

Guide to Hazardous Locations

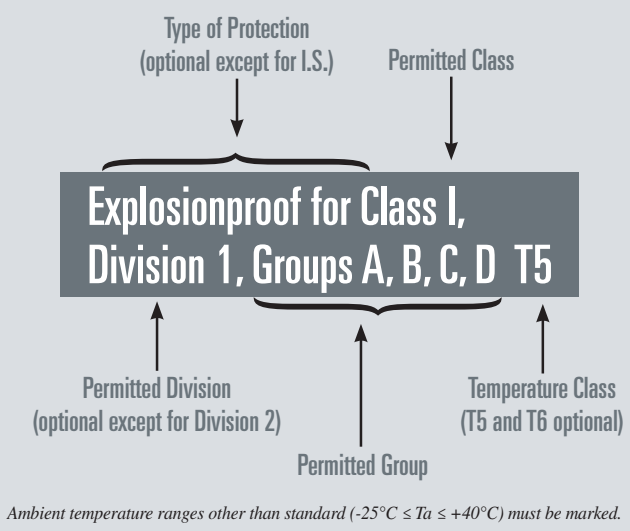
Explosive Gas Atmospheres



Member of the FM Global Group

Ex Marking

US (NEC® 500) and CA (CE Code Annex J18)



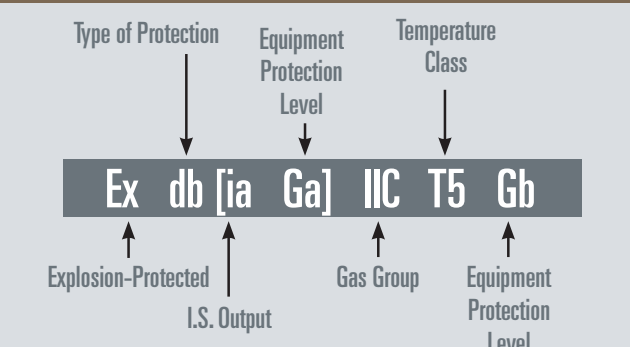
Ambient temperature ranges other than standard (-25°C ≤ Ta ≤ +40°C) must be marked.

US (NEC® 505)



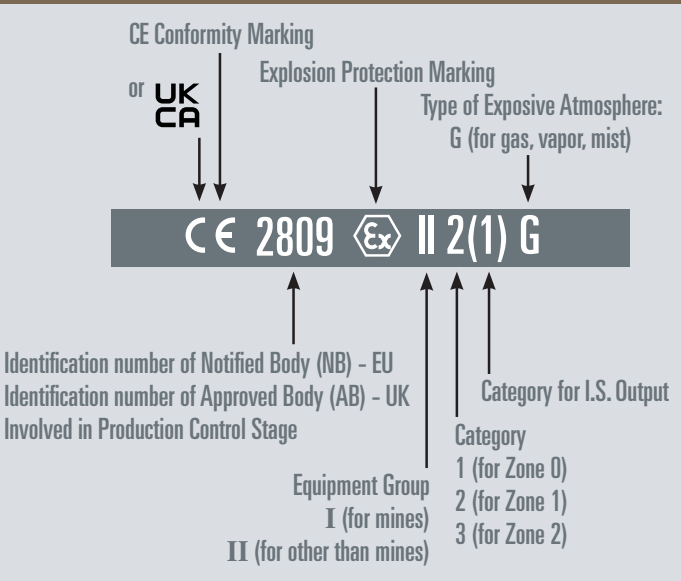
Ambient temperature ranges other than standard (-20°C < Ta < +40°C) must be marked.

CA (CE Code Section 18), EU and IEC



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

Additional EU marking per 2014/34/EU (ATEX) Additional UK marking per SI-2016 No. 1107 (as amended) (UKEX)



EPL/Category

Definition	IEC		EU (ATEX) UK (UKEX)		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		
Gas atmospheres, "enhanced" level of protection	Gc		3G		

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

FM Approvals is your global conformity assessment solution

Market	Recognized product certification marks	
US		
Canada		
EU (ATEX)		
UK (UKEX)		

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

Protection Concepts

Type of Protection	Code	Market	Application	Standard	Protection Principle	
General Requirements						
	AEx	US	Class I, Division 1 & 2	FM 3600		
	Ex	CA	Class I, Division 1 & 2	CSA C22.2 No. 0		
	Ex	US	Class I, Zone 0, 1 & 2	ANSI/UL 60079-0		
	Ex	CA	EPL Ga, Gb, & Gc	CSA C22.2 No. 60079-0		
	Ex	EU	Category 1G, 2G, & 3G	EN IEC 60079-0		
	Ex	IEC	EPL Ga, Gb, Gc	IEC 60079-0		
Increased Safety						
	AEx eb (or AEx e)	US	Class I, Zone 1	ANSI/UL 60079-7	No arcs, sparks or hot surfaces	
	Ex eb (or Ex e)	CA	EPL Gb	CSA C22.2 No. 60079-7		
	Ex eb	EU	EPL Gb	EN IEC 60079-7		
	Ex eb	IEC	EPL Gb	IEC 60079-7		
	AEx ec	US	Class I, Zone 2	ANSI/UL 60079-7		
	Ex ec	CA	EPL Gc	CSA C22.2 No. 60079-7		
	Ex ec	EU	Category 3G	EN IEC 60079-7		
	Ex ec	IEC	EPL Gc	IEC 60079-7		
Non-Incendive						
	(NI)	US	Class I, Division 2	FM 3611		
	(NI)	CA	Class I, Division 2	CSA C22.2 No. 213		
Explosionproof						
	(XP)	US	Class I, Division 1	FM 3615		
	(XP)	CA	Class I, Division 1	CSA C22.2 No. 30		
Flameproof						
	AEx da	US	Class I, Zone 0	ANSI/UL 60079-1	Contain the explosion and extinguish the flame	
	Ex da	CA	EPL Ga	CSA C22.2 No. 60079-1		
	Ex da	EU	Category 1G	EN 60079-1		
	Ex da	IEC	EPL Ga	IEC 60079-1		
	AEx db (or AEx d)	US	Class I, Zone 1	ANSI/UL 60079-1		
	Ex db (or Ex d)	CA	EPL Gb	CSA C22.2 No. 60079-1		
	Ex db	EN	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	EPL Gc	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 qb (or AEx q)	US	Class I, Zone 1	ANSI/UL 60079-5		
	Ex qb (or Ex q)	CA	EPL Gb	CSA C22.2 No. 60079-5		
	Ex qb	EU	Category 2G	EN 60079-5		
	Ex qb	IEC	EPL Gb	IEC 60079-5		
NI Component						
	AEx nC	US	Class I, Zone 2	ANSI/UL 60079-15		
	Ex nC	CA	EPL Gc	CSA C22.2 No. 60079-15		
	Ex nC	EU	Category 3G	EN IEC 60079-15		
	Ex nC	IEC	EPL Gc	IEC 60079-15		
Intrinsic Safety (I.S.)						
	(I.S.)	US	Class I, Division 1	FM 3610	Limit energy of sparks and surface temperature	
	(I.S.)	CA	Class I, Division 1	C22.2 No. 60079-11 or CSA C22.2 No. 157		
	AEx ia	US	Class I, Zone 0	ANSI/UL 60079-11		
	Ex ia	CA	EPL Ga	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	EPL Gb	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	EPL Gc	CSA C22.2 No. 60079-11		
	Ex ic	EU	Category 3G	EN 60079-11		
	Ex ic	IEC	EPL Gc	IEC 60079-11		
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 pxb (or AEx px)	US	Class I, Zone 1	ANSI/UL 60079-2		
	Ex pxb (or Ex px)	CA	EPL Gb	CSA C22.2 No. 60079-2		
	Ex pxb	EU	Category 2G	EN 60079-2		
	Ex pxb	IEC	EPL Gb	IEC 60079-2		
	AEx pyb (or AEx py)	US	Class I, Zone 1	ANSI/UL 60079-2		
	Ex pyb (or Ex py)	CA	EPL Gb	CSA C22.2 No. 60079-2		
	Ex pyb	EU	Category 2G	EN 60079-2		
	Ex pyb	IEC	EPL Gb	IEC 60079-2		
	AEx pzc (or AEx pz)	US	Class I, Zone 2	ANSI/UL 60079-2		
	Ex pzc (or Ex pz)	CA	EPL Gc	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	US	Class I, Zone 2	ANSI/UL 60079-15		
	Ex nR	CA	EPL Gc	CSA C22.2 No. 60079-15		
	Ex nR	EU	Category 3G	EN IEC 60079-15		
	Ex nR	IEC	EPL Gc	IEC 60079-15		
Encapsulation						
	AEx ma	US	Class I, Zone 0	ANSI/UL 60079-18		
	Ex ma	CA	EPL Ga	CSA C22.2 No. 60079-18		
	Ex ma	EU	Category 1G	EN 60079-18		
	Ex ma	IEC	EPL Ga	IEC 60079-18		
	AEx mb (or AEx m)	US	Class I, Zone 1	ANSI/UL 60079-18		
	Ex mb	CA	EPL Gb	CSA C22.2 No. 60079-18		
	Ex mb	EU	Category 2G	EN 60079-18		
	Ex mb	IEC	EPL Gb	IEC 60079-18		
	AEx mc	US	Class I, Zone 2	ANSI/UL 60079-18		
	Ex mc	CA	EPL Gc	CSA C22.2 No. 60079-18		
	Ex mc	EU	Category 3G	EN 60079-18		
	Ex mc	IEC	EPL Gc	IEC 60079-18		
Sealed Device						
	AEx nC	US	Class I, Zone 2	ANSI/UL 60079-15		
	Ex nC	CA	EPL Gc	CSA C22.2 No. 60079-15		
	Ex nC	EU	Category 3G	EN IEC 60079-15		
	Ex nC	IEC	EPL Gc	IEC 60079-15		
Liquid Immersion						
	AEx ob (or AEx o)	US	Class I, Zone 1	ANSI/UL 60079-6		
	Ex ob	CA	EPL Gb	CSA C22.2 No. 60079-6		
	Ex ob	EU	Category 2G	EN 60079-6		
	Ex ob	IEC	EPL Gb	IEC 60079-6		
	AEx oc	US	Class I, Zone 2	ANSI/UL No. 60079-6		
	Ex oc	CA	EPL Gc	CSA No. 60079-6		
	Ex oc	EN	Category 3G	EN 60079-6		
	Ex oc	IEC	EPL Gc	IEC 60079-6		

Note 7: For the US, the marking of "Class I" for Zones 0, 1, or 2 is optional.

Area Classification

	Flammable Material Present Continuously		Flammable Material Present Intermittently		Flammable Material Present Abnormally	
	Zone 0	Zone 1	Zone 1	Zone 2	Zone 2	Zone 2
IEC / EU / UK						
US (NEC® 505)	Zone 0	Zone 1				
US (NEC® 500)	Division 1			Division 2		
CA (CE Code Section 18)	Zone 0	Zone 1				
CA (CE Code Annex J18)	Division 1			Division 2		

IEC classification per IEC 60079-10-1

EU / UK classification per EN 60079-10-1

US classification per ANSI/NFPA 70 National Electrical Code® (NEC®) Article 500 or Article 505

CA classification per CSA C22.1 Canadian Electrical Code (CE Code) Section 18 or Annex J

Equipment Grouping

Typical gas	US (NEC® 505) CA (CE Code Section 18) IEC / EU / UK	US (NEC® 500) CA (CE Code 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 CE Code.

Temperature Class

Marking	US (NEC® 505) CA (CE Code Section 18) IEC / EU / UK		US (NEC® 500) CA (CE Code Annex J18)	
		T1	T2	T3
450°C	T1			
300°C	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	75° 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		Temporary immersion
8		Continuous immersion
9		High pressure/temperature water jet

Approximate US 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

2-WISE	2 Wire Intrinsically Safe Ethernet
ATEX	Explosion Protection for EU
CA	Canada
CE Code	Canadian Electrical Code (CSA C22.1)
EPL	Equipment Protection Level
EU	European Union
FISCO	Fieldbus Intrinsically Safe Concept
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)
UK	United Kingdom
UKEX	Explosion Protection for UK
US	United States of America

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