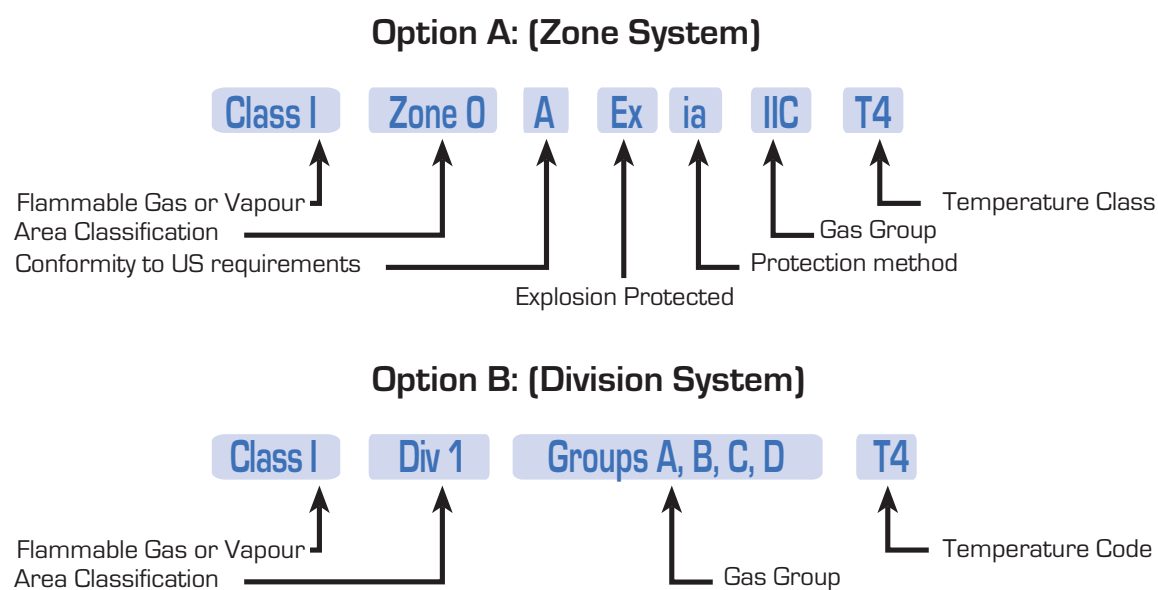




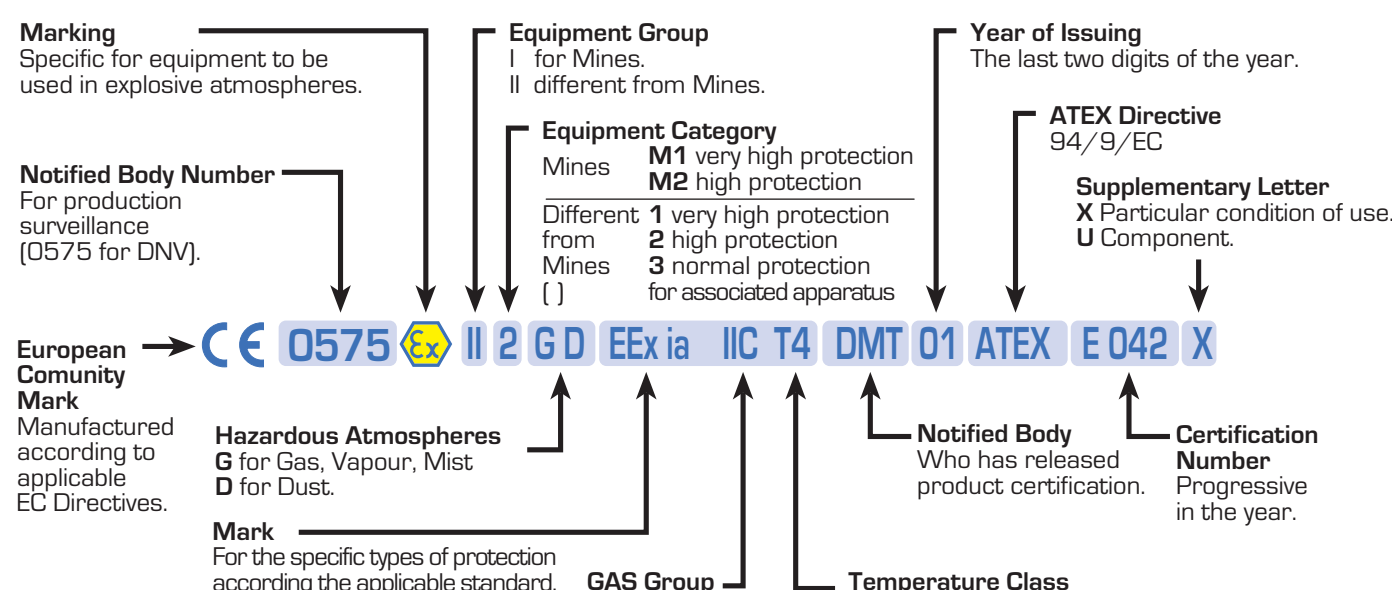
UNDERSTANDING HAZARDOUS LOCATIONS



MARKING for NORTH AMERICA according NEC / CEC



MARKING ACCORDING ATEX DIRECTIVE 94/9/EC



Electrical apparatus for Intrinsically Safe Applications

Field Equipment:

SIMPLE APPARATUS: Less than 1.5 V; 0.1 A; 20 μJ; 25 mW. Do not require certification (TC, RTD, Pot, Switch, LED ..)

INTRINSICALLY SAFE APPARATUS: Require certification. (TX, I/P, Solenoid Valve, Proximity, Field Display ..)

Safety Parameters to be matched by **Associated Apparatus:**

Ui / Vmax (Max. Input Voltage); Ii / Imax (Max. Input Current); Ci (Internal Capacitance); Li (Internal Inductance); Pi (Max. Input Power)

Control Room Equipment:

ASSOCIATED APPARATUS: Require certification. (Isolators, Zener Barriers, Signal Conditioners)

Safety Parameters to be matched with **Intrinsically Safe Apparatus:**

Uo / Voc (Open Circuit Voltage); Ioc / Isc (Short Circuit Current); Co / Ca (Allowed Capacitance); Lo / La (Allowed Inductance); Po (Max. Power)

NON INTRINSICALLY SAFE APPARATUS: All Apparatuses without Approval (PLC, DCS, Computers, Controllers ..)

Electrical apparatus for use in presence of combustible Dust Category 1, 2 and 3

EN 50281-1-1 Electrical apparatus protected by enclosures - Construction and Testing.

EN 50281-1-2 Electrical apparatus protected by enclosures - Selection, installation and maintenance.

EN 50281-2-1 Test methods - Methods for determining the minimum ignition temperatures of dust.

Note: EN 50281-1-1 can be combined with other EN standards where appropriate.

ATEX ZONES and CATEGORIES

		Level of Protection	Equipment Category Directive 94/9/EC	Area Classification Directive 1999/92/EC
GAS	Dust	Definitions	ATEX	Typical Zone Suitability
EN 60079-10 0	EN 50281-3 20	Very High: two independent means of protection or safe even when two independent faults occur. Place in which an explosive atmosphere is frequently, for long periods, or continuously present.	High probability of Explosive Atmosphere 1G / 1D / M1	Equipment for Zone 0 Equipment for Zone 20
1	21	High: suitable for normal operation and frequently occurring disturbances or equipment where faults are taken into account. A place in which an explosive atmosphere is occasionally to occur.	Possibility of Explosive Atmosphere 2G / 2D / M2	Equipment for Zone 1 Equipment for Zone 21
2	22	Normal: suitable for normal operation. A place in which an explosive atmosphere is unlikely to occur in normal operation, and only for short periods.	Low probability of Explosive Atmosphere 3G / 3D	Equipment for Zone 2 Equipment for Zone 22

DIVISIONS / ZONES

Area Classification	North America	ATEX
Continuous Hazard	Div. 1 or Zone 0	Zone 0
Intermittent Hazard	Div. 1 or Zone 1	Zone 1
Abnormal Conditions Hazard	Div. 2 or Zone 2	Zone 2

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ENCLOSURES

IP Protection Codes			
First Numeral Protection Against Solids		Second Numeral Protection Against Water	
0	No protection	0	No Protection
1	Greater than 50 mm	1	Vertical Dripping
2	Greater than 12.5 mm	2	Angled Dripping (15°)
3	Greater than 2.5 mm	3	Spraying
4	Greater than 1 mm	4	Splashing
5	Dust Protected	5	Jetting
6	Dust Tight	6	Powerful Jetting
		7	Temporary Immersion
		8	Continuous Immersion

NEMA Types		
Type	Application	Protection Against
1	Indoor	General Purpose
2	Indoor	Dripping Water, Falling Dust
3, 3R, 3S	Outdoor	Rain, Snow, Windblown Dust
4, 4X	Indoor/Outdoor	Hose-Directed Water, Corrosion (X)
5	Indoor	Angled Dripping Water, Settling Dust
6	Indoor/Outdoor	Temporary Submersion
6P	Indoor/Outdoor	Prolonged Submersion
7	Indoor	Hazardous Location Class I
8	Indoor/Outdoor	Hazardous Location Class I
9	Indoor	Hazardous Location Class II
12, 12K	Indoor	Dripping non-corrosive Liquid, Dust
13	Indoor	Water, Oil, Dust, Seepage

TEMPERATURE Code / Class

Max surface Temperature in °C	CODE / CLASS	
	North America	ATEX
450	T1	T1
300	T2	T2
280	T2A	-
260	T2B	-
230	T2C	-
215	T2D	-
200	T3	T3
180	T3A	-
165	T3B	-
160	T3C	-
135	T4	T4
120	T4A	-
100	T5	T5
85	T6	T6

ELECTRICAL APPARATUS for EXPLOSIVE ATMOSPHERES

Category 1 and 2 apparatus Gas

Type of protection	CENELEC Code	CENELEC Standard	IEC Standard	US Division Standards	US Zone Standards	Canadian Div. Standards	Canadian Zone Standards
General requirements	-	EN 50014	60079-0	FM3600	UL60079-0	C22.2 No. 0	E60079-0
Intrinsic Safety	EEx ia; ib	EN 50020	60079-11	FM3610/UL913	UL60079-11	C22.2 No. 157	E60079-11
Increased Safety	EEx e	EN 50019	60079-7	-	UL60079-7	-	E60079-7
Flameproof/Expl. Proof	EEx d	EN 50018	60079-1	FM3615/UL1203	UL60079-1	C22.2 No. 30	E60079-1
Pressurization	EEx p	EN 50016	60079-2	NFPA 496	-	CSA TIL 13A	-
Powder Filling	EEx q	EN 50017	60079-5	-	UL60079-5	-	E60079-5
Encapsulation	EEx m	EN 50028	60079-18	-	UL60079-18	-	E60079-18
Oil Immersion	EEx o	EN 50015	60079-6	-	UL60079-6	-	E60079-6
Type n	EEx n	EN 50021	60079-15	FM3611/UL1604	UL60079-15	C22.2 No. 213	E60079-15
Intrinsically Safe Systems	EEx ia; ib	EN 50039	60079-25	-	-	-	-
Special requirements for construction, test and marking of electrical apparatus of equipment group II, Cat. 1G	-	EN 50284	60079-26	-	-	-	-

Category 3 Gas

Type n equipment containing:	Additional code letter
Enclosed break device	C
Non incandescent component	C
Hermetically sealed device	C
Sealed device	C
Encapsulated device	C
Energy limited apparatus and circuits	L
Restricted breathing enclosure	R
Simplified pressurization	P
Non sparking	A

A: for non sparking apparatus.
C: for sparking apparatus in which the contacts are suitably protected.
R: for restricted breathing enclosures.
L: for energy limited apparatus.
P: for enclosure with simplified pressurization.

Gas / Dust Grouping

Reference Gas / Dust	North America	ATEX
Acetylene	Class I, Group A	Group IIC
Hydrogen	Class I, Group B	Group IIC
Ethylene	Class I, Group C	Group IIB
Propane	Class I, Group D	Group IIA
Methane	Gaseous Mines	Group I
Magnesium	Class II, Group E	-
Coal	Class II, Group F	-
Grain	Class II, Group G	-
Cotton	Class III	-

DIRECTIVE 94/9/EC - Equipment and Protective Systems

Group	Substance	Potentially Explosive Atmosphere	Protection Level	Fault or Protection Mode	Category	Zone
I	Methane (Grisou) and coal dusts	Present	Very High	2 independent faults or 2 independent protection methods.	M1	
		Probably present	High	1 fault or 1 protection method.	M2	
II	Gas, Vapours, Mists or Dust	Continuously present, or for long periods.	Very High	2 independent faults or 2 independent protection methods.	1	Zone 0 (G) Zone 20 (D)
		Probably present during normal operation.	High	1 fault or 1 protection method.	2	Zone 1 (G) Zone 21 (D)
		Occasionally present, for short periods only.	Normal	No fault during normal operation.	3	Zone 2 (G) Zone 22 (D)

Note: Group II (Category 1 and Category 2) electric, or internal combustion motor; certification mandatory (Notified Body).
(Category 2 non electric) manufacturer declaration and deposit of technical file to Notified Body.
(Category 3) manufacturer declaration.

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