

Understanding Equipment Certification Programs for Potentially Explosive Environments

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A potentially explosive environment in an industrial facility can exist as a result of flammable gases, mists, vapors or combustible dusts. Explosions can cause catastrophic damages and worker injury and/or death.

Explosions are commonly caused by the trifecta of three separate elements - a flammable source, air/oxygen and an ignition source. In order to reduce the risk of explosion, many industrial facilities will either prevent releases of flammable sources or prevent sources of ignition.

Section 1: Systems Governing Equipment in Potentially Explosive Environments

There are four major systems that exist in the world to drive the selection of equipment for use in potentially explosive environments:

- 1. European Union’s Directive 94/9/EC Equipment for Explosive Atmospheres (ATEX)
 - 2. International Electrotechnical Commission’s IEC Ex Rules 01-05
 - 3. US National Fire Protection Association NFPA 70: National Electric Code®
 - 4. Canadian Standards Association CSA C22.1: Canadian Electrical Code
- } Hereafter referenced as North American standards

The decision by an industrial facility as to what system to follow is based on geographic location. Countries participating in each system are below.

System	Examples of Participating Countries
ATEX	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom
IECEX	Australia, Brazil, Canada, China, Croatia, Czech Republic, Denmark, Finland, France, Germany, Hungary, Israel, India, Italy, Japan, Korea, Malaysia, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Unit Arab Emirates, United Kingdom, United States
North America	United States, Canada

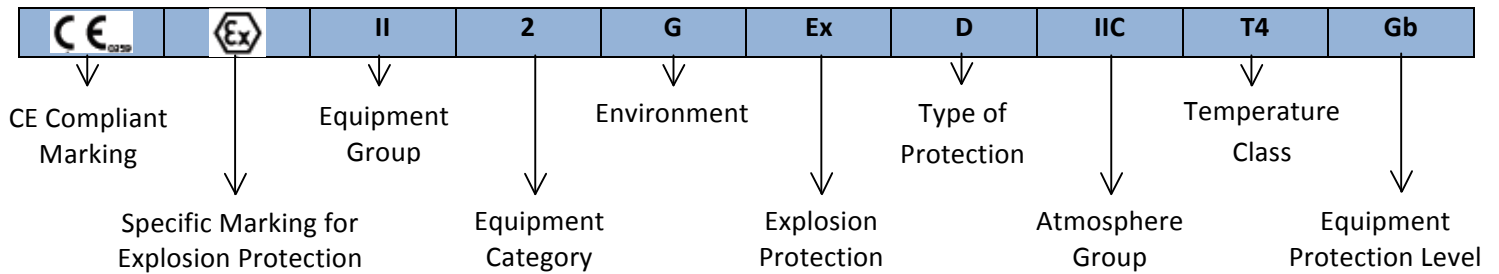
It is important to note that most of the countries not listed above administer a specific national system that must be investigated on a case-by-case basis.

Section 2: Zone vs. Class/Division Product Categorization

Each of the systems begins by identifying likelihood of explosion based on the proximity of the ignition source to the flammable source. Historically, equipment for potentially explosive environments in North America has been categorized on a class/division basis while equipment for potentially explosive environments elsewhere has been categorized on a zone basis. Both the US and Canadian Electrical Codes have been recently revised to recognize the zone system. As a result, new equipment installations in Canada must be classified by zone while existing equipment installations can continue to be classified by class/division. In the US, both new and existing equipment installations may classify by class/division or zone.

Definition of Zone or Class/Division	ATEX/IECEX	North American
Explosive mixture is continuously present or present for long periods	Zone 0 (gases)	Class I Division 1 (gases)
Explosive mixture is likely to occur in normal operation	Zone 1 (gases)	Class I Division 1 (gases)
Explosive mixture is not likely to occur in normal operation and if it occurs it will exist only for a short time.	Zone 2 (gases)	Class I Division 2 (gases)
Explosive mixture is continuously present or present for long periods	Zone 20 (dusts)	Class II Division 1 (dusts)
Explosive mixture is likely to occur in normal operation	Zone 21 (dusts)	Class II Division 1 (dusts)
Explosive mixture is not likely to occur in normal operation and if it occurs it will exist only for a short time.	Zone 22 (dusts)	Class II Division 2 (dusts)

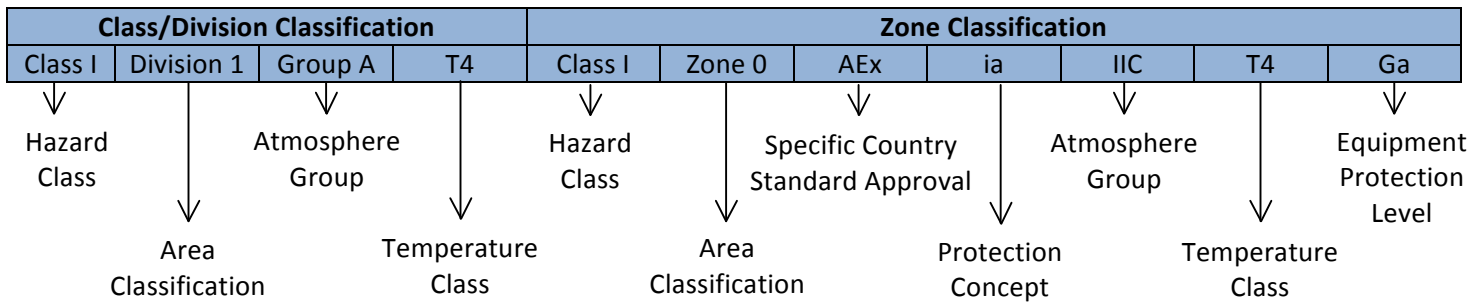
Section 3: Understanding ATEX/IECEX Product Marking



The selections listed in the Options represent only the selections most commonly used with IMI Sensors' products.

Component	Description	Options
CE Compliant Marking	Equipment meets European Conformity standards.	Always used.
Specific Marking for Explosion Protection	Equipment is compliant with European Union Directive 94/9/EC (ATEX Equipment Directive).	Always used.
Equipment Group	Areas in which the equipment is certified for installation	I- Mines II- All other areas
Equipment Category and Environment	Typical zone in which the equipment is suitable for installation. The equipment category ranges from 1-3 while the environment is represented by either a G (gas) or a D (dust).	1G- Gas protected for Zones 0, 1, 2 2G- Gas protected for Zones 1, 2 3G- Gas protected for Zone 2
Explosion Protection	Equipment has a certification to be installed in a potentially explosive environment.	Always used.
Type of Protection	Particular explosion proof features of the equipment that are approved. There are many different protection types; the selections of the entirety that are listed below are those most commonly associated with IMI Sensors' product.	d- Flameproof for Zones 1, 2 ia- Intrinsic Safety for Zone 0, 1, 2 ic- Intrinsic Safety for Zone 2 nA- Non-Sparking for Zone 2
Atmosphere Group	Types of gases or dusts that can be present in the potentially explosive atmosphere along with the approved equipment. Groups I and II are for gases while Group III is for dusts.	IIA- Methane, propane IIB- Ethylene, coke oven gas IIC- Hydrogen, acetylene
Temperature Class	Maximum allowable surface temperature of equipment. The classes range from T1 to T6. (Higher custom temperature classes are available on a case-by-case basis.)	T1- 450 °C T2- 300 °C T3- 200 °C T4- 135 °C T5- 100 °C T6- 85 °C
Equipment Protection Level	Typical zone in which the equipment is suitable for installation. The first letter is either a G (gas) or a D (dust).	Ga- Gas protected in Zones 0, 1, 2 Gb- Gas protected in Zones 1, 2 Gc- Gas protected in Zones 2

Section 4: Understanding North American (US and Canada) Product Marking



The selections listed in the Options represent only the selections most commonly used with IMI Sensors' products.

Class/Division Classification		
Component	Description	Options
Hazard Class	Equipment is certified for use with explosive gases (Class I), explosive dusts (Class II) or fibers/flyings (Class III).	I- Flammable Gases II- Explosive Dusts III- Fibers/Flyings
Area Classification	See Section 2: Zone vs. Class/Division Product Categorization	
Atmosphere Group	Types of gases/dust that can be present in the potentially explosive atmosphere along with the approved equipment. The groups range from Group A to Group G with Groups A-D for gas and Groups E-G for dust.	A- Acetylene B- Hydrogen C- Ethylene D- Propane and Methane E- Combustible Metal Dusts F- Combustible Carbonaceous Dusts G- Combustible Dusts not in Group E/F
Temperature Class	Maximum allowable surface temperature of equipment. The classes range from T1 to T6. (Higher custom temperature classes are available on a case-by-case basis.)	T1- 450 °C T2- 300 °C T3- 200 °C T4- 135 °C T5- 100 °C T6- 85 °C

Zone Classification		
Component	Description	Options
Hazard Class	Same as Hazard Class information in Class/Division Classification table	
Area Classification	See Section 2: Zone vs. Class/Division Product Categorization	
Specific Country Standard Approval	If the certification is to Canadian standards or US standards.	No Prefix- Approved to CA standards "A" Prefix- Approved to US standards
Protection Concept	Particular explosion proof features of the equipment that are approved. There are many different protection types; the selections of the entirety that are listed below are those most commonly associated with IMI Sensors' product.	d- Flameproof for Zones 1, 2 ia- Intrinsic Safety for Zone 0, 1, 2 ic- Intrinsic Safety for Zone 2 nA- Non-Sparking for Zone 2
Atmosphere Group	Types of gases or dusts that can be present in the potentially explosive atmosphere along with the approved equipment. Groups I and II are for gases while Group III is for dusts.	IIA- Methane, propane IIB- Ethylene, coke oven gas IIC- Hydrogen, acetylene
Temperature Class	Same as Temperature Class information in Class/Division Classification table	
Equipment Protection Level	Typical zone in which the equipment is suitable for installation. The first letter is either a G (gas) or a D (dust).	Ga- Gas protected in Zones 0, 1, 2 Gb- Gas protected in Zones 1, 2 Gc- Gas protected in Zones 2

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