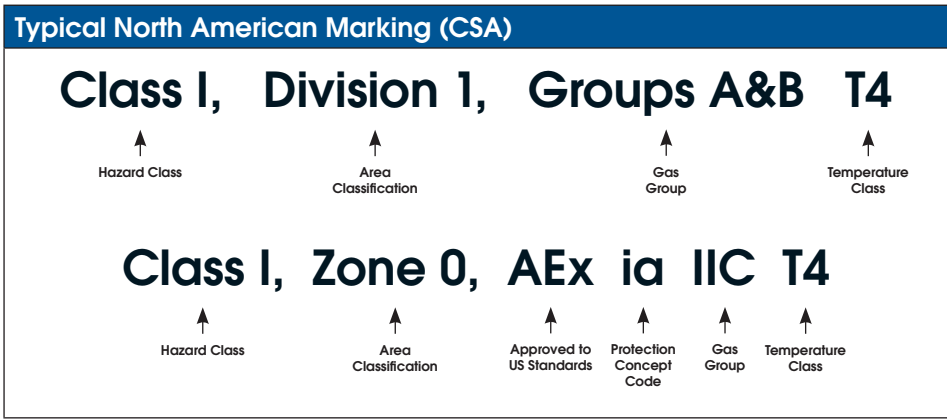




Guide to Equipment Certification Requirements for Hazardous Locations

cCSAUs

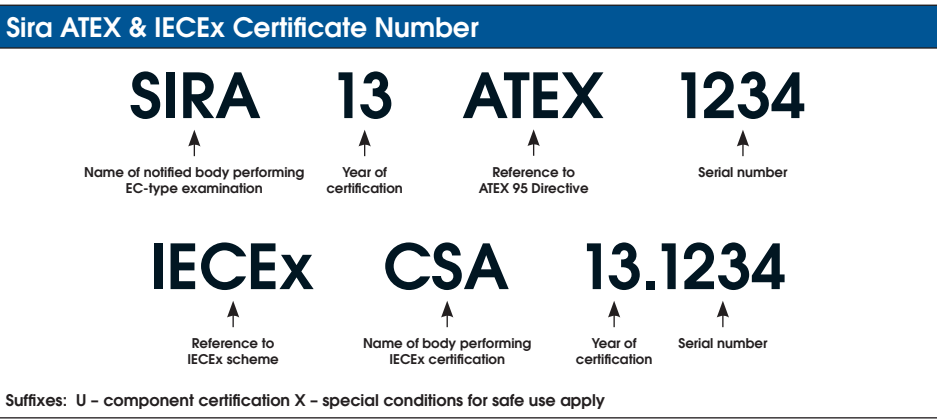


Protection Concepts					
Type of Protection	Code	Country	Class	Division / Zone	Standard
Electrical Equipment for Flammable Gas, Vapors and Mist - Class I					
General Requirements	AEx Ex	US	Class I	Division 1 & 2	FM 3600
		CA	Class I	Division 1 & 2	-
		US	Class I	Zone 1 & 2	ISA 60079-0
Increased Safety	AEx e Ex e	US	Class I	Zone 1	ISA 60079-7
		CA	Class I	Zone 1	CSA E60079-7
Non-Incendive	(NI) (NI)	US	Class I	Division 2	ISA 12.12.01 / FM 3611
		CA	Class I	Division 2	C22.2 No. 213
Non-Sparking	AEx nA EX nA	US	Class I	Zone 2	ISA 60079-15
		CA	Class I	Zone 2	CSA E60079-15
Explosion Proof	(XP) (XP)	US	Class I	Division 1	UL 1203 / FM 3615
		CA	Class I	Division 1	C22.2 No. 30
Flame Proof	AEx d AEx d Ex d	US	Class I	Zone 1	ISA 60079-1
		CA	Class I	Zone 1	UL 1203 / FM 3615
		US	Class I	Zone 1	CSA 60079-1
Power Filled	AEx q Ex q	US	Class I	Zone 1	ISA 60079-5
		CA	Class I	Zone 1	CSA E60079-5
Enclosed Break	AEx nC Ex nC	US	Class I	Zone 2	ISA 60079-15
		CA	Class I	Zone 2	CSA E60079-15
Intrinsic Safety	(IS) (IS) AEx ia AEx ib EX ia EX ib	US	Class I	Division 1	UL 913 / FM 3610
		CA	Class I	Division 1	C22.2 No. 157
		US	Class I	Zone 0	ISA 60079-11 / FM 3616
		US	Class I	Zone 1	ISA 60079-11 / FM 3616
		CA	Class I	Zone 0	CSA E60079-11
		CA	Class I	Zone 1	CSA E60079-11
Limited Energy	AEx nC Ex nL	US	Class I	Zone 2	ISA 60079-15
		CA	Class I	Zone 2	CSA E60079-15
Pressurised	Type X Type X Type Y Type Y Type Z Type Z AEx px Ex px AEx py Ex py AEx pz Ex pz	US	Class I	Division 1	NFPA 496 (FM 3620)
		CA	Class I	Division 1	NFPA 496
		US	Class I	Division 1	NFPA 496 (FM 3620)
		CA	Class I	Division 1	NFPA 496
		US	Class I	Division 2	NFPA 496 (FM 3620)
		CA	Class I	Division 2	NFPA 496
		US	Class I	Zone 1	ISA 60079-2
		CA	Class I	Zone 1	CSA E60079-2
		US	Class I	Zone 1	ISA 60079-2
		CA	Class I	Zone 1	CSA E60079-2
		US	Class I	Zone 2	ISA 60079-2
		CA	Class I	Zone 2	CSA E60079-2
Restricted Breathing	AEx nR Ex nR	US	Class I	Zone 2	ISA 60079-15
		CA	Class I	Zone 2	CSA E60079-15
Encapsulated	AEx ma AEx m Ex m AEx mb	US	Class I	Zone 0	ISA 60079-18
		CA	Class I	Zone 1	ISA 60079-18
		US	Class I	Zone 1	ISA 60079-18
		CA	Class I	Zone 1	ISA 60079-18
Oil Emersion	AEx o EX o	US	Class I	Zone 1	ISA 60079-6
		CA	Class I	Zone 1	CSA E60079-6

Electrical Equipment for Combustible Dust and Fibres - Class II / Class III					
Type of Protection	Code	Country	Class	Division / Zone	Standard
General Requirements	Ex	US	Class II	Division 1 & 2	FM 3600
		CA	Class II	Division 1 & 2	CSA C22.2 No.0
		US	Class III	Division 1 & 2	FM 3600
		US	Class III	Division 1 & 2	CSA C22.2 No.0
Dust Ignition Proof	(DIP)	US	Class II	Division 1	UL 1203 / FM 3616
		CA	Class II	Division 1	CSA C22.2 No. 25
Dust Protected	(NI)	US	Class II	Division 2	ISA 12.12.01 / FM 3611
		CA	Class II	Division 2	CSA C22.2 No. 25
Protection by Enclosure	AEx ta AEx tb AEx tc Ex ta Ex tb Ex tc	US	Class II	Zone 20	ISA 60079-31
		US	Class II	Zone 21	ISA 60079-31
		US	Class II	Zone 22	ISA 60079-31
		CA	Class II	Zone 20	CSA C22.2 No. 60079-31
		CA	Class II	Zone 21	CSA C22.2 No. 60079-31
		CA	Class II	Zone 22	CSA C22.2 No. 60079-31
Fiber & Flying Protection	-	US	Class III	Division 1 & 2	UL 1203 / ISA 12.12.01
		CA	Class III	Division 1 & 2	CSA C22.2 No. 25
Encapsulation	AEx maD AEx mbD	US	-	Zone 20	ISA 60079-18
		US	-	Zone 21	ISA 60079-18
Pressurisation	(PX) (PX) (PY) (PY) (PZ) (PZ) AEx pD	US	Class II	Division 1	NFPA 496 (FM 3620)
		CA	Class II	Division 1	NFPA 496
		US	Class II	Division 1	NFPA 496 (FM 3620)
		CA	Class II	Division 1	NFPA 496
		US	Class II	Division 2	NFPA 496 (FM 3620)
		CA	Class II	Division 2	NFPA 496
		US	-	Zone 21	ISA 61241-2
		US	-	Zone 21	ISA 61241-2
Intrinsic Safety	(IS) (IS) AEx iaD AEx ibD (IS) (IS)	US	Class II	Division 1	UL 913 / FM 3610
		CA	Class II	Division 1	CSA C22.2 No. 157
		US	-	Zone 20	ISA 60079-11
		US	-	Zone 21	ISA 60079-11
		US	Class III	Division 1	UL 913 / FM 3610
		CA	Class III	Division 1	CSA C22.2 No. 157

Note: For associated intrinsically safe apparatus suitable for installation in a hazardous location, the symbol for the type of protection "ia" or "ib" are enclosed within square brackets on the marking, e.g. AEx d (ia) IIC T4.

Note: For 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 on the marking, e.g. (AEx ia) IIC; in this case, a temperature class is not included.



Classification of Divisions and Zones			
Type of Area	NEC and CEC*	ATEX and IEC	Definitions
Continuous hazard	Division 1	Zone 0 / Zone 20 Cat 1	A place in which an explosive atmosphere is continually present
Intermittent hazard	Division 1	Zone 1 / Zone 21 Cat 2	A place in which an explosive atmosphere is likely to occur in normal operation
Hazard under abnormal conditions	Division 2	Zone 2 / Zone 22 Cat 3	A place in which an explosive atmosphere is not likely to occur in normal operation, but may occur for short periods

* On occasion the ATEX and IEC Zones may be used in the corresponding NEC and CEC system

Equipment Groups (ATEX and IECEx)					
Equipment Group	Equipment Category	Equipment Protection Level	Atmosphere	Protection Level	Required Protection Performance & Operation
I (Mines with firedamp)	M1	Ma	Methane & Dust	Very High	Two Faults, Remain energised and functioning
I (Mines with firedamp)	M2	Mb	Methane & Dust	High	Severe normal operation, De-energise in explosive atmosphere
II (all other areas)	1	Ga / Da	Gas, Vapour, Mist, Dust	Very High	Two Faults
II (all other areas)	2	Gb / Db	Gas, Vapour, Mist, Dust	High	One Fault
II (all other areas)	3	Gc / Dc	Gas, Vapour, Mist, Dust	Low	Normal operation

Ingress Protection Codes		
First Number (protect from solid bodies)		Second Number (protect from water)
0	No protection	0 No protection
1	Objects > 50mm	1 Vertical drip
2	Objects > 12.5mm	2 Angled drip
4	Objects > 1.0mm	4 Splashing
5	Dust-protected	5 Jetting
6	Dust-tight	6 Powerful jetting
		7 Temporary immersion
		8 Continuous immersion

Enclosure Type Ratings (NEMA / CSA / UL)		
Type	Area	Brief Definition
1	Indoor	General Purpose
2	Indoor	Protection against angled dripping water
3, 3R, 3S	Indoor / Outdoor	Protection against rain, snow
4, 4X	Indoor / Outdoor	Protection against rain, snow, hose directed water
5	Indoor	Protection against angled dripping water, dust, fibers, flyings
6	Indoor / Outdoor	Protection against temporary submersion
6P	Indoor / Outdoor	Protection against prolonged submersion
12, 12K	Indoor	Protection against circulating dust, fibers, flyings
13	Indoor	Protection against circulating dust, fibers, flyings, seepage

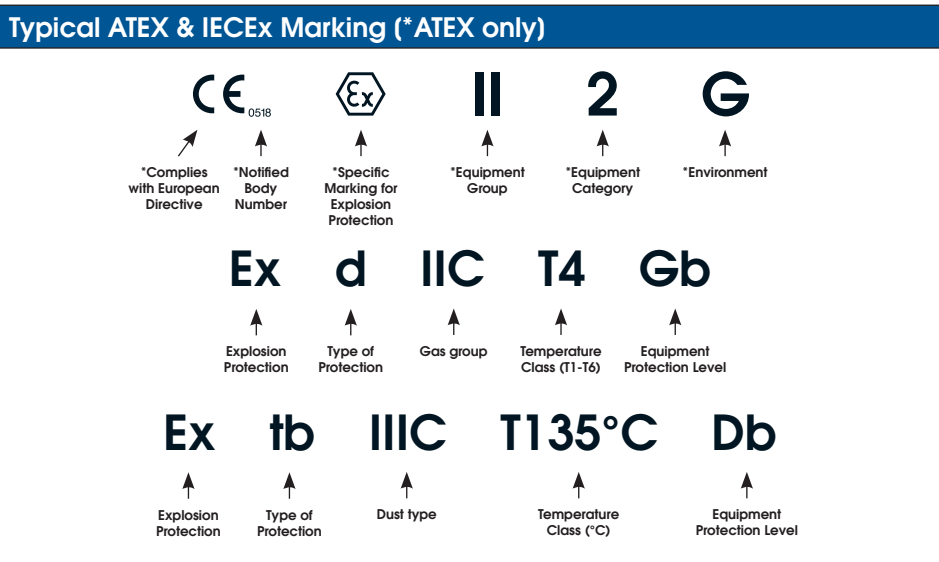
Atmosphere Groups (ATEX and IECEx)			
Group	Environment	Location	Typical Substance
I		Coal Mining	Methane (Fire damp)
IIA	Gases, Vapours	Surface and other locations	Acetic acid, Acetone, Ammonia, Butane, Cyclohexane, Ethanol (ethyl alcohol), Gasoline (petrol), Kerosene, Methane (natural gas) (non-mining), Methanol (methyl alcohol), Propane, Propan-2-ol (iso-propyl alcohol), Toluene, Xylene
IIIB			Di-ethyl ether, Ethylene, Methyl ethyl ketone (MEK), Propan-1-ol (n-propyl alcohol)
IIC			Acetylene, Hydrogen
IIIA	Combustible Dusts	Surface and other locations	Combustible flyings
IIIB			Non-conductive
IIIC			Conductive

Atmosphere Groups (US / CAN)				
Substance	Hazard Class	NEC 500	NEC 505	
Acetylene	Class I Flammable Gases	Group A	IIC	
Hydrogen		Group B	IIC	
Ethylene		Group C	IIIB	
Propane		Group D	IIA	
Methane (mining)	Class II Combustible Dusts	Group D	-	
Combustible Metal Dusts		Group E	-	
Combustible Carbonaceous Dusts		Group F	-	
Combustible Dusts not in Group E or F (Flour, Grain, Wood, Plastics, Chemicals)		Group G	-	
Combustible Fibers and Flyings	Class III Fibers and Flyings	-	-	



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ATEX & IECEx



Protection Concepts (ATEX and IECEx)					
Type of Protection	Symbol	Typical IEC EPL	Typical Zone(s)	IEC Standard	Basic Concept of Protection
Electrical equipment for gases, vapours and mists (G)					
General Requirements	-	-	0.1,2	IEC 60079-0	-
Optical Radiation	Op pr Op sh Op ls	Gb Ga Gb	1,2 0.1,2 0.1,2	IEC 60079-28 IEC 60079-28 IEC 60079-28	Inherently safe protected by shutdown
Increased safety Type 'n' (non-sparking)	e nA	Gb Gc	1,2 2	IEC 60079-7 IEC 60079-15	No arcs, sparks or hot surfaces. Enclosure IP54 or better
Flameproof	d	Gb	1,2	IEC 60079-1	Contain the explosion, quench the flame
Type 'n' (enclosed break)	nC	Gc	2	IEC 60079-15	
Quartz / sand filled	q	Gb	1,2	IEC 60079-5	Quench the flame
Intrinsic safety	ia ib ic	Ga Gb Gc	0.1,2 1,2 2	IEC 60079-11 IEC 60079-11 IEC 60079-11	Limit the energy of sparks and surface temperatures
Pressurised	px py pz	Gb Gb Gc	1,2 1,2 2	IEC 60079-2 IEC 60079-2 IEC 60079-2	
Type 'n' (sealing & hermetic sealing) Type 'n' (restricted breathing)	nC nR	Gc Gc	2 2	IEC 60079-15 IEC 60079-15	Keep the flammable gas out
Encapsulation	ma mb mc	Ga Gb Gc	0.1,2 1,2 2	IEC 60079-18 IEC 60079-18 IEC 60079-18	
Oil immersion	o	Gb	1,2	IEC 60079-6	
Electrical equipment for combustible dusts (D)					
General Requirements	-	-	20,21,22	IEC 60079-0	-
Enclosure	fa fb fc	Da Db Dc	20 21 22	IEC 60079-31	Standard protection for dusts, rugged tight enclosure
Intrinsic safety	ia ib ic	Da Db Dc	20 21 22	IEC 60079-11	Limit the energy of sparks and surface temperatures
Encapsulation	ma mb mc	Da Db Dc	20 21 22	IEC 60079-18	Protection by encapsulation of incandive parts
Pressurised	pD	Db Dc	21,22 22	IEC 61241-4	Protection by pressurisation of enclosure
Non-Electrical equipment					
General Requirements	-	-	0.1,2, 20,21,22	EN 13463-1	Low potential energy
Flow restricted enclosure flameproof enclosure	fr d	-	2,22 1,2,21,22	EN 13463-2 EN 13463-3	Relies on tight seals, closely matched joints and tough enclosures to restrict the breathing of the enclosure
Constructional safety	c	-	0.1,2, 20,21,22	EN 13463-5	Ignition hazards eliminated by good engineering methods
Control of ignition sources	b	-	0.1,2, 20,21,22	EN 13463-6	Control equipment fitted to detect malfunctions
Pressurisation	p	-	1,2, 21,22	EN 60079-2 EN 61241-4	Enclosure is purged and pressurised to prevent ignition sources from arising
Liquid immersion	k	-	0.1,2, 20,21,22	EN 13463-8	Enclosure uses liquid to prevent contact with explosive atmosphere

Temperature Classification		
Classification of maximum surface temperatures for Group II Electronic Equipment (T Class).		
IIA	T1	Ammonia 630°
IIC	T1	Hydrogen 560°
IIA	T1	Methane 537°
IIA	T1	Propane 470°
IIIB	T2	Ethylene 425°
IIA	T2	Butane 372°
IIC	T2	Acetylene 305°
IIA	T3	Cyclohexane 259°
IIA	T3	Kerosene 210°
IIIB	T4	Di-ethyl Ether 160°
IIC	T6	Carbon Disulphide 95°

Dusts Typical Ignition Temperatures (°C)		
Dusts	Cloud	Layer
Aluminium	590 °C	>450 °C
Coal dust (lignite)	380 °C	225 °C
Flour	490 °C	340 °C
Grain dust	510 °C	300 °C
Methyl cellulose	420 °C	320 °C
Phenolic resin	530 °C	>450 °C
Polythene	420 °C	(melts) °C
PVC	700 °C	>450 °C
Soot	810 °C	570 °C
Starch	460 °C	435 °C
Sugar	490 °C	460 °C

Quality Assurance

Quality Assurance is concerned with the continued monitoring of systems and processes in relation to manufacturers of Ex products, and is concerned mainly with post-compliance activities.

CSA-Sira offers the full range of QA services including ATEX & IECEx Product & Production Quality Assurance, Certification of Service Facilities involved in Repair and overhaul of Ex Equipment and technical auditing services.

The routes to market for ATEX and IECEx:

- ATEX Quality Assurance Notification: Quality system certification for the manufacture of category 1 and category 2 electrical equipment. (refer IEC/ISO 90079-34 and IEC Directive Annexes IV / VII)
- IECEx QAR (Quality Assessment Report): Required together with the ExTR (test report) to enable issue of an IECEx Certificate of Conformity. (refer IEC/ISO 90079-34 and IECEx Scheme Rules)
- ATEX Conformity-to-Type Notification is certification for the manufacture of category 2 electrical equipment. (refer ATEX Directive Annexes VI)
- ATEX Product Verification is certification for the manufacture of category 1 equipment - 100% verification by the Notified Body. (refer ATEX Directive Annexes V)
- ATEX or IECEx Unit Verification is certification covering design and manufacture of equipment - 100% verification by the Notified Body. (refer ATEX Directive Annexes IX and IECEx Scheme Rules)

