

Training Note: IP and NEMA Enclosure Ratings

Purpose: IP and NEMA enclosure ratings determine how well the enclosures of electronic components resist the infiltration of dust and moisture.

IP X X

1st Numeral:
Protection
Against Solids

2nd Numeral:
Protection Against Liquids

Examples:

IP67: Dust-tight; Immersion up to 1 meter

IP69K: Dust-tight; High-temperature, high-pressure spray

IP (Ingress Protection) Enclosure Rating for Nonhazardous Locations

IEC-based classification system for electrical component enclosure protection against dust and moisture.

| Level | 1st Numeral: Protection against Solids | 2nd Numeral: Protection against Liquids |
|-------|---|---|
| 0 | Non-protected | Non-protected |
| 1 | Objects greater than 50 mm | Dripping water |
| 2 | Objects greater than 12 mm | Dripping water on enclosure tilted up to 15 degrees |
| 3 | Objects greater than 2.5 mm | Spraying water up to 60 degrees from both sides |
| 4 | Objects greater than 1.0 mm | Splashing water from all sides |
| 5 | Dust-protected | Water jets |
| 6 | Dust-tight | Heavy seas |
| 7 | --- | Immersion |
| 8 | --- | Submersion |
| 9K* | --- | High-temperature, high-pressure spray (per DIN 40050-9) |

* Currently not part of the harmonized IEC standard 60529, which describes the IP ratings for enclosures.

NEMA Enclosure Ratings for Nonhazardous Locations

National Electrical Manufacturers Association classification system for electrical component enclosure protection against a variety of environmental conditions described below.

| Protection Against: | Enclosure Rating | | | | | | | | | | |
|--|------------------|-------------|--------------|---------------|-------------------------|--------------------------|-------------------------|--------------------------|--------------|--------------|----------------------------|
| | 1 indoor | 2 indoor | 3 outdoor | 3S outdoor | 4 indoor/ outdoor | 4X indoor/ outdoor | 6 indoor/ outdoor | 6P indoor/ outdoor | 12 indoor | 13 indoor | PW12 indoor/ outdoor |
| Accidental bodily contact | NEMA 1 | NEMA 2 | NEMA 3 | NEMA 3S | NEMA 4 | NEMA 4X | NEMA 6 | NEMA 6P | NEMA 12 | NEMA 13 | --- |
| Falling dirt | NEMA 1 | NEMA 2 | NEMA 3 | NEMA 3S | NEMA 4 | NEMA 4X | NEMA 6 | NEMA 6P | NEMA 12 | NEMA 13 | --- |
| Dust, lint, non-volatile fibers | --- | --- | NEMA 3 | NEMA 3S | NEMA 4 | NEMA 4X | NEMA 6 | NEMA 6P | NEMA 12 | NEMA 13 | --- |
| Windblown dust | --- | --- | NEMA 3 | NEMA 3S | NEMA 4 | NEMA 4X | NEMA 6 | NEMA 6P | --- | --- | --- |
| Falling liquid, light splash | --- | NEMA 2 | NEMA 3 | NEMA 3S | NEMA 4 | NEMA 4X | NEMA 6 | NEMA 6P | NEMA 12 | NEMA 13 | --- |
| Hosedown, heavy splash | --- | --- | --- | --- | NEMA 4 | NEMA 4X | NEMA 6 | NEMA 6P | --- | --- | --- |
| High-pressure, high-temperature spray | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | PW12 |
| Exposure to cleaning, sanitizing chemicals | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | PW12 |
| Rain, snow, sleet | --- | --- | NEMA 3 | NEMA 3S | --- | --- | NEMA 6 | NEMA 6P | --- | --- | --- |
| Ice buildup | --- | --- | --- | NEMA 3S | --- | --- | --- | --- | --- | --- | --- |
| Oil or coolant seepage | --- | --- | --- | --- | --- | --- | --- | --- | NEMA 12 | NEMA 13 | --- |
| Oil, coolant spray or splash | --- | --- | --- | --- | --- | --- | --- | --- | --- | NEMA 13 | --- |
| Occasional submersion | --- | --- | --- | --- | --- | --- | NEMA 6 | NEMA 6P | --- | --- | --- |
| Prolonged submersion | --- | --- | --- | --- | --- | --- | --- | NEMA 6P | --- | --- | --- |
| Corrosive agents | --- | --- | --- | --- | --- | NEMA 4X | --- | NEMA 6P | --- | --- | --- |
| IEC Equivalent* | IP10 | IP11 | IP54 | IP54 | IP56 | IP56 | IP67 | IP67 | IP52 | IP54 | IP69K* |

* IEC equivalents listed here are general approximations. For example, the PW12 rating is less rigorous than the IP69K rating.