying water
4: Protected against solid objects > 1mm in diameter	4: Protected against splashing water
5: Dust protected	5: Protected against water jet spray
6: Dust Tight	6: Protected against heavy jet spray
	7: Protected against the effects of immersion
	8: Protected against submersion

Example: IP54 is dust protected, and protected against splashing water.

## Durability Ratings

Here's where the waters get really murky. Where IP and NEMA standards and ratings have strict guidelines, this area is rather open for the manufacturers of the devices and very subject to confusion by their potential adopters.

In the case of any device we provide that is intended to be used "in the hand" (i.e. mobile scanning terminals and hand-held tethered and cordless scanners) most manufacturers will offer a durability rating in the form of a "drop spec." In simple terms, this number—expressed as a distance—indicates just how far a tested device can be dropped and be expected to survive. Manufacturers test their devices in many varied ways, all of which will affect these ratings, which become very ambiguous when one wants to compare them! For examples:

- Device A will withstand a 3m drop to a concrete floor, while Device B will survive five 2m drops to concrete. Which is more durable?
- Device C will live through a 2.5m drop to concrete while Device D will withstand a 3.2m drop to carpeted concrete. Which is more durable?
- Device E will survive 1,000 .5m tumbles at room temperature. Device F can take 200 1m tumbles at freezing. Which is more durable?

You see where we're going here! That's where obtaining technologies like this from a knowledgeable source (like us!) can pay big dividends. Once your application and operating environment is understood, we can then recommend suitable devices that we know, through experience, will survive the conditions you've set forth.

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