Technical Annex

CHART I International Protection (IP) Ratings to IEC 529

Protection Modes to EN 60529 DIN VDE 0470 Part 1			Second Digit – Degree of Water Protection								
First Digit			IP 0X No Protection	IP X1 Protection against dripping water falling vertically	IP X2 Protection against dripping water even when tilted 15° vertically	IP X3 Protection against dripping water even when tilted 60°	IP X4 Protection against splashing water from any direction	IP X5 Protection against water jets from any direction	IP X6 Protection against heavy seas from any direction	IP X7 Protection against effects of immersion	IP X8 Protection against submersion
	Person touching	Protection against penetration of foreign bodies									
IP X0	No protection	No protection	IP 00								
IP 1X	Protection against touching with the hand	Protection against large solid bodies >50 mm Ø	IP 10	IP 11 IP	IP 12						
IP 2X	Protection against touching with the finger	Protection against med., solid bodies >12.5 mm Ø	IP 20	IP 21	IP 22	IP 23					
IP 3X	Protection against touching with tools, wires, etc., >2.5 mm Ø	Protection against small, solid bodies >2.5 mm Ø	IP 30	IP 31	IP 32	IP 33	IP 34				
IP 4X	Protection against touching with tools, wires, etc., >1 mm Ø	Protection against small, solid bodies >1 mm Ø	IP 40	IP41	IP 42	IP 43	IP 44				
IP 5X	Protection against touching with tools, wires, etc., >1mm Ø	Protection against internal dust accumulation	IP 50				IP 54	IP 55			
IP 6X	Protection against touching with tools, wires, etc., >1mm Ø	Protection against all dust accumulation	IP 60					IP 65	IP 66	IP 67	IP 68

In some countries a third digit is added. It gives information about the mechanical properties of the equipment.
This designation has not yet been standardized according to current DIN and IEC regulations.
Devices in this catalogue correspond to digit IP .7.

CHART II NEMA / IP Cross Reference

The chart below provides a cross-reference from NEMA to International Protection (IP) Ratings. This cross-reference is an approximation based on the most current information available. It is not sanctioned by NEMA, IEC, or any other regulatory body. This chart should be used only as a guideline.

IEC 529 Protection Ratings	NEMA Ratings									
	1	2	3	3R	4	4X	5	6	12	13
IP 00	↓									
IP 10		↓								
IP 11										
IP 20										
IP 21										
IP 22										
IP 23										
IP 30										
IP 31				↓						
IP 32										
IP 33										
IP 40										
IP 41										
IP 42										
IP 43										
IP 50							↓			
IP 51										
IP 52										
IP 53										
IP 54										↓
IP 55										
IP 56										
IP 60										
IP 61										
IP 62										
IP 63			↓							
IP 64										
IP 65					↓	↓		↓	↓	
IP 66										
IP 67										
IP 68										

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Guide to NEMA and IEC Enclosure Ratings

Application Note #4

Overview

There are a number of standards that exist worldwide to define the type and applicability of enclosures. In the United States the **National Electrical Manufacturers Association** (NEMA) are the most prevalent, worldwide the **International Electrotechnical Commission** (IEC) standards are most prevalent. Why is there not a single standard to define enclosures and their suitability for various applications? Why ask why?

More information on both of these organizations can be found at the following websites:

NEMA – www.nema.org - NEMA Standards Publication 250
IEC – www.iec.ch - Ingress Protection (IP) Standard 60529

This Application Note will discuss in limited detail the NEMA standards, the IEC standards, and then provide a cross reference from NEMA standards to IEC standards. Please refer to the appropriate sections of the latest revision of NEMA Standards Publication No. 250 for complete information regarding applications, features and design tests. Refer to the corresponding IP Standard 60529 for similar information on the IEC standards.

NEMA Definitions Pertaining to Non-Hazardous Locations:

Type	Description
1	Intended for use primarily to provide a degree of protection against limited amounts of falling dirt.
3	Intended for outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust, and damage from external ice formation.
3R	Intended for outdoor use primarily to provide a degree of protection against rain, sleet, and damage from external ice formation.
3S	Intended for outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust, and to provide for operation of external mechanisms when ice laden.
4	Intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water, and damage from external ice formation.
4X	Intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water, and damage from ice formation
6	Intended for indoor or outdoor use primarily to provide a degree of protection against hosedirected water, the entry of water during occasional temporary submersion at a limited depth, and damage from external ice formation.
6P	Intended for indoor or outdoor use primarily to provide a degree of protection against hosedirected water, the entry of water during prolonged submersion at a limited depth, and damage from external ice formation.
12	Intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping non-corrosive liquids.
12K	Type 12 with knockouts.

NEMA Definitions Pertaining to Hazardous Locations:

Type	Description
7	Intended for indoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the National Electrical Code.
8	Intended for indoor or outdoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the National Electrical Code.
9	Intended for indoor use in locations classified as Class II, Groups E, F, or G, as defined in the National Electrical Code.
10	Constructed to meet the applicable requirements of the Mine Safety and Health Administration.

Guide to NEMA and IEC Enclosure Ratings (cont'd)

IEC Definitions

The IEC, standard 60529, has defined Ingress Protection as a two digit code. The ***first digit*** describes the degree of protection against access to hazardous parts and ingress of solid objects. The ***second digit*** designates the Ingress Protection against water. Please refer to the appropriate sections of IEC 60529 for complete information regarding applications, features, and design tests.

Therefore an **IP 65** rating means that the unit is: Protected against access with a wire (1.0 mm), is Dust tight and can handle Jetting water - any direction.

Protection Against Access to Hazardous Parts (*First Digit*)

Number	Description
0	Non-protected
1	Protected against access with back of hand (50 mm)
2	Protected against access with jointed finger (12 mm x 80 mm)
3	Protected against access with a tool (2.5 mm)
4, 5, 6	Protected against access with a wire (1.0 mm).

Protection Against Ingress of Solid Foreign Objects (*First Digit*)

Number	Description
0	Non-protected
1	Objects equal or greater than 50mm
2	Objects equal or greater than 12.5mm
3	Objects equal or greater than 2.5mm
4	Objects equal or greater than 1mm
5	Dust protected
6	Dust tight

Protection Against Ingress of Liquids (*Second Digit*)

Number	Description
0	Non-protected
1	Water dripping vertically
2	Water dripping, enclosure tilted up to 15°
3	Spraying water, up to 60° angle from vertical
4	Splashing water, any direction
5	Jetting water, any direction
6	Powerful jetting water, any direction
7	Temporary immersion in water
8	Continuous immersion in water

Guide to NEMA and IEC Enclosure Ratings (cont'd)

NEMA To IEC Enclosure Designations

The following information is provided by NEMA Standard No. 250 Appendix A as a guide to comparing NEMA enclosure types to IEC designations.

IEC Publication 60529 Classification of Degrees of Protection Provided by Enclosures provides a system for specifying the enclosures of electrical equipment on the basis of the degree of protection provided by the enclosure. IEC 60529 does not specify degrees of protection against mechanical damage of equipment, risk of explosions, or conditions such as moisture (produced for example by condensation), corrosive vapors, fungus, or vermin (those creatures looking for a new home or to sharpen their teeth). NEMA Standards Publication 250 does test for environmental conditions such as corrosion, rust, icing, oil, and coolants. For this reason, and because the tests and evaluations for other characteristics are not identical, the IEC Enclosure Classification Designations **cannot be exactly equated** with NEMA Enclosure Type Numbers.

The following table provides a guide for converting from NEMA Enclosure Type Numbers to IEC Enclosure Classification Designations. The NEMA Types meet or exceed the test requirements for the associated IEC Classifications; for this reason the table should not be used to convert from IEC classifications to NEMA Types and the NEMA to IEC conversion should be verified by test.

NEMA Enclosure Type Number	IEC Enclosure Designation
1	IP10
2	IP11
3	IP54
3R	IP14
3S	IP54
4 and 4X	IP56
5	IP52
6 and 6P	IP67
12 and 12K	IP52
13	IP54

IP69K – What is IP69K?

IP69K Rating

The IP69K rating is for applications where high pressure and high temperature washdown is used to sanitize equipment.

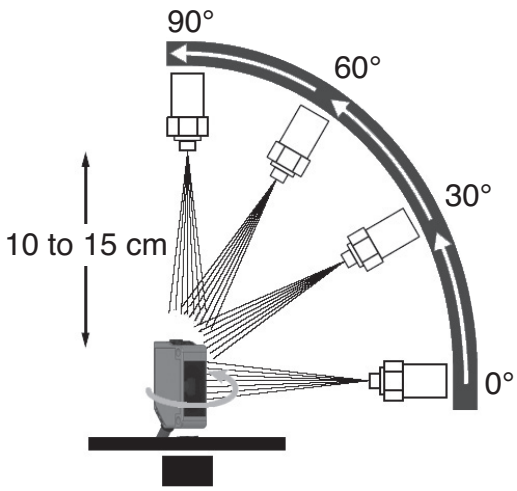
The IP69K test specification was initially developed for road vehicles, especially those that need regular intensive cleaning (dump trucks, cement mixers, etc.), but has been widely adopted in the Food & Beverage industries as a test of products to withstand sanitary washdown.

What does IP69K mean?

In the IEC 60529 rating system, IP6 refers to the product's ability to resist ingress of dust. The 69K refers to the product's ability to resist ingress of high temperature (Steam)/high pressure water.

How is the product tested?

- Products rated to IP69K must be able to withstand high-pressure and steam cleaning.
- The test specifies a spray nozzle that is fed with 80 °C water at 80-100 bar (-1160-1450) and a flow rate of 14-16 L/min.
- The nozzle is held 10-15 cm from the tested device at angles of 0°, 30°, 60° and 90° for 30 seconds each.
- The test device sits on a turntable that rotates once every 12 seconds.



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