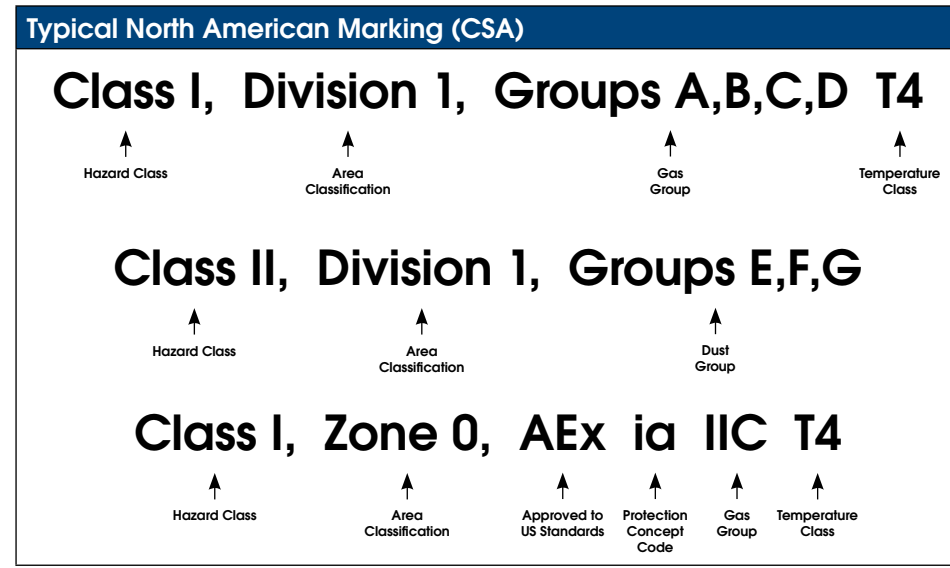


Guide to Equipment Certification Requirements for Hazardous Locations



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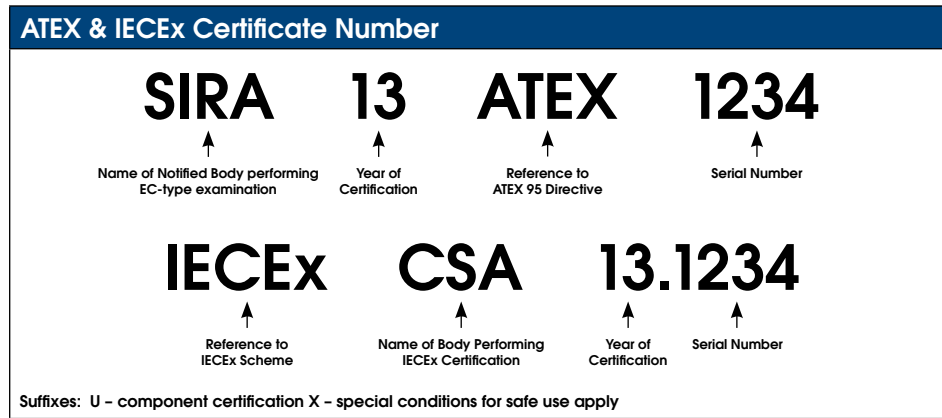
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Protection Concepts							
Type of Protection	Code	Country	Class	Division / Zone	Standard	Basic Concept of Protection	
Electrical Equipment for Flammable Gas, Vapours and Mists - Class I							
General Requirements	AEx Ex	US CA	Class I	Division 1 & 2 Zone 1 & 2	FM 3600 ISA 60079-0 CSA 60079-0	No arcs, sparks or hot surfaces	
Increased Safety	AEx e Ex e	US CA	Class I	Zone 1	ISA 60079-7 CSA C22.2 No. 60079-7		
Non-Incendive	(NI) (NI)	US CA	Class I	Division 2 Division 2	ISA 12.12.01 / FM 3611 C22.2 No. 213		
Non-Sparking	AEx nA Ex nA	US CA	Class I	Zone 2	ISA 60079-15 CSA C22.2 No. 60079-15		
Explosion Proof	(XP) (XP)	US CA	Class I	Division 1 Division 1	ISA 60079-5 C22.2 No. 30		
Flameproof	AEx d Ex d	US CA	Class I	Zone 1	ISA 60079-1 UL 1203 / FM 3615 CSA 60079-1		
Powder Filled	AEx q Ex q	US CA	Class I	Zone 1	ISA 60079-5 CSA C22.2 No. 60079-5		
Enclosed Break	AEx nC Ex nC	US CA	Class I	Zone 2	ISA 60079-15 CSA C22.2 No. 60079-15		
Intrinsic Safety	(IS) (IS)	US CA	Class I	Division 1 Division 1	UL 913 / FM 3610 C22.2 No. 157		Limit energy of sparks and surface temperature
	AEx ia EX ia	US CA	Class I	Zone 0 Zone 0	ISA 60079-11 / FM 3610 CSA C22.2 No. 60079-11		
	AEx ib EX ib	US CA	Class I	Zone 1 Zone 1	ISA 60079-11 / FM 3610 CSA C22.2 No. 60079-11		
	AEx nC Ex nL	US CA	Class I	Zone 2 Zone 2	ISA 60079-15 CSA C22.2 No. 60079-15		
Pressurised	Type X Type Y Type Z Type Z	US CA	Class I	Division 1 Division 1 Division 1 Division 2	NFPA 496 (FM 3620) NFPA 496 NFPA 496 NFPA 496 (FM 3620)	Keep flammable gas out	
	AEx px Ex px	US CA	Class I	Zone 1	ISA 60079-2 CSA C22.2 No. 60079-2		
	AEx py Ex py	US CA	Class I	Zone 1	ISA 60079-2 CSA C22.2 No. 60079-2		
	AEx pz Ex pz	US CA	Class I	Zone 2	ISA 60079-2 CSA C22.2 No. 60079-2		
	Restricted Breathing	AEx nR Ex nR	US CA	Class I	Zone 2 Zone 2		ISA 60079-15 CSA C22.2 No. 60079-15
	Encapsulated	AEx ma Ex m AEx mb	US CA	Class I	Zone 0 Zone 1 Zone 1		ISA 60079-18 CSA C22.2 No. 60079-18 ISA 60079-18
Oil Immersion	AEx o Ex o	US CA	Class I	Zone 1 Zone 1	ISA 60079-6 CSA C22.2 No. 60079-6		
Electrical Equipment for Combustible Dust and Fibres - Class II / Class III							
General Requirements	Ex	US CA	Class II Class III	Division 1 & 2 Division 1 & 2 Division 1 & 2 Zone 20, 21, 22	FM 3600 CSA C22.2 No. 0 FM 3600 CSA C22.2 No. 0 ISA 60079-0	Keep combustible dust out	
Dust Ignition Proof	-	US CA	Class II Class II	Division 1 Division 1	UL 1203 / FM 3616 CSA C22.2 No. 25		
Dust Protected	-	US CA	Class II Class II	Division 2 Division 2	ISA 12.12.01 / FM 3611 CSA C22.2 No. 25		
Protection by Enclosure	AEx ta AEx tb AEx tc Ex ta Ex tb Ex tc	US CA	Class II Class II Class II Class II Class II Class II	Zone 20 Zone 21 Zone 22 Zone 20 Zone 21 Zone 22	ISA 60079-31 ISA 60079-31 ISA 60079-31 CSA C22.2 No. 60079-31 CSA C22.2 No. 60079-31 CSA C22.2 No. 60079-31		
Fiber & Flying Protection	-	US CA	Class III Class III	Division 1 & 2 Division 1 & 2	UL 1203 / ISA 12.12.01 CSA C22.2 No. 25		
Encapsulation	AEx maD AEx mbD	US CA	Class II Class II	Zone 20 Zone 21	ISA 60079-18 ISA 60079-18		
Pressurisation	(PX) (PX) (PY) (PY) (PZ) (PZ) AEx pD	US CA	Class II Class II Class II Class II Class II Class II	Division 1 Division 1 Division 1 Division 1 Division 2 Division 2 Zone 21	NFPA 496 (FM 3620) NFPA 496 NFPA 496 (FM 3620) NFPA 496 NFPA 496 (FM 3620) NFPA 496 ISA 61241-2		
	(IS) (IS)	US CA	Class II Class II	Division 1 Division 1	UL 913 / FM 3610 CSA C22.2 No. 157		Limit energy of sparks and surface temperature
	AEx iaD AEx ibD	US CA	Class II Class II	Zone 20 Zone 21	ISA 60079-11 UL 913 / FM 3610		
	(IS)	US CA	Class III	Division 1	UL 913 / FM 3610		
	(IS)	US 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.



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 continuously 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 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

First Number (protect from solid bodies)	Second Number (protect from water)
0	No protection
1	Vertical drip
2	Angled drip
3	Spraying
4	Splashing
5	Jetting
6	Powerful jetting
7	Temporary immersion
8	Continuous immersion

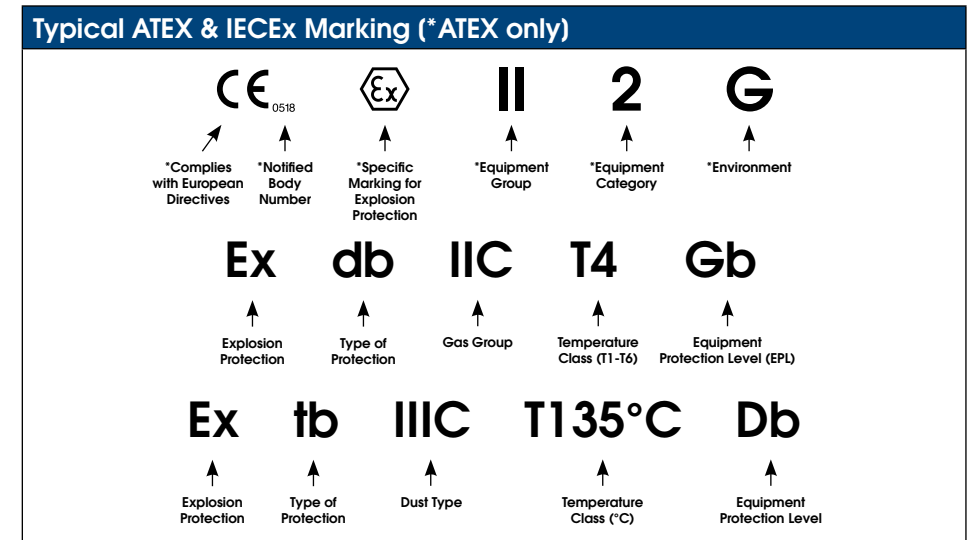
Type	Area	Brief Definition
1	Indoor	General purpose
2	Indoor	Protection against angled dripping water
3, 3R, 3S	Indoor / Outdoor	Protection against rain, snow
4, 4X	Indoor / Outdoor	Protection against rain, snow, hose directed water
5	Indoor	Protection against angled dripping water, dust, fibers, flyings
6	Indoor / Outdoor	Protection against temporary submersion
6P	Indoor / Outdoor	Protection against prolonged submersion
12, 12X	Indoor	Protection against circulating dust, fibers, flyings
13	Indoor	Protection against circulating dust, fibers, flyings, seepage

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

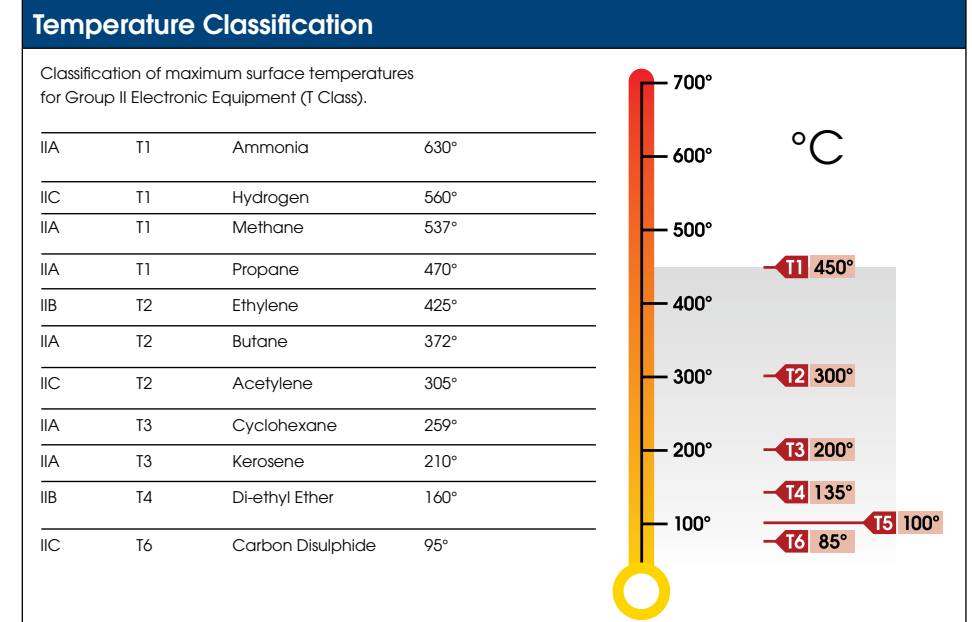
Substance	Hazard Class	NEC 500	NEC 505
Acetylene	Class I Flammable Gases	Group A	IIC
Hydrogen		Group B	IIC
Ethylene		Group C	IIB
Propane		Group D	IIA
Methane (mining)		Group D	-
Combustible Metal Dusts		Group E	-
Combustible Carbonaceous Dusts	Class II Combustible Dusts	Group F	-
Combustible Dusts not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



ATEX & 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	-	-	-	IEC 60079-0	-
Optical Radiation	Op pr Op sh Op is	Gb Ga Gc	1, 2 0, 1, 2 0, 1, 2	IEC 60079-28	Protection against ignitions from optical radiation
Increased Safety	eb ec	Gb Gc	1, 2 2	IEC 60079-7	No arcs, sparks or hot surfaces, Enclosure IP54 or better
Type 'n' (non-sparking)	nA	Gc	2	IEC 60079-15	-
Flameproof	da db dc	Gb Gc	0, 1, 2 1, 2 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	Limit the energy of sparks and surface temperatures
Pressurised	px py pz	Gb Gc	1, 2 1, 2 2	IEC 60079-2	-
Type 'n' (sealing & hermetic sealing)	nC	Gc	2	IEC 60079-15	-
Type 'n' (restricted breathing)	nR	Gc	2	IEC 60079-15	Keep the flammable gas out
Encapsulation	ma mb mc	Ga Gb Gc	0, 1, 2 1, 2 2	IEC 60079-18	-
Oil Immersion	ob oc	Gb Gc	1, 2 2	IEC 60079-6	-
Electrical Equipment for Combustible Dusts (D)					
General Requirements	-	-	-	IEC 60079-0	-
Optical Radiation	Op pr Op sh Op is	Db Da Dc	21, 22 20, 21, 22 20, 21, 22	IEC 60079-28	Protection against ignitions from optical radiation
Enclosure	ta tb tc	Da Db Dc	20, 21, 22 21, 22 22	IEC 60079-31	Standard protection for dusts, rugged tight enclosure
Intrinsic Safety	ia ib ic	Da Db Dc	20, 21, 22 21, 22 22	IEC 60079-11	Limit the energy of sparks and surface temperatures
Encapsulation	ma mb mc	Da Db Dc	20, 21, 22 21, 22 22	IEC 60079-18	Protection by encapsulation of incandescent parts
Pressurised	pD	Dc	20, 21, 22 21, 22	IEC 61241-4	Protection by pressurisation of enclosure
Non-Electrical Equipment					
General Requirements	-	-	-	EN 13463-1	Low potential energy
Flow Restricted Enclosure	fr	Ga, Gb, Gc Da, Db, Dc	0, 1, 2 20, 21, 22	IEC 80079-36	-
Flameproof Enclosure	d	-	-	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 Source	h	Ga, Gb, Gc Da, Db, Dc	0, 1, 2 20, 21, 22	IEC 80079-37	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	h	Ga, Gb, Gc Da, Db, Dc	0, 1, 2 20, 21, 22	EN 13463-8	Enclosure uses liquid to prevent contact with explosive atmosphere



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	(melt) °C
PVC	700°C	>450°C
Soot	810°C	570°C
Starch	460°C	435°C
Sugar	490°C	460°C

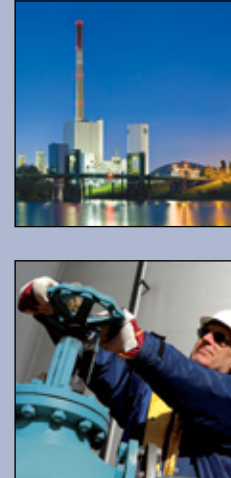
Quality Assurance

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 Group 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 QAN (Quality Assurance Notification): Quality system certification for the manufacture of category 1 and category 2 electrical equipment (refer IEC/ISO 80079-34 and ATEX 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 80079-34 and IECEx Scheme Rules).
- ATEX Conformity-to-Type Notification: Certification for the manufacture of category 2 electrical equipment (refer ATEX Directive Annexes V).
- ATEX Product Verification: Certification for the manufacture of category 1 equipment - 100% verification by the Notified Body (refer ATEX Directive Annexes V).
- ATEX or IECEx Unit Verification: Certification covering design and manufacture of equipment - 100% verification by the Notified Body (refer ATEX Directive Annexes IX and IECEx Scheme Rules).



ATEX & IEC Training & Competence

CSA Group has been at the forefront of hazardous area training for over 25 years, utilising the skills and experience of our highly specialised engineers and lecturers to "transfer knowledge". This detailed knowledge and vast experience allows us to offer a comprehensive range of training courses and competence schemes that can be delivered as part of our "open" training programme or tailored to your needs and delivered on-site at your premises.

- Hazardous Area Training (ATEX, DSEAR & IEC)
- Functional Safety Training
- Environmental & MCERTS Training
- Competence Certification (CoPC)
- IECEx Certification of Personnel Competence Scheme
- MCERTS Personnel Competence Scheme

For further details please contact CSA Group on: +44 1244 670 900 or Email: training@csacongroup.com



Functional Safety

CSA Group is a leading provider of functional safety certification. IEC 61508 is the international standard for electrical, electronic and programmable electronic safety (E/E/PE) related systems. It sets out the requirements for ensuring that systems are designed, implemented, operated and maintained to provide the required safety integrity level (SIL). Four SILs are defined according to the risks involved in the system application, with SIL4 being used to protect against the highest risks. The standard specifies a process that can be followed by all links in the supply chain so that information about the system can be communicated using common terminology and system parameters.

The standard consists of the following parts:

- IEC 61508-1 General requirements. IEC 61508-2 Requirements for E/E/PE safety-related systems.
- IEC 61508-3 Software requirements. IEC 61508-4 Definitions and abbreviations.
- IEC 61508-5 Examples and methods for the determination of safety integrity levels.
- IEC 61508-6 Guidelines on the application of IEC 61508-2 and IEC 61508-3. IEC 61508-7 Overview of techniques and measures.

Sector specific standards related to IEC 61508 include:

- IEC 61511 Process industries. IEC 61513 Nuclear power plants. IEC 62061 Machinery sector and ISO 13849. IEC 61800-5-2 Power drive systems. EN 50727 and EN 50402 Functional safety requirements for portable and fixed gas detection systems. EN 50495 safety devices requirements for safe operation of equipments with respect to explosion risks.

