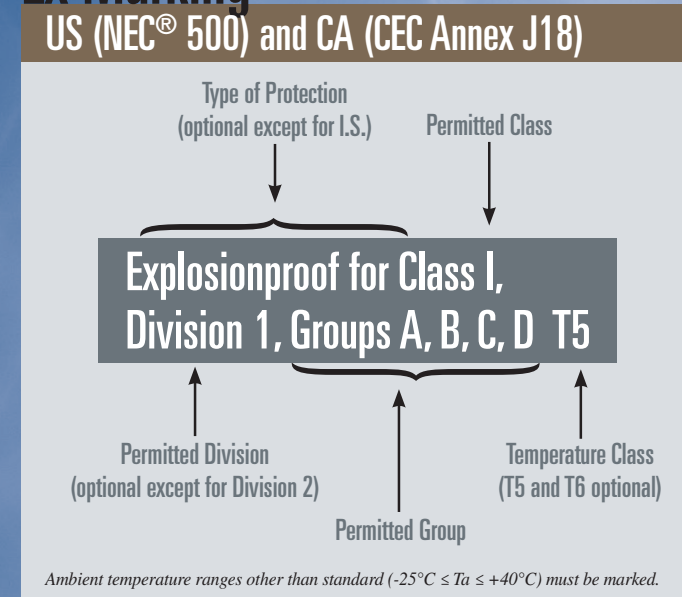


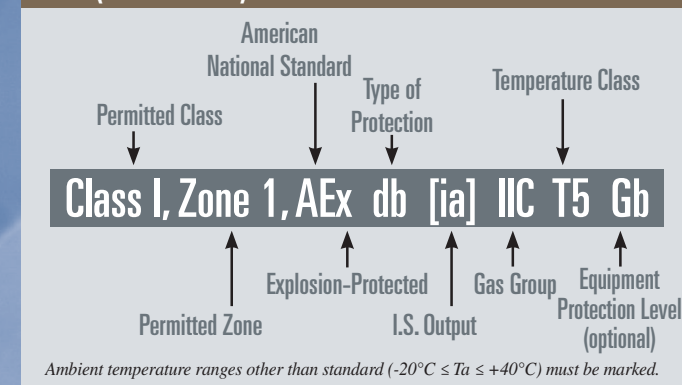
Guide to Hazardous Locations

Explosive Gas Atmospheres

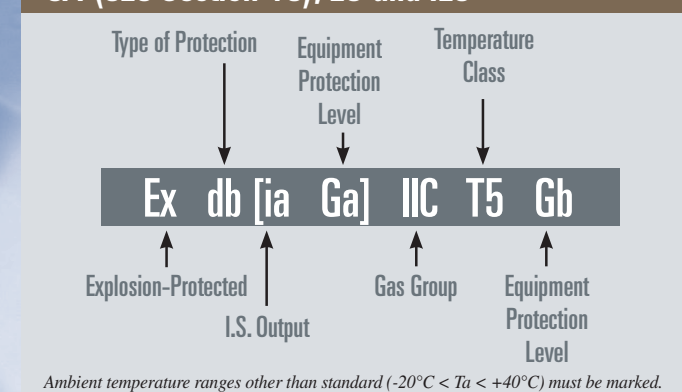
Ex Marking



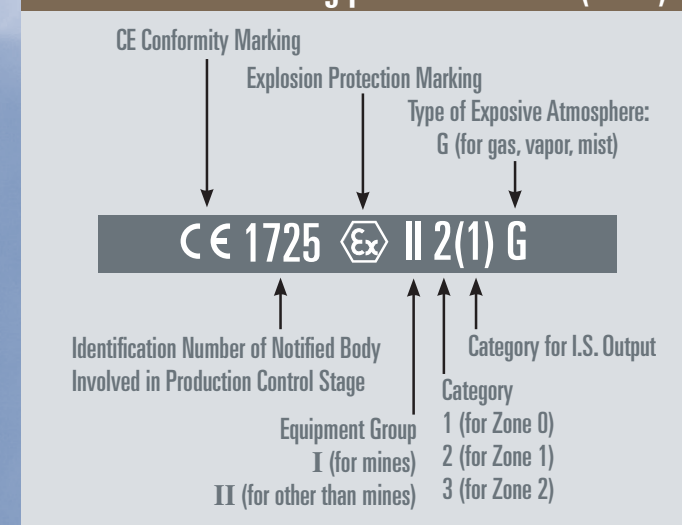
US (NEC® 505)



CA (CEC Section 18), EU and IEC



Additional EU marking per 2014/34/EU (ATEX)



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	I	M2	I	N/A
Gas atmospheres, "very high" level of protection	Ga	I	1G	I	0
Gas atmospheres, "high" level of protection	Gb	II	2G	II	1
Gas atmospheres, "enhanced" level of protection	Gc	III	3G	III	2

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

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U.S.	FM APPROVED, FM IS APPROVED
Canada	FM APPROVED, FM IS APPROVED
EU (ATEX)	FM APPROVED, Ex, CE

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Protection Concepts

Type of Protection	Code	Market	Application	Standard	Protection Principle	
General Requirements						
	AEx	US	Class I, Division 1 & 2	FM 3600	No arcs, sparks or hot surfaces	
	Ex	CA	Class I, Division 1 & 2	CAN/CSA C22.2 No. 0		
	Ex	US	Class I, Division 1 & 2	ANSI/UL 60079-0		
	Ex	CA	Class I, Division 1 & 2	CAN/CSA C22.2 No. 60079-0		
	Ex	EU	Category 1G, 2G, & 3G	EN 60079-0		
	Ex	IEC	EPL Ga, Gb, Gc	IEC 60079-0		
Increased Safety	AEx e (or AEx eb)	US	Class I, Zone 1	ANSI/UL 60079-7	Contain the explosion and extinguish the flame	
	Ex e (or Ex eb)	CA	Zone 1	CAN/CSA C22.2 No. 60079-7		
	Ex eb	EU	EPL Gb	EN 60079-7		
	Ex e (or Ex eb)	IEC	EPL Gb	IEC 60079-7		
	AEx ec	US	Class I, Zone 2	ANSI/UL 60079-7		
	Ex ec	CA	Zone 2	CAN/CSA C22.2 No. 60079-7		
	Ex ec	EU	Category 3G	EN 60079-7		
	Ex ec	IEC	EPL Gc	IEC 60079-7		
Non-Incendive	(NI)	US	Class I, Division 2	FM 3611		Limit energy of sparks and surface temperature
	(NI)	CA	Class I, Division 2	CAN/CSA C22.2 No. 213		
Non-Sparking	AEx nA (or AEx nAc)	US	Class I, Zone 2	ANSI/UL 60079-15	Keep flammable gas out	
	Ex nA	CA	Zone 2	CAN/CSA C22.2 No. 60079-15		
	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		No arcs, sparks or hot surfaces
	(XP)	CA	Class I, Division 1	CAN/CSA C22.2 No. 30		
Flameproof	AEx da	US	Class I, Zone 0	ANSI/UL 60079-1		Contain the explosion and extinguish the flame
	AEx da	CA	Zone 0	CAN/CSA C22.2 No. 60079-1		
	Ex da	EU	Category 1G	EN 60079-1		
	Ex da	IEC	EPL Ga	IEC 60079-1		
	AEx d (or AEx db)	US	Class I, Zone 1	ANSI/UL 60079-1		
	Ex d (or Ex db)	CA	Zone 1	CAN/CSA C22.2 No. 60079-1		
	Ex db	EU	Category 2G	EN 60079-1		
	Ex db	IEC	EPL Gb	IEC 60079-1		
	AEx dc	US	Class I, Zone 2	ANSI/UL 60079-1		
	Ex dc	CA	Zone 2	CAN/CSA C22.2 No. 60079-1		
	Ex dc	EU	Category 3G	EN 60079-1		
	Ex dc	IEC	EPL Gc	IEC 60079-1		
Powder-Filled	AEx q (or AEx qb)	US	Class I, Zone 1	ANSI/UL 60079-5	Limit energy of sparks and surface temperature	
	Ex q	CA	Zone 1	CAN/CSA C22.2 No. 60079-5		
	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 (or AEx nCc)	US	Class I, Zone 2	ANSI/UL 60079-15	Keep flammable gas out	
	Ex nC	CA	Zone 2	CAN/CSA C22.2 No. 60079-15		
	Ex nC (or Ex nCc)	EU	Category 3G	EN 60079-15		
	Ex nC (or Ex nCc)	IEC	EPL Gc	IEC 60079-15		
Intrinsic Safety	(I.S.)	US	Class I, Division 1	FM 3610	Limit energy of sparks and surface temperature	
	(I.S.)	CA	Class I, Division 1	CAN/CSA C22.2 No. 157		
	AEx ia	US	Class I, Zone 0	ANSI/UL 60079-11		
	Ex ia	CA	Zone 0	CAN/CSA C22.2 No. 60079-11		
	Ex ia	EU	Category 1G	EN 60079-11		
	Ex ia	IEC	EPL Ga	IEC 60079-11		
	AEx ib	US	Class I, Zone 1	ANSI/UL 60079-11		
	Ex ib	CA	Zone 1	CAN/CSA C22.2 No. 60079-11		
	Ex ib	EU	Category 2G	EN 60079-11		
	Ex ib	IEC	EPL Gb	IEC 60079-11		
	AEx ic	US	Class I, Zone 2	ANSI/UL 60079-11		
	Ex ic	CA	Zone 2	CAN/CSA C22.2 No. 60079-11		
	Ex ic	EU	Category 3G	EN 60079-11		
	Ex ic	IEC	EPL Gc	IEC 60079-11		
Limited Energy	AEx nC (or AEx nCc)	US	Class I, Zone 2	ANSI/UL 60079-15	Keep flammable gas out	
	Ex nL	CA	Zone 2	CAN/CSA C22.2 No. 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 (or AEx pxb)	US	Class I, Zone 1	ANSI/UL 60079-2		
	Ex px (or Ex pxb)	CA	Zone 1	CAN/CSA C22.2 No. 60079-2		
	Ex pxb	EU	Category 2G	EN 60079-2		
	Ex pxb	IEC	EPL Gb	IEC 60079-2		
	AEx py (or AEx pyb)	US	Class I, Zone 1	ANSI/UL 60079-2		
	Ex py (or Ex pyb)	CA	Zone 1	CAN/CSA C22.2 No. 60079-2		
	Ex pyb	EU	Category 2G	EN 60079-2		
	Ex pyb	IEC	EPL Gb	IEC 60079-2		
	AEx pz (or AEx pzc)	US	Class I, Zone 2	ANSI/UL 60079-2		
	Ex pz (or Ex pzc)	CA	Zone 2	CAN/CSA C22.2 No. 60079-2		
	Ex pzc	EU	Category 3G	EN 60079-2		
	Ex pzc	IEC	EPL Gc	IEC 60079-2		
Restricted Breathing	AEx nR (or AEx nRc)	US	Class I, Zone 2	ANSI/UL 60079-15	Keep flammable gas out	
	Ex nR	CA	Zone 2	CAN/CSA C22.2 No. 60079-15		
	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	ANSI/UL 60079-18	Keep flammable gas out	
	Ex ma	CA	Zone 0	CAN/CSA C22.2 No. 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	ANSI/UL 60079-18		
	AEx mb	US	Class I, Zone 1	ANSI/UL 60079-18		
	Ex mb	CA	Zone 1	CAN/CSA C22.2 No. 60079-18		
	Ex mb	IEC	EPL Gb	IEC 60079-18		
	Ex mb	EU	Category 2G	EN 60079-18		
	AEx mc	US	Class I, Zone 2	ANSI/UL 60079-18		
	Ex mc	CA	Zone 2	CAN/CSA C22.2 No. 60079-18		
	Ex mc	EU	Category 3G	EN 60079-18		
	Ex mc	IEC	EPL Gc	IEC 60079-18		
Liquid Immersion	AEx o (or AEx ob)	US	Class I, Zone 1	ANSI/UL 60079-6		Keep flammable gas out
	Ex o	CA	Zone 1	CAN/CSA C22.2 No. 60079-6		
	Ex o (or Ex ob)	EU	Category 2G	EN 60079-6		
	Ex o (or Ex ob)	IEC	EPL Gb	IEC 60079-6		
	AEx oc	US	Class I, Zone 2	ANSI/UL No. 60079-6		
	Ex oc	CA	Zone 2	CAN/CSA No. 60079-6		
	Ex oc	EN	Category 3G	EN 60079-6		
	Ex oc	IEC	EPL Gc	IEC 60079-6		

Area Classification

IEC / EU	Flammable Material Present Continuously	Flammable Material Present Intermittently	Flammable Material Present Abnormally
	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 J18)	Division 1		Division 2

IEC classification per IEC 60079-10-1
EU classification per EN 60079-10-1
US classification per NFPA 70 National Electrical Code® (NEC®) Article 500 or Article 505
CA classification per CSA22.2 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 J18)
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 J18)
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
1	Objects greater than 50mm
2	Objects greater than 12mm
3	Objects greater than 2.5mm
4	Objects greater than 1mm
5	Dust-protected
6	Dust-tight
7	Temporary immersion
8	Continuous immersion
9	High pressure/temperature water jet

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)
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