NEC & NEMA

The National Electrical Code (NEC) provides regulations concerning the installation and use of various types of electrical equipment.
These classifications are being "harmonized" with the IEC and European Hazardous Location Ratings. A source of information about this "harmonization" is the Instrument Society of America (ISA).
Contact the ISA at:
67 Alexander Drive
RTP, NC 27709
Phone: (919)549-8411
www.isa.org
Another resource is UL at:
www.ul.com/hazloc/

National Electric Code (NEC) Article 500 Hazardous Location Classification

Class	*Division*	*Group*	
Class I Locations in which flammable gases or vapors are (or may be) present in the air in quantities great enough to produce explosive or ignitable mixtures.	**DIVISION 1:** Locations in which hazardous concentrations of flammable gases or vapors exist continuously, intermittently, or periodically under normal conditions. **-or-** Locations in which hazardous concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage. **-or-** Locations in which breakdown or faulty operation of equipment or processes might release hazardous concentrations of flammable gases or vapors. **DIVISION 2:** Locations in which volatile flammable Liquids or flammable gases are handled, processed, or used, but are normally kept in closed containers and can only escape due to accidental rupture. **-or-** Locations in which hazardous concentrations of gases or vapors are normally prevented by mechanical ventilation and might become hazardous due to failure of the ventilating equipment. **-or-** Locations that are adjacent to Class I, Division 1 locations.	**GROUP A:** Atmospheres containing acetylene **GROUP B:** Atmospheres containing: acrolein(inhibited) butadiene ethylene oxide hydrogen gases containing more than 30% hydrogen by volume propylene oxide **GROUP C:** Atmospheres containing: allyl alcohol carbon monoxide cyclopropane diethyl ether ethylene hydrogen sulfide methyl ether n-propyl ether or gases or vapors of equivalent hazard	**GROUP D:** Atmospheres containing: acetone ammonia benzene butane butyl alcohol ethane ethyl alcohol gasoline heptanes hexanes methane (natural gas) methyl alcohol methyl ethyl ketone (MEK) naphta octanes pentanes propane styrene toluene xylenes or gases or vapors of equivalent hazard
Class II Locations in which there are explosive mixtures of air and combustible dust.	**DIVISION 1:** Locations in which explosive or ignitable amounts of combustible dust is or may be in suspension of continuously, intermittently, or periodically under normal operating conditions. **-or-** Locations where mechanical failure or abnormal operation of machinery or equipment might cause explosive or ignitable mixtures to be produced. **-or-** Locations in which combustible electrically conductive dust is present. **DIVISION 2:** Locations where combustible dust deposits exist but are not likely to be thrown into suspension in the air, but where the dust deposits may be heavy enough to interfere with safe heat dissipation from electric equipment. **-or-** Locations where combustible dust deposits may be ignited by arcs, sparks, or burning material from electrical equipment.	**GROUP E:** Atmospheres containing combustible: metal dusts regardless of resistivity-or-dusts of similarly hazardous characteristics having resistivity of less than 100,000 ohm-centimeter **GROUP F:** Atmospheres containing combustible: carbon black, charcoal, or coke dusts which have more than 8% total volatile material or- carbon black, charcoal, or coke dusts sensitized by other materials so that they present an explosion hazard, and having a resistivity greater than 100 ohm-centimeter but equal to or less than 100,000,000 ohm-centimeter **GROUP G:** Atmospheres containing dusts having resistivity of 100,000,000 ohm-centimeter	
Class III Locations in which there is the presence of easily-ignited fibers or flyings, but where the fibers or flyings are not likely to be in suspension in the air in quantities great enough to produce ignitable mixtures.	**DIVISION 1:** Locations in which easily ignitable fibers or materials producing flyings are handled, manufactured, or used. **DIVISION 2:** Locations in which easily ignitable fibers are stored or handled (except in a manufacturing process).	**(NOT GROUPED)** Manufacturers include: textile mills, clothing plants, and fiber processing plants. Easily ignitable fibers include: Cotton, rayon, sisal, hemp, and jute.	

National Electrical Manufacturers Association(NEMA)

NEMA publishes many different documents that discuss standards for industrial control equipment. Please note that these standards are undergoing "harmonization" with the IEC and European standards and may be replaced. Global Engineering Documents handles the sale of NEMA, IEC and CE documents. For more information, please contact Global Information at:
1 (800) 854-7179 (within the U.S.)
(303) 397-7956 (international)
(303) 397-2740 (fax)
15 Inverness Way East
Englewood, Co 80112-5776
www.global.ihs.com

- ICS 1, General Standards for Industrial Control and Systems
- ICS 2, Controllers, Contactors, and Overload Relays, Rated no more than 2000 Volts AC or 750 Volts DC
- ICS 3, Factory Built Assemblies
- ICS 6, Enclosures for Industrial Control Systems

NEMA Electrical Enclosure Environmental Protection Ratings

Type	*Protection*	*Location*	*Description*
1	General Purpose	indoor	accidental contact
2	Drip-proof	indoor	falling non-corrosive liquids and falling dirt
3	Dust-tight, rain-tight	outdoor	windblown dust, water, and sleet; ice-resistant
3R	Dust-tight, rain-tight	outdoor	same as above, plus melting of sleet/ice will not damage external enclosure or mechanisms
4	Water-tight/dust-tight	indoor/ outdoor	splashing water, outdoor seepage of water, falling or hose-directed water
4X	Water-tight/dust-tight	indoor	same as above, plus corrosion resistant
5	Dust-tight	indoor	dust and falling dirt
6	Water-tight/dust-tight	indoor/ outdoor	temporary entry of water limited submersion, formation of ice on enclosure
6P	Water-tight/dust-tight	indoor/ outdoor	same as previous, plus prolonged submersion
7	Explosion proof/Class I Group D Hazardous Locations	indoor	hazardous chemicals and gases
9	Explosion proof/Class II Hazardous Locations	indoor	hazardous dust
11	Drip-proof/Corrosion Resistant	indoor	oil immersion, corrosive effects of liquids and gases
12	Drip-tight/Dust-tight	indoor	fibers, lint, dust, and splashing, see page, and dripping condensation of non-corrosive liquids
13	Oil-tight/Dust-tight	indoor	dust, spraying of water, oil, and non-corrosive coolant

How to Define Your IP Ratings

IP-

The first number defines the amount of protection against penetration of solid objects into the housing.

Number	Level of Protection
0	No protection against contact or entry of solids
1	Protection against accidental contact by hand, but not deliberate contact. Protection against large objects.
2	Protection against contact by fingers. Protection against medium-size foreign objects.
3	Protection against contact by tools, wires, etc. Protection against small foreign objects.
4	Protection against contact by small tools and wires. Protection against small foreign objects.
5	Complete protection against contact with live or moving parts. Protection against harmful deposits of dust.
6	Complete protection from live or moving parts. Protection against penetration of dust.

Additional information on IP ratings can be found in the 1976 IEC Publication: Classification of Degrees of Protection Provided by Enclosures or at **www.iec.ch.**

Example: What is IP-67?

Complete protection of live parts Protection against the penetration of dust. Additionally, protection while immersed in water.

The second number defines the amount of protection against penetration of liquid into the housing.

Number	Level of Protection
0	No Protection
1	Protection against drops of condensed water. Condensed water falling on housing shall have no effect.
2	Protection against drops of liquid. Drops of falling liquid shall have no effect when housing is tilted to 15° from vertical.
3	Protection against rain. No harmful effect from rain at angles less than 60° from vertical.
4	Protection against splashing from any direction.
5	Protection against water jets from any direction.
6	Protection against conditions on ships and decks. Water from heavy seas will not enter.
7	Protection against immersion in water. Water will not enter under stated conditions of pressure and length of time.
8	Protection against indefinite immersion in water under a specified pressure.

Federation UL/CUL/CSA Certification Numbers*

	UL/CUL	CSA	ISO-9000
AnnArbor Technologies Industrial Computers	E 184 646	-	-
Centsable Photo Switches	E 130 644	-	✔
Centsable Proximity Switches	E 130 644	-	✔
Centsable Limit Switches	E 189 258	-	✔
Centsable Contactors	E 191 059	LR 703171	✔
Centsable Manual Motor Controllers	E 195 426	-	✔
Cutler-Hammer Pushbuttons	E 1491	LR 353	-
Cutler-Hammer Contactors	E 1491	LR 353	-
DIN*nectors*	E 179 129	-	-
DirectLogic	E 157 382	-	✔

Federation UL/CUL/CSA Certification Numbers*

	UL/CUL	CSA	ISO-9000
DL305 Family Class I Div II	E 200 031	-	✔
DirectTouch Panels	E 178 572	-	✔
EZTouch Panels	Pending	Pending	-
Facts	E 139 594	-	-
Hitachi Drives	E 178 241	-	✔
Host	E 185 989	-	-
Optimation	E 182 843	-	-
Zip*Link* Cables	E 101 344	LL 80671	-
Zip*Link* Connectors	E 179 771		-

*For the latest information on agency approvals, please check our Web site.