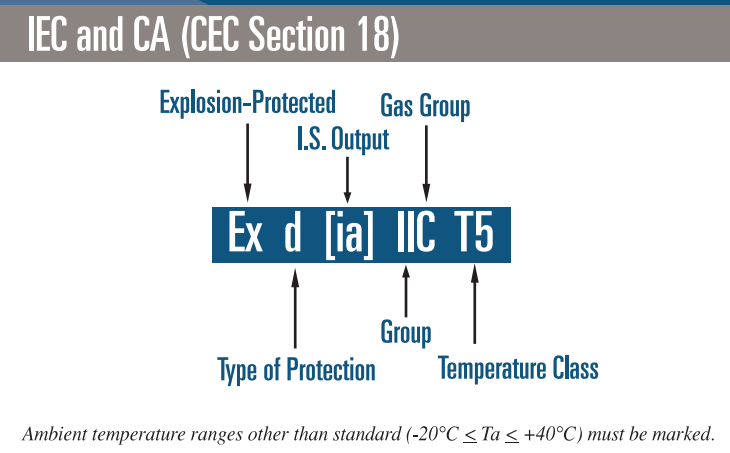
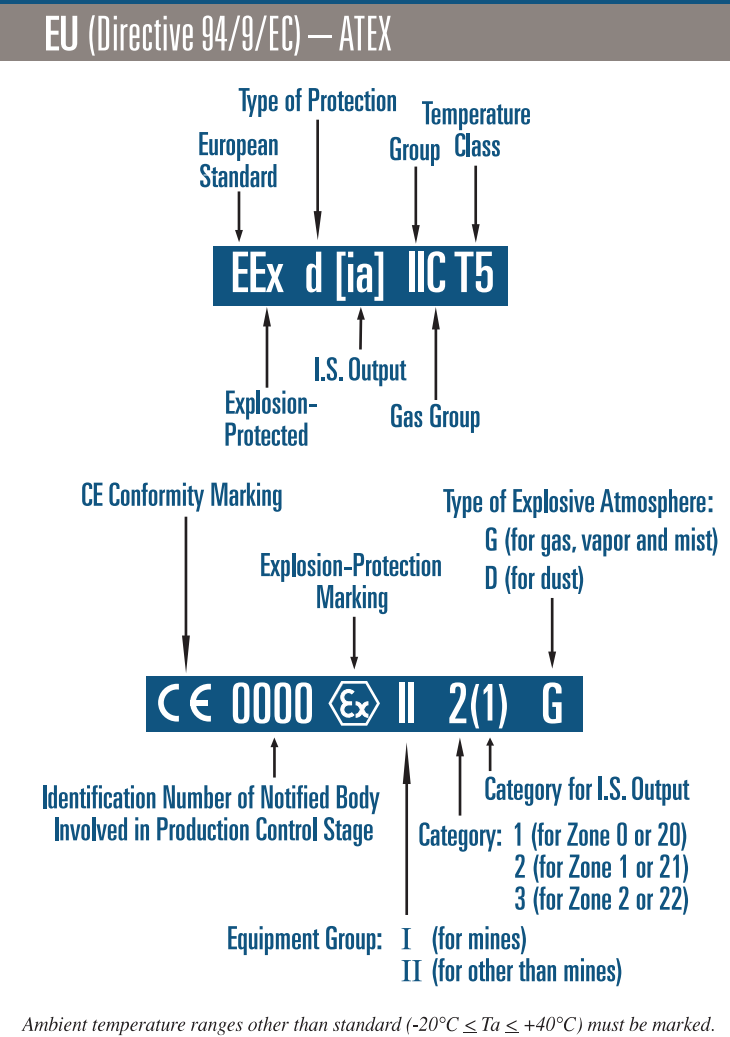
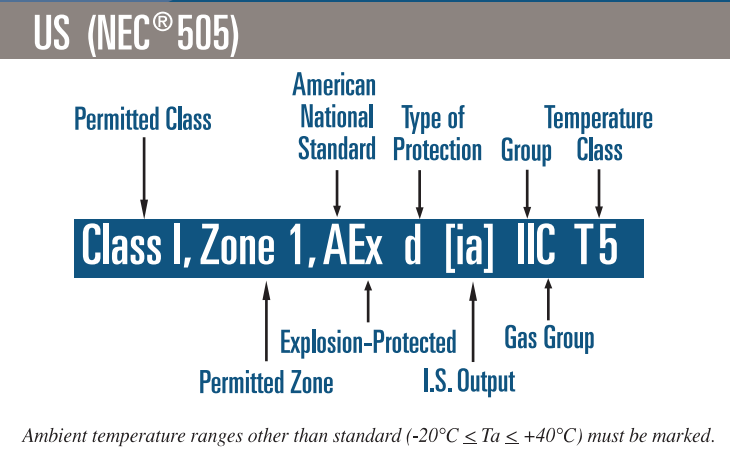
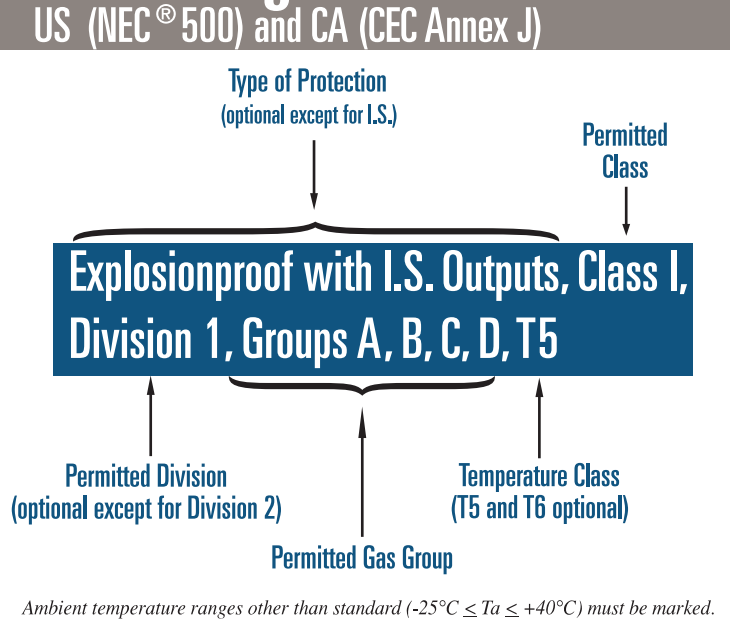


Expert Guide to Hazardous Locations

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Ex Marking



Acronyms

ATEX	Atmosphère explosible
CA	Canada
CEC	Canadian Electrical Code (CSA C22.1)
CENELEC	European Committee for Electrotechnical Standardization
EU	European Union
IEC	International Electrotechnical Commission
I.S.	Intrinsic Safety
MSHA	Mine Safety and Health Administration
NEC	National Electrical Code (NFPA 70)
US	United States of America

Protection Concepts

Type of Protection	Code	Market	Permitted Use	Standard	Protection Principle
General Requirements		US	Class I, Division 1 & 2	FM 3600	No arcs, sparks or hot surfaces
		CA	Class I, Division 1 & 2	CSA C22.2 No. 0	
	AEx	US	Class I, Zone 0, 1, & 2	ISA 60079-0	
	Ex	CA	Class I, Zone 0, 1, & 2	CSA E60079-0	
	EEx	EU	Zone 0, 1, & 2	EN 60079-0	
	Ex	IEC	Zone 0, 1, & 2	IEC 60079-0	
Increased Safety	AEx e	US	Class I, Zone 1	ISA 60079-7	No arcs, sparks or hot surfaces
	Ex e	CA	Class I, Zone 1	CSA E60079-7	
	EEx e	EU	Zone 1	EN 60079-7	
	Ex e	IEC	Zone 1	IEC 60079-7	
Non-Incendive	(NI)	US	Class I, Division 2	FM 3611	No arcs, sparks or hot surfaces
	(NI)	CA	Class I, Division 2	C22.2 No. 213	
Non-Sparking	AEx nA	US	Class I, Zone 2	ISA 60079-15	No arcs, sparks or hot surfaces
	Ex nA	CA	Class I, Zone 2	CSA E60079-15	
	EEx nA	EU	Zone 2	EN 60079-15	
	Ex nA	IEC	Zone 2	IEC 60079-15	
Explosionproof	(XP)	US	Class I, Division 1	FM 3615	Contain the explosion and extinguish the flame
	(XP)	CA	Class I, Division 1	C22.2 No. 30	
Flameproof	AEx d	US	Class I, Zone 1	ISA 60079-1	Contain the explosion and extinguish the flame
	Ex d	CA	Class I, Zone 1	CSA E60079-1	
	EEx d	EU	Zone 1	EN 60079-1	
	Ex d	IEC	Zone 1	IEC 60079-1	
Powder-Filled	AEx q	US	Class I, Zone 1	ISA 60079-5	Contain the explosion and extinguish the flame
	Ex q	CA	Class I, Zone 1	CSA E79-5	
	EEx q	EU	Zone 1	EN 50017	
	Ex q	IEC	Zone 1	IEC 60079-5	
Enclosed Break	AEx nC	US	Class I, Zone 2	ISA 60079-15	Limit energy of sparks and surface temperature
	Ex nC	CA	Class I, Zone 2	CSA E60079-15	
	EEx nC	EU	Zone 2	EN 60079-15	
	Ex nC	IEC	Zone 2	IEC 60079-15	
Intrinsic Safety	(IS)	US	Class I, Division 1	FM 3610	Limit energy of sparks and surface temperature
	(IS)	CA	Class I, Division 1	C22.2 No. 157	
	AEx ia	US	Class I, Zone 0	FM 3610	
	Ex ia	CA	Class I, Zone 0	CSA E60079-11	
	Ex ia	CA	Class I, Zone 0	CSA E60079-11	
	EEx ia	EU	Zone 0	EN 50020	
	EEx ib	EU	Zone 1	EN 50020	
	Ex ia	IEC	Zone 0	IEC 60079-11	
	Ex ib	IEC	Zone 1	IEC 60079-11	
	Ex ib	IEC	Zone 1	IEC 60079-11	
Limited Energy	AEx nL	US	Class I, Zone 2	ISA 60079-15	Limit energy of sparks and surface temperature
	Ex nL	CA	Class I, Zone 2	CSA E60079-15	
	EEx nL	EU	Zone 2	EN 60079-15	
	Ex nL	IEC	Zone 2	IEC 60079-15	
Pressurized	Type X	US	Class I, Division 1	FM 3620	Keep flammable gas out
	Type X	CA	Class I, Division 1	NFPA 496	
	Type Y	US	Class I, Division 1	FM 3620	
	Type Y	CA	Class I, Division 1	NFPA 496	
	Type Z	US	Class I, Division 2	FM 3620	
	Type Z	CA	Class I, Division 2	NFPA 496	
	AEx px	US	Class I, Zone 1	ISA 60079-2	
	Ex px	CA	Class I, Zone 1	CSA E60079-2	
	EEx px	EU	Zone 1	EN 60079-2	
	Ex px	IEC	Zone 1	IEC 60079-2	
	AEx py	US	Class I, Zone 1	ISA 60079-2	
	Ex py	CA	Class I, Zone 1	CSA E60079-2	
	EEx py	EU	Zone 1	EN 60079-2	
	Ex py	IEC	Zone 1	IEC 60079-2	
	AEx pz	US	Class I, Zone 2	ISA 60079-2	
	Ex pz	CA	Class I, Zone 2	CSA E60079-2	
	EEx pz	EU	Zone 2	EN 60079-2	
	Ex pz	IEC	Zone 2	IEC 60079-2	
Restricted Breathing	AEx nR	US	Class I, Zone 2	ISA 60079-15	Keep flammable gas out
	Ex nR	CA	Class I, Zone 2	CSA E60079-15	
	EEx nR	EU	Zone 2	EN 60079-15	
	Ex nR	IEC	Zone 2	IEC 60079-15	
Encapsulation	EEx ma	EU	Zone 0	EN 60079-18	Keep flammable gas out
	Ex ma	IEC	Zone 0	IEC 60079-18	
	AEx m	US	Class I, Zone 1	ISA 60079-18	
	Ex m	CA	Class I, Zone 1	CSA E60079-18	
	EEx mb	EU	Zone 1	EN 60079-18	
	Ex mb	IEC	Zone 1	IEC 60079-18	
Oil Immersion	AEx o	US	Class I, Zone 1	ISA 60079-6	Keep flammable gas out
	Ex o	CA	Class I, Zone 1	CSA E79-6	
	EEx o	EU	Zone 1	EN 50015	
	Ex o	IEC	Zone 1	IEC 60079-6	

Note 1: For associated intrinsically safe apparatus suitable for installation in a hazardous location, the symbols for the type of protection "ia" or "ib" are enclosed within square brackets, e.g. AEx d [ia] IIC T4.

Note 2: For associated intrinsically safe apparatus not suitable for installation in a hazardous location, both the symbol "Ex", or "AEx", or "EEx" and the symbol for the type of protection "ia" or "ib" are enclosed within the same square brackets, e.g. [AEx ia] IIC; in this case, a temperature class is not included.

Area Classification

	Flammable Material Present Continuously	Flammable Material Present Intermittently	Flammable Material Present Abnormally
IEC/EU	Zone 0	Zone 1	Zone 2
US NEC® 505	Zone 0	Zone 1	Zone 2
US NEC® 500	Division 1		Division 2
CA CEC Section 18	Zone 0	Zone 1	Zone 2
CA CEC Annex J	Division 1		Division 2

IEC classification per IEC 60079-10
EU classification per EN 60079-10
US classification per ANSI/NFPA 70 National Electrical Code® (NEC®) Article 500 or Article 505
CA Classification per CSA C22.1 Canadian Electrical Code (CEC) Section 18 or Annex J

Apparatus Grouping

Typical Gas	US (NEC® 505) CA (CEC Section 18) IEC	US (NEC® 500) CA (CEC Annex J)
Acetylene	Group IIC	Class I/Group A
Hydrogen	(Group IIB + H ₂)	Class I/Group B
Ethylene	Group IIB	Class I/Group C
Propane	Group IIA	Class I/Group D
Methane	Group I*	Mining*

*Not within scope of NEC®. Under jurisdiction of MSHA. Not within scope of CEC.

Temperature Class

Maximum Surface Temperature	US (NEC® 505) CA (CEC Section 18) IEC	US (NEC® 500) CA (CEC Annex J)
450 °C	T1	T1
300 °C	T2	T2
280 °C		T2A
260 °C		T2B
230 °C		T2C
215 °C		T2D
200 °C	T3	T3
180 °C		T3A
165 °C		T3B
160 °C		T3C
135 °C	T4	T4
120 °C		T4A
100 °C	T5	T5
85 °C	T6	T6

Ingress Protection (IP) Codes

First characteristic numeral		Second characteristic numeral	
Protection Against Solid Bodies		Protection Against Liquid	
0	No protection	0	No protection
1	Objects greater than 50 mm	1	Vertical (90°) dripping water
2	Objects greater than 12 mm	2	75° to 90° dripping water
3	Objects greater than 2.5 mm	3	Sprayed water
4	Objects greater than 1 mm	4	Splashed water
5	Dust-protected	5	Water jets
6	Dust-tight	6	Heavy seas
7		7	Effects of immersion
8		8	Indefinite immersion

Approximate U.S. Enclosure Type Equivalent to IPXX			
Type → IP	Type → IP	Type → IP	Type → IP
1 10	3S 54	6 and 6P 67	
2 11	4 and 4X 55	12 and 12K 52	
3 54	5 52	13 54	
3R 14			

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