



UNDERSTANDING HAZARDOUS LOCATIONS



ATEX AND IECEX: GROUPS, CATEGORIES, ZONES AND EPLs

Protection Level	Definition	Explosive atmosphere	94/9/EC (ATEX)		99/92/EC (ATEX)		IECEX		
			Group	Equipment Category	Area classification	Group	EPL		
Very High two independent means of protection or one protection allowing two independent faults	Place where an explosive atmosphere is frequently or for long periods or continuously present	Coal mine	I	M1	-	I	Ma		
		Gas		1G	Zone 0*			II	Ga
		Dust		1D	Zone 20**			III	Da
High single mean of protection allowing only one fault	Place where an explosive atmosphere is occasionally present during normal operation	Coal mine	I	M2	-	I	Mb		
		Gas		2G	Zone 1*			II	Gb
		Dust		2D	Zone 21**			III	Db
Normal safe during normal operation	Place where an explosive atmosphere is not present during normal operation, and eventually for short periods	Gas	II	3G	Zone 2*	II	Gc		
		Dust		3D	Zone 22**			III	Dc

* according to IEC/EN 60079-10-1; ** according to IEC/EN 60079-10-2

DIVISIONS / ZONES

Atmosphere	Class *	Division *	Zone **	Area Classification
Gas	Class I	Div. 1	Zone 0	Continuous Hazard
			Zone 1	Intermittent Hazard
		Div. 2	Zone 2	Abnormal Conditions Hazard
Dust	Class II	Div. 1	Zone 20	Continuous Hazard
			Zone 21	Intermittent Hazard
		Div. 2	Zone 22	Abnormal Conditions Hazard
Fiber	Class III	Div. 1	Zone 20	Continuous Hazard
			Zone 21	Intermittent Hazard
		Div. 2	Zone 22	Abnormal Conditions Hazard

* according to NEC 500 / CEC Annex J; ** according to IEC / NEC 505 / CEC 18

GROUPS

Atmosphere	Class *	Group *	Group **	Representative element
Gas	Class I	-	Group I	Methane
		Group D	Group IIA	Propane
		Group C	Group IIB	Ethylene
		Group B	Group IIC (except C ₂ H ₂)	Hydrogen
		Group A	Group IIC	Acetylene
Dust	Class II	Group G	Group IIIB	Non-conductive dusts
		Group F	Group IIIB	Carbonaceous dusts
		Group E	Group IIIC	Metal dusts
		-	Group IIIA	Fibers or flyings
Fiber	Class III	-	Group IIIA	Fibers or flyings

* according to NEC 500 / CEC Annex J; ** according to IEC / NEC 505 / CEC 18

PROTECTION DEGREE

IP (IEC/EN 60529)			
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 (Standards Publication 250)			
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	

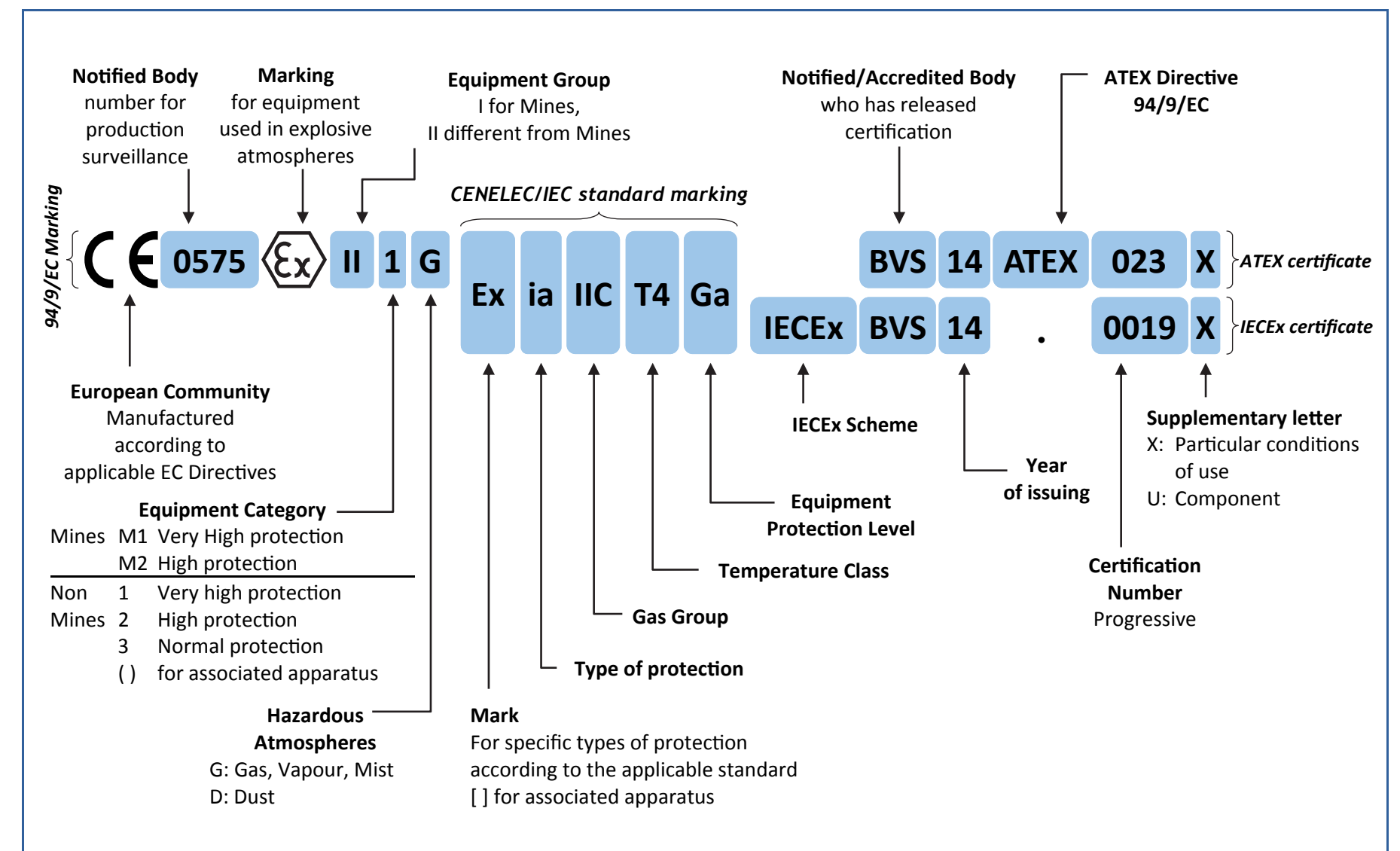
MINIMUM SIL FOR ATEX SAFETY RELATED DEVICES (EN 50495)

Fault Tolerance of Equipment (number of single faults that cause the apparatus to fail)	Combined equipment desired category		
	1 / M1	2 / M2	3
2	-	-	-
1	HFT 0 SIL 1	-	-
0	HFT 1 SIL 2	HFT 0 SIL 1	-

“-” means that no safety device is required.
“SIL 1” or “SIL 2” is required Safety Integrity Level of safety related device according to EN 61508.



MARKING ACCORDING ATEX DIRECTIVE 94/9/EC AND IECEX CERTIFICATION SCHEME



ELECTRICAL APPARATUS FOR IS APPLICATIONS

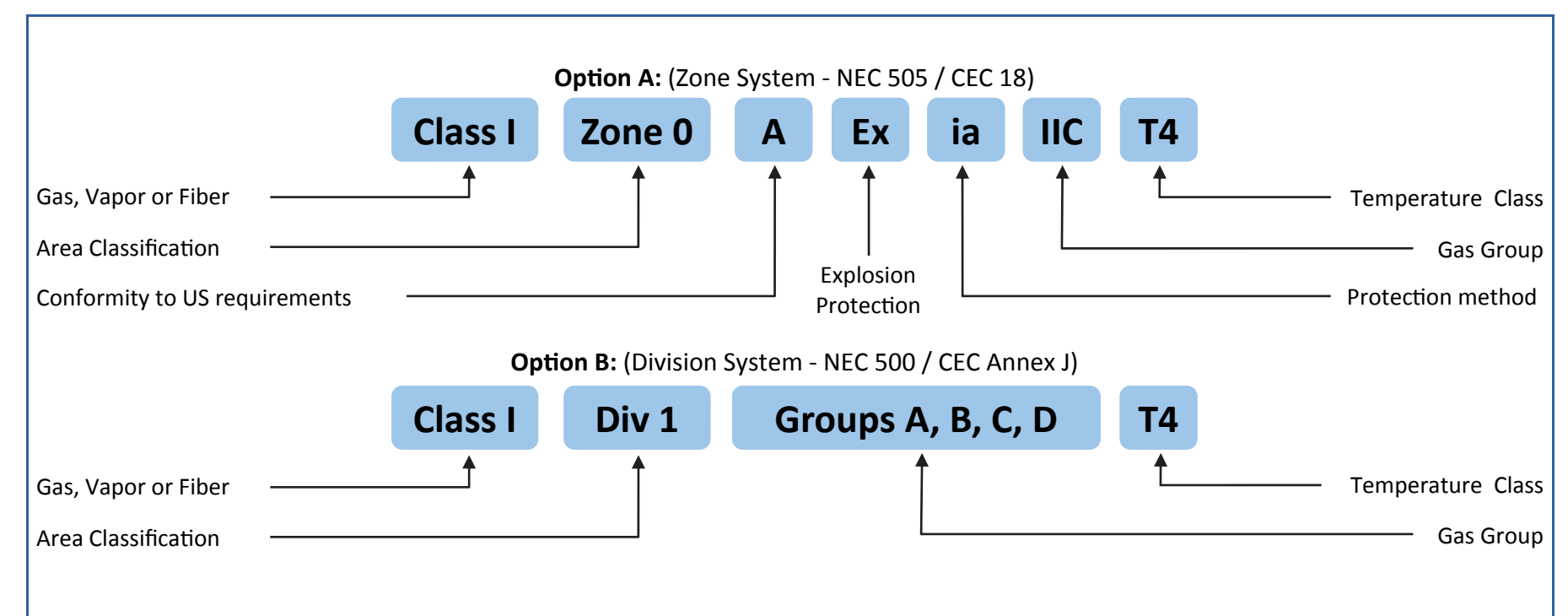
Field Equipment:
SIMPLE APPARATUS: Less than 1.5 V; 0.1 A; 20 μ; 25 mW (TC, RTD, Pot, Switch...) Simple apparatus is considered not to require certification by a notified body; certification to the ATEX Directive is not required because of the low levels of energy, which are added to the intrinsically safe circuit by this apparatus. A simple apparatus is required to be clearly identified when it is installed. Simple apparatus shall conform to all relevant requirements of the standard.
INTRINSICALLY SAFE APPARATUS: • Requires 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); Pi (Max. Input Power); Ci (Internal Capacitance); Li (Internal Inductance)
Control Room Equipment: ASSOCIATED APPARATUS: • Requires certification. (Galvanic Isolators, Zener Barriers, Signal Conditioners) • Safety Parameters to be matched with Intrinsically Safe Apparatus: Uo / Voc (Open Circuit Voltage); Io / Isc (Short Circuit Current); Po (Max. Output Power); Co / Ca (Allowed Capacitance); Lo / La (Allowed Inductance);
NON INTRINSICALLY SAFE APPARATUS: All Apparatuses without Approval (PLC, DCS, Computers, Controllers...)

TEMPERATURE CLASS

Max surface Temperature	T class *	T class **
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

* according to NEC 500 / CEC Annex J
** according to IEC / NEC 505 / CEC 18

MARKING FOR NORTH AMERICA ACCORDING NEC / CEC



ELECTRICAL APPARATUS FOR GAS AND DUST EXPLOSIVE ATMOSPHERES

Type of protection	Concept	Code	EPL	IEC/CENELEC standard	US Division Standard	US Zone Standard	Canadian Div. Standard	Canadian Zone Standard
Gas								
General requirements		-	-	60079-0	FM3600	60079-0	-	60079-0
Intrinsic Safety	Energy limitation	Ex ia Ex ib Ex ic	Ga or Ma Gb or Mb Gc	60079-11	FM3610/UL913	60079-11	C22.2 No. 157	60079-11
Intrinsically Safe systems	Energy limitation	Ex ia Ex ib Ex ic	Ga Gb Gc	60079-25	-	-	-	-
Increased Safety	Non sparking	Ex e	Gb or Mb	60079-7	-	60079-7	-	60079-7
Type n (non sparking/non incandive)		Ex nA Ex nC	Gc	60079-15	FM3611	60079-15	C22.2 No. 213	60079-15
Flameproof / Expl. Proof	Explosion containment	Ex d	Gb or Mb	60079-1	FM3615/UL1203	60079-1	C22.2 No. 30	60079-1
Powder filling		Ex q	Gb or Mb	60079-5	-	60079-5	-	60079-5
Type n (enclosed-break)		Ex nC	Gc	60079-15	FM3611	60079-15	C22.2 No. 213	60079-15
Encapsulation	Separation of explosive atmosphere from ignition	Ex ma Ex mb Ex mc	Ga or Ma Gb or Mb Gc	60079-18	-	60079-18	-	60079-18
Type n (sealed/hermetically sealed)		Ex nC	Gc	60079-15	FM3611	60079-15	C22.2 No. 213	60079-15
Pressurization		Ex pv Ex px Ex py Ex pz	Gb or Gc Gb or Mb Gb Gc	60079-2	FM3620/ NFPA 496	-	-	60079-2
Oil immersion		Ex o	Gb	60079-6	-	60079-6	-	60079-6
Type n (restricted breathing)		Ex nR	Gc	60079-15	-	-	-	60079-15
Special requirements		-	Ga	60079-26	-	-	-	-
Dust								
Intrinsic Safety	Energy limitation	Ex ia Ex ib Ex ic	Da Db Dc	60079-11	FM3610/UL913	60079-11	C22.2 No. 157	60079-11
Dust ignition proof	Separation of explosive atmosphere from ignition	Ex ta Ex tb	Da Db	60079-31	FM3616/UL1203	-	-	60079-31
Dust tight		Ex tc	Dc	60079-31	FM3611/ ANSI/ISA 12.12.01	-	C22.2 No. 25	60079-31
Encapsulation	Separation of explosive atmosphere from ignition	Ex ma Ex mb Ex mc	Da Db Dc	60079-18	-	60079-18	-	60079-18
Pressurization		Ex pD	Db or Dc	61241-4	NFPA 496	-	-	61241-4



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TECHNOLOGY FOR SAFETY