Guide to Hazardous Locations

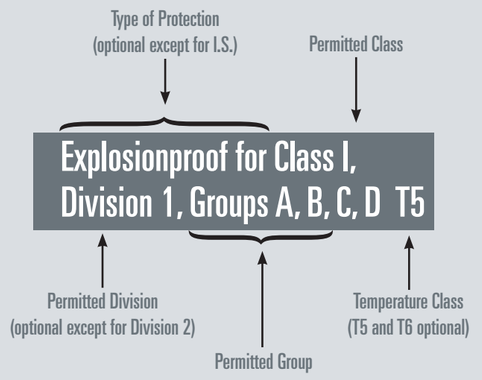
Explosive Gas Atmospheres

FM Approvals®

Member of the FM Global Group

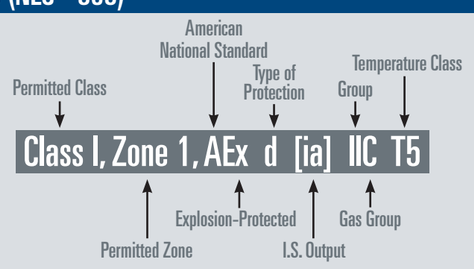
Ex Marking

US (NEC® 500) and CA (CEC Annex J)



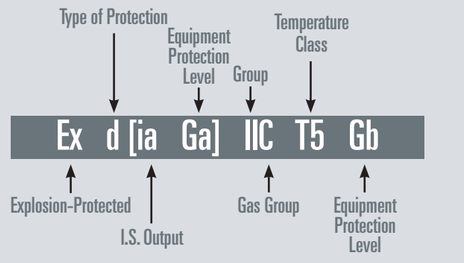
Ambient temperature ranges other than standard (-25°C ≤ Ta ≤ +40°C) must be marked.

US (NEC® 505)



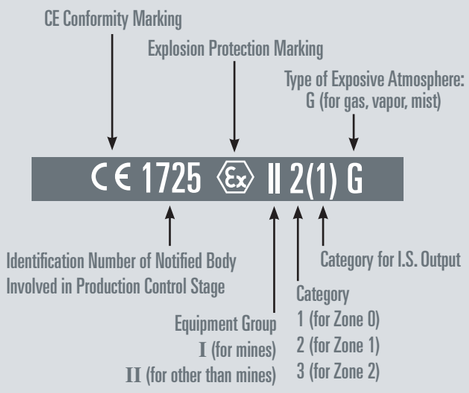
Ambient temperature ranges other than standard (-20°C ≤ Ta ≤ +40°C) must be marked.

EU and IEC

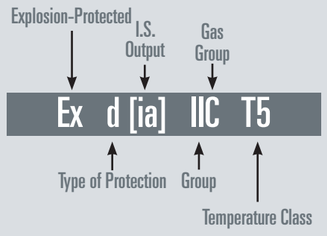


Ambient temperature ranges other than standard (-20°C < Ta < +40°C) must be marked.
The Equipment Protection Level is not required to be marked if the type of protection code includes the "a", "b", or "c" suffix as part of the type of protection designation, e.g. "Ex db IIC T4" is equivalent to "Ex d IIC T4 Gb".

Additional EU marking per 94/9/EC (ATEX)



CA (CEC Section 18)



Ambient temperature ranges other than standard (-20°C < Ta < +40°C) must be marked.

EPL/Category

Definition	IEC		EU (ATEX)		Typical Zone of Application
	EPL	Group	Category	Group	
Mines, "very high" level of protection	Ma	I	M1	I	N/A
Mines, "high" level of protection	Mb		M2		
Gas atmospheres, "very high" level of protection	Ga	II	1G	II	0
Gas atmospheres, "high" level of protection	Gb		2G		1
Gas atmospheres, "enhanced" level of protection	Gc		3G		2

Level of protection assigned to equipment based on its likelihood of becoming a source of ignition

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Protection Concepts

Type of Protection	Code	Market	Application	Standard	Protection Principle
General Requirements		US	Class I, Division 1 & 2	FM 3600	
		CA	Class I, Division 1 & 2	CSA C22.2 No. 0	
	AEx	US	Class I, Division 1 & 2	ISA 60079-0	
	Ex	CA	Class I, Division 1 & 2	CSA E60079-0	
	Ex	EU	Category 1G, 2G, & 3G	EN 60079-0	
	Ex	IEC	EPL Ga, Gb, Gc	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	
	Ex e *(or Ex eb)*	EU	Category 2G	EN E60079-7	
	Ex e *(or Ex eb)*	IEC	EPL Gb	IEC E60079-7	
Non-Incendive	(NI)	US	Class I, Division 2	FM 3611	
	(NI)	CA	Class I, Division 2	C22.2 No. 213	
Non-Sparking	AEx nA	US	Class I, Zone 2	ISA 60079-15	
	Ex nA	CA	Class I, Zone 2	CSA E60079-15	
	Ex nA *(or Ex nAc)*	EU	Category 3G	EN 60079-15	
	Ex nA *(or Ex nAc)*	IEC	EPL Gc	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	
	Ex d	CA	Class I, Zone 1	CSA E60079-1	
	Ex d *(or Ex db)*	EU	Category 2G	EN 60079-1	
	Ex d *(or Ex db)*	IEC	EPL Gb	IEC 60079-1	
Powder-Filled	AEx q	US	Class I, Zone 1	ISA 60079-5	
	Ex q	CA	Class I, Zone 1	CSA E60079-5	
	Ex q *(or Ex qb)*	EU	Category 2G	EN 60079-5	
	Ex q *(or Ex qb)*	IEC	EPL Gb	IEC 60079-5	
Enclosed Break	AEx nC	US	Class I, Zone 2	ISA 60079-15	
	Ex nC	CA	Class I, Zone 2	CSA E60079-15	
	Ex nC *(or Ex nCc)*	EU	Category 3G	EN 60079-15	
	Ex nC *(or Ex nCc)*	IEC	EPL Gc	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	
	AEx ib	US	Class I, Zone 1	FM 3610	
	Ex ia	CA	Class I, Zone 0	CSA E60079-11	
	Ex ib	CA	Class I, Zone 1	CSA E60079-11	
	Ex ia	EU	Category 1G	EN E60079-11	
	Ex ib	EU	Category 2G	EN E60079-11	
	Ex ic	EU	Category 3G	EN E60079-11	
	Ex ia	IEC	EPL Ga	IEC E60079-11	
	Ex ib	IEC	EPL Gb	IEC E60079-11	
	Ex ic	IEC	EPL Gc	IEC E60079-11	
Limited Energy	AEx nC	US	Class I, Zone 2	ISA 60079-15	
	Ex nL	CA	Class I, Zone 2	CSA E60079-15	
	Ex nL *(or Ex nLc)*	EU	Category 3G	EN 60079-15	
	Ex nL *(or Ex nLc)*	IEC	EPL Gc	IEC 60079-15	
Pressurized	Type X	US	Class I, Division 1	FM 3620 (NFPA 496)	Keep flammable gas out
	Type X	CA	Class I, Division 1	NFPA 496	
	Type Y	US	Class I, Division 1	FM 3620 (NFPA 496)	
	Type Y	CA	Class I, Division 1	NFPA 496	
	Type Z	US	Class I, Division 2	FM 3620 (NFPA 496)	
	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	
	Ex px *(or Ex pxb)*	EU	Category 2G	EN 60079-2	
	Ex px *(or Ex pxb)*	IEC	EPL Gb	IEC 60079-2	
	AEx py	US	Class I, Zone 1	ISA 60079-2	
	Ex py	CA	Class I, Zone 1	CSA E60079-2	
	Ex py *(or Ex pyb)*	EU	Category 2G	EN 60079-2	
	Ex py *(or Ex pyb)*	IEC	EPL Gb	IEC 60079-2	
	AEx pz	US	Class I, Zone 2	ISA 60079-2	
	Ex pz	CA	Class I, Zone 2	CSA E60079-2	
	Ex pz *(or Ex pzc)*	EU	Category 3G	EN 60079-2	
	Ex pz *(or Ex pzc)*	IEC	EPL Gc	IEC 60079-2	
Restricted Breathing	AEx nR	US	Class I, Zone 2	ISA 60079-15	
	Ex nR	CA	Class I, Zone 2	CSA E60079-15	
	Ex nR *(or Ex nRc)*	EU	Category 3G	EN 60079-15	
	Ex nR *(or Ex nRc)*	IEC	EPL Gc	IEC 60079-15	
Encapsulation	AEx ma	US	Class I, Zone 0	ISA 60079-18	
	Ex ma	EU	Category 1G	EN 60079-18	
	Ex ma	IEC	EPL Ga	IEC 60079-18	
	AEx m	US	Class I, Zone 1	ISA 60079-18	
	Ex m	CA	Class I, Zone 1	CSA E60079-18	
	AEx mb	US	Class I, Zone 1	ISA 60079-18	
	Ex mb	EU	Category 2G	EN 60079-18	
	Ex mb	IEC	EPL Gb	IEC 60079-18	
Oil Immersion	AEx o	US	Class I, Zone 1	ISA 60079-6	
	Ex o	CA	Class I, Zone 1	CSA E60079-6	
	Ex o *(or Ex ob)*	EU	Category 2G	EN 60079-6	
	Ex o *(or Ex ob)*	IEC	EPL Gb	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" 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.

FM Approvals is your global conformity assessment solution

Market	Recognized product certification marks	
US	FM APPROVED	FM C US APPROVED
Canada	FM C APPROVED	FM C US APPROVED
EU (ATEX)	FM APPROVED, Ex, CE	

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
US 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/NFPA 70 National Electrical Code® (NEC®) Article 500 or Article 505
CA classification per CSAC22.1 Canadian Electrical Code (CEC) Section 18 or Annex J

Equipment 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

Marking	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 50mm	Vertical (90°) dripping water
2	Objects greater than 12mm	70° to 90° dripping water
3	Objects greater than 2.5mm	Sprayed water
4	Objects greater than 1mm	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	
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				

Acronyms

ATEX	Atmosphère explosible
CA	Canada
CEC	Canadian Electrical Code (CSA C22.1)
CENELEC	European Committee for Electrotechnical Standardization
EPL	Equipment Protection Level
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