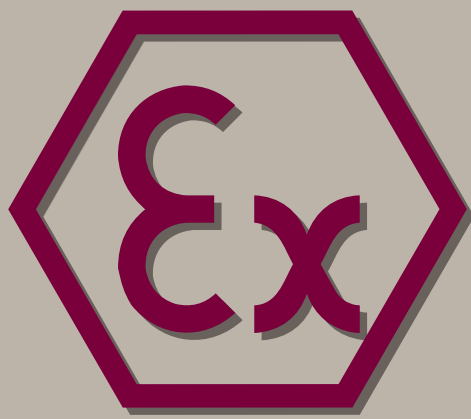




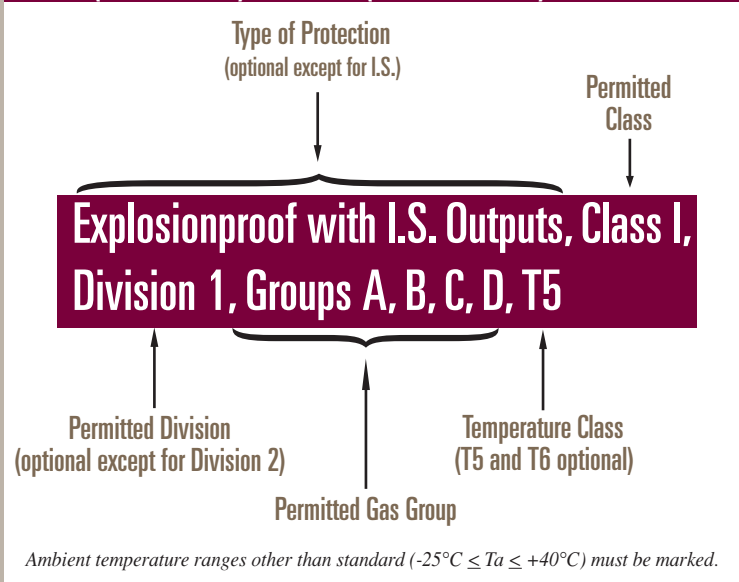
Expert Guide to Hazardous Locations

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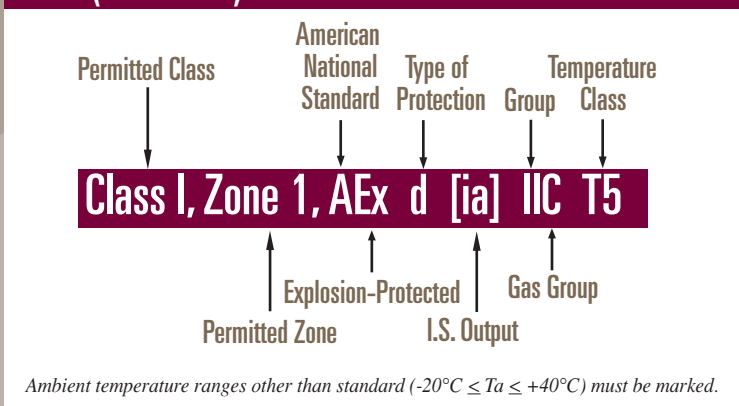
Member of the FM Global Group

Ex Marking

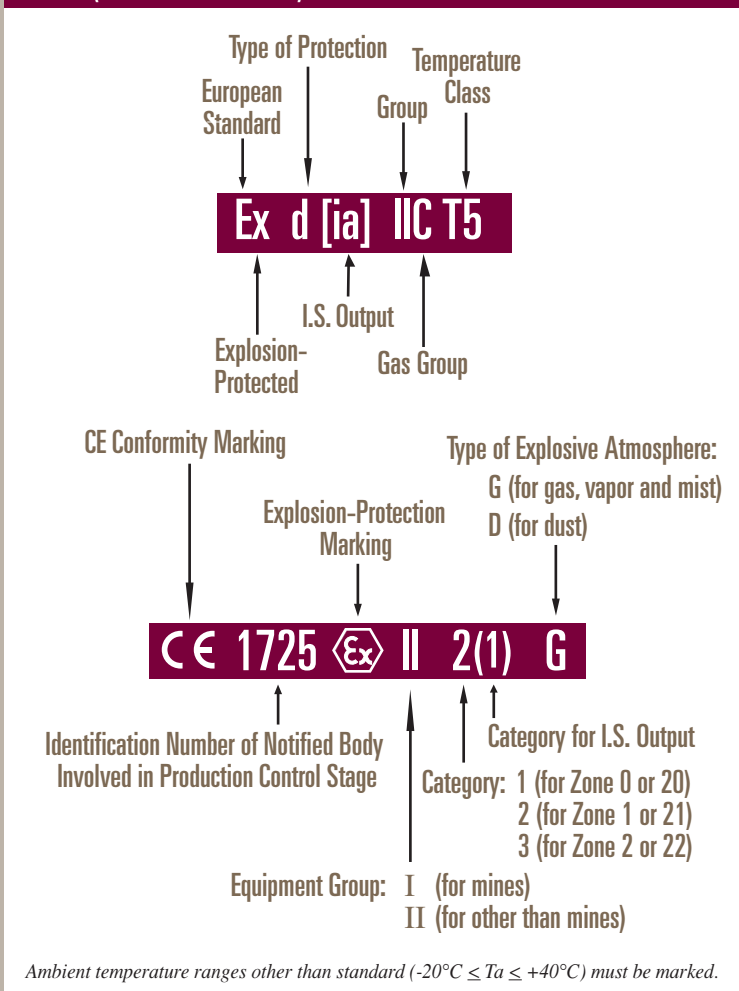
US (NEC® 500) and CA (CEC Annex J)



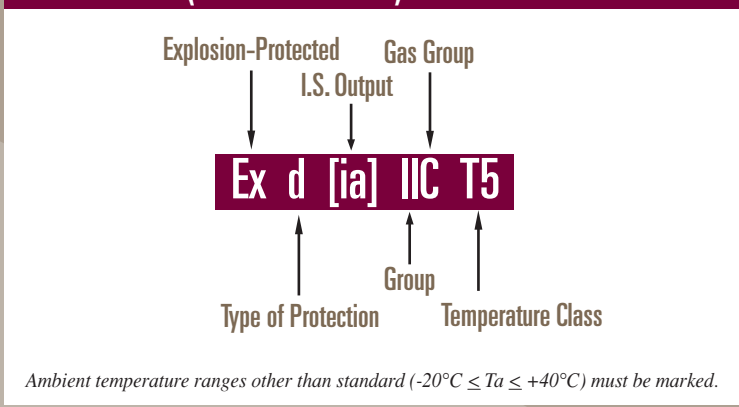
US (NEC® 505)



EU (Directive 94/9/EC) — ATEX



IEC and CA (CEC Section 18)



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
NFPA	National Fire Protection Association
NEC	National Electrical Code (NFPA 70)
US	United States of America

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Protection Concepts

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

FM Approvals is your global conformity assessment solution

Market	Recognized product certification marks	
US		
Canada		
EU (ATEX)		

FM Approvals can also issue IECEx Test Reports, Quality Assessment Reports and Certificates of Conformity.

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
NEC® 500	Division 1		Division 2
CA CEC Section 18	Zone 0	Zone 1	Zone 2
CEC Annex J	Division 1		Division 2

IEC classification per IEC 60079-10
EU classification per EN 60079-10
US classification per ANSI/NF PA 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) EU 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) EU 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	No protection	
1	Objects greater than 50 mm	Vertical (90°) 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 → 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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