

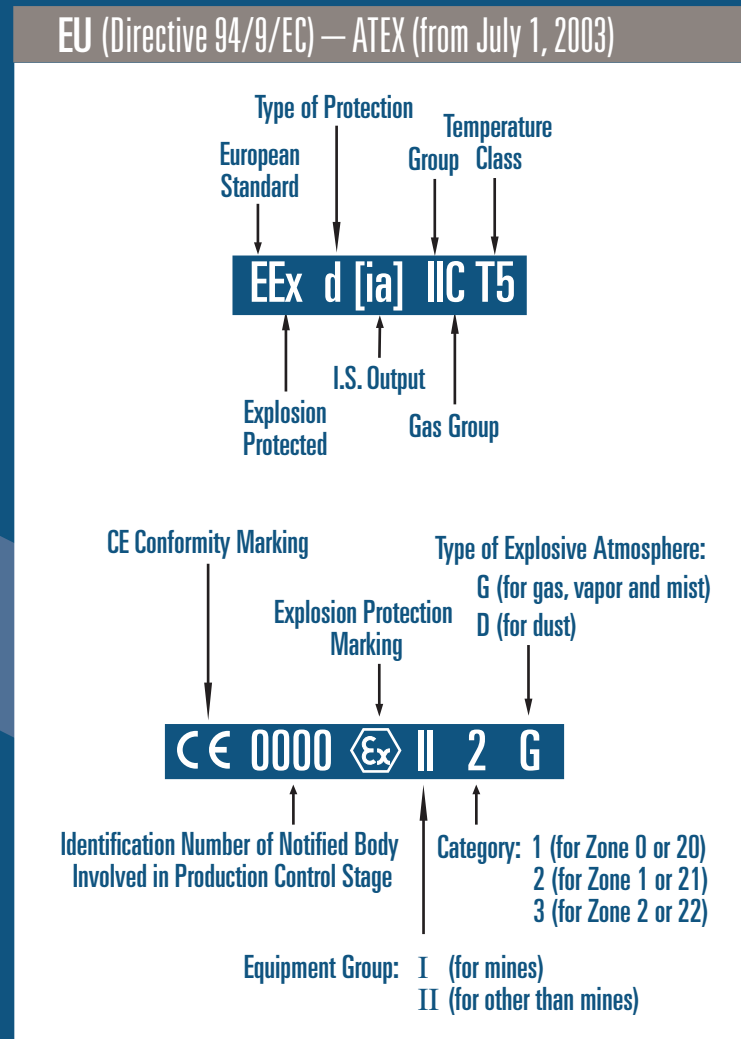
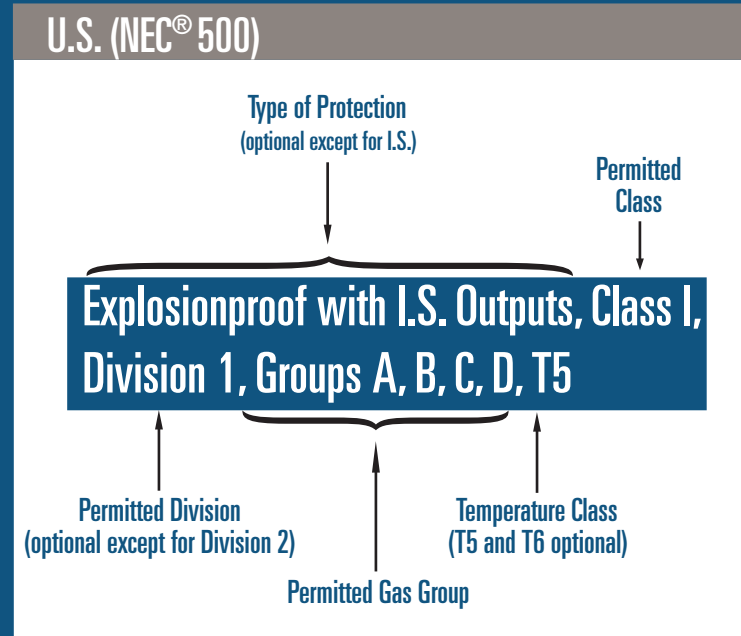
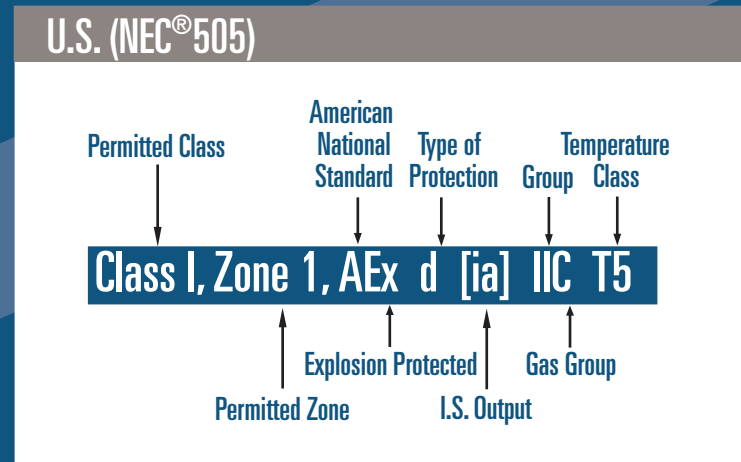
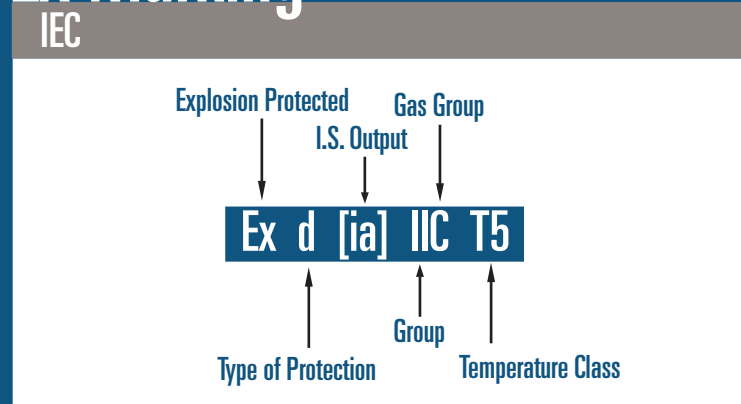


# Expert Guide to Hazardous Locations



An FM Global Enterprise

## Ex Marking



## Acronyms

- ATEX** - Atmosphère Explosible
- CENELEC** - European Committee for Electrotechnical Standardization
- EU** - European Union
- IEC** - International Electrotechnical Commission
- I.S.** - Intrinsically Safe
- MSHA** - Mine Safety and Health Administration
- NEC®** - National Electric Code®

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## Protection Concepts

Type of Protection	Code	Permitted Use	Standard	Protection Principle
<b>Increased Safety</b>	AEx e	Class I, Zone 1	FM 3600 (ISA 12.16.01*)	No arcs, sparks or hot surfaces
	EEx e	Zone 1	EN 50 019 (until July 2006) or EN 60079-7	
<b>Non-Incendive</b>	Ex e	Zone 1	IEC 60079-7	No arcs, sparks or hot surfaces
	(NI)	Class I, Div 2	FM 3611	
<b>Non-Sparking</b>	AEx nA	Class I, Zone 2	FM 3600 (ISA 12.12.02)	Contain the explosion and extinguish the flame
	EEx nA	Zone 2	EN 50 021	
	Ex nA	Zone 2	IEC 60079-15	
<b>Explosionproof</b>	(XP)	Class I, Div 1	FM 3615	Contain the explosion and extinguish the flame
<b>Flameproof</b>	AEx d	Class I, Zone 1	FM 3600 (ISA 12.22.01*)	
	EEx d	Zone 1	EN 50 018	
<b>Powder-Filled</b>	Ex d	Zone 1	IEC 60079-1	Contain the explosion and extinguish the flame
	AEx q	Class I, Zone 1	FM 3600 (ISA 12.25.01*)	
<b>Enclosed Break</b>	EEx q	Zone 1	EN 50 017	Limit energy of sparks and surface temperature
	Ex q	Zone 1	IEC 60079-5	
	AEx nC	Class I, Zone 2	FM 3600 (ISA 12.12.02)	
<b>Intrinsic Safety</b>	EEx nC	Zone 2	EN 50 021	Limit energy of sparks and surface temperature
	Ex nC	Zone 2	IEC 60079-15	
	(IS)	Class I, Div 1	FM 3610†	
<b>Limited Energy</b>	AEx ia	Class I, Zone 0	FM 3610 †	Limit energy of sparks and surface temperature
	AEx ib	Class I, Zone 1	FM 3610 †	
	EEx ia	Zone 0	EN 50 020/39	
	EEx ib	Zone 1	EN 50 020/39	
	Ex ia	Zone 0	IEC 60079-11	
	Ex ib	Zone 1	IEC 60079-11	
<b>Pressurized</b>	AEx nA	Class I, Zone 2	FM 3600 (ISA 12.12.02)	Keep flammable gas out
	EEx nA	Zone 2	EN 50 021	
	Ex nA	Zone 2	IEC 60079-15	
	EEx nL	Zone 2	EN 50 021	
	Ex nL	Zone 2	IEC 60079-15	
	Type X	Class I, Div 1	FM 3620	
Type Y	Class I, Div 1	FM 3620		
Type Z	Class I, Div 2	FM 3620		
<b>Restricted Breathing</b>	EEx p	Zone 1	EN 50 016	Keep flammable gas out
	EEx nP	Zone 2	EN 50 021	
	Ex px	Zone 1	IEC 60079-2	
	Ex py	Zone 1	IEC 60079-2	
<b>Encapsulation</b>	Ex pz	Zone 2	IEC 60079-2	Keep flammable gas out
	Ex nZ	Zone 2	IEC 60079-15	
	AEx nR	Class I, Zone 2	FM 3600 (ISA 12.12.02)	
<b>Oil Immersion</b>	EEx nR	Zone 2	EN 50 021	Keep flammable gas out
	Ex nR	Zone 2	IEC 60079-15	
	AEx m	Class I, Zone 1	FM 3600 (ISA 12.23.01*)	
<b>Oil Immersion</b>	EEx m	Zone 1	EN 50 028	Keep flammable gas out
	Ex m	Zone 1	IEC 60079-18	
	AEx o	Class I, Zone 1	FM 3600 (ISA 12.16.01*)	
<b>Oil Immersion</b>	EEx o	Zone 1	EN 50 015	Keep flammable gas out
	Ex o	Zone 1	IEC 60079-6	

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

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

\*Also shall comply with ISA 12.00.01 † Based on ISA 12.02.01

## International Partners

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## Area Classification

IEC/EU	Flammable Material Present Continuously	Flammable Material Present Intermittently	Flammable Material Present Abnormally
Zone 0 (Zone 20 - dust)	Zone 1 (Zone 21 - dust)	Zone 2 (Zone 22 - dust)	
U.S. NEC® 505	Zone 0	Zone 1	Zone 2
NEC® 500	Division 1		Division 2

IEC classification per IEC 60079-10  
 EU classification per EN 60 079-10  
 U.S. classification per ANSI/NFPA 70 National Electric Code® (NEC®) Article 500 or Article 505

## Apparatus Grouping

Typical Gas/Dust/Fiber	U.S. (NEC® 505) IEC EU	U.S. (NEC® 500)
Acetylene	Group IIC	Class I/Group A
Hydrogen	(Group IIB + H <sub>2</sub> )	Class I/Group B
Ethylene	Group IIB	Class I/Group C
Propane	Group IIA	Class I/Group D
Methane	Group I*	Mining*
Metal Dust	None	Class II/Group E
Coal Dust	None	Class II/Group F
Grain Dust	None	Class II/Group G
Fibers	None	Class III

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

## Temperature Class

Maximum Surface Temperature	U.S. (NEC® 505) IEC EU	U.S. (NEC® 500)
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 Number	Second Number
<b>Protection Against Solid Bodies</b>	<b>Protection Against Liquid</b>
0 No protection	No protection
1 Objects greater than 50 mm	Vertically dripping water
2 Objects greater than 12 mm	75° to 90° dripping water
3 Objects greater than 2.5 mm	Sprayed water
4 Objects greater than 1 mm	Splashed water
5 Dust-protected	Water jets
6 Dust-tight	Heavy seas
7	Effects of immersion
8	Indefinite immersion

Approximate U.S. Enclosure Type	Equivalent to IPXX	Type	Equivalent to IPXX	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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