Ingress Protection Explained

Definition

A worldwide standard has been established by the International Electrotechnical Commission (IEC) for comparing the ability of electronic devices to withstand exposure to dust particles and water. The IEC describes its mission to be:

...the leading global organization that prepares and publishes international standards for all electrical, electronic and related technologies. These serve as a basis for national standardization and as references when drafting international tenders and contracts. Through its members, the IEC promotes international cooperation on all questions of electrotechnical standardization and related matters, such as the assessment of conformity to standards, in the fields of electricity, electronics and related technologies. [Quoted from the IEC website.]

The ratings established by the IEC for resistance to particulates and water are called "Ingress Protection" or "IP" ratings, and are defined by IEC 60529, Degrees of protection provided by enclosures ("IP" Code), for all IP Codes. A full rating contains two digits, each of which can take a value of 1 through 6. The first measures the ability of the device to resist the ingress of foreign objects, or dust. The second measures the ability to resist the ingress of moisture. The first digit can have a value from 1 to 6, the second a value of 1 to 8. The higher the number, the better the protection. The lowest combined rating would be IP11; the highest would be IP68. Where a device has not been rated for either dust or water, an "X" is substituted for the digit. So what do the different digit values mean? The table below was developed by Underwriter's Laboratory (UL) to explain the Ingress Protection code values, as specified in the IEC 60529 standard.

IP Ratings Explained by Underwriters Laboratories (UL)

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First Digit	Protection Against Foreign Objects	Second Digit	Protection Against Moisture
0	Not protected	0	Not protected
1	Protected against objects greater than 50mm	1	Protected against dripping water
2	Protected against objects greater than 12mm	2	Protected against dripping water when tilted up to 15°N
3	Protected against objects greater than 2.5mm	3	Protected against spraying water
4	Protected against objects greater than 1.0mm	4	Protected against splashing water
5	Dust Protected	5	Protected against water jets
6	Dust Tight	6	Protected against heavy seas
		7	Protected against the effects of immersion
		8	Complete protection against submersion