Hazardous Locations

Intertek

Product Certification Solutions

Designing and manufacturing products for hazardous locations is a complex environment to navigate, with many requirements for certification. To achieve certification, all components must be properly rated; user information, product details, markings, drawings and manuals must be present and correct; and all country and quality requirements must be met. Failing to meet any one of these conditions can keep products from achieving certification, thereby jeopardizing market access.

Our comprehensive certification solutions for hazardous location products help to avoid these pitfalls that can lead to certification failure. We offer manufacturers expert guidance throughout the certification process – ensuring that components are properly rated, the necessary information is present, and products meet the requirements for every market where they will be distributed. In addition, our broad scope of training programs, one-on-one guidance, superior qualifications, and comprehensive consulting services grants manufacturers the knowledge to successfully fulfill certification requirements.

North American Product Approvals

Our ETL Mark provides fast and efficient certification of industrial control panels (ICPs) and other products used in hazardous locations

- Full certification to US and Canadian standards
- Limited production certification
- Bundled certifications

ATEX Certification

As a notified body accredited by the United Kingdom Accreditation Service (UKAS), we offer comprehensive solutions for ATEX certification

- Ex marking standards and requirements
- Unit verification
- Quality audits
- Bundled certifications

IECEx Certification

Certification to the IECEx scheme demonstrates a product's compliance with international standards for hazardous location equipment

- Equipment certification scheme
- Unit verification
- Quality audits
- Bundled certifications

Panel Builder Program and Certification

Tailored to manufacturers who custom-build or mass produce ICPs, our panel builder program offers a cost-efficient approach to certification, including:

- Greater choices in component sourcing
- ETL mark certification
- On-site audits to assist in compliance

Hazardous Locations Training Programs

Our expertise in hazardous locations keeps you up to date on regulatory changes with comprehensive training programs

- CompEx certification scheme training
- Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) site safety training
- ATEX site safety training

Intrinsic Safety

We provide a specialized preliminary review process to guide manufacturers through standards and requirements to prevent explosions in hazardous locations, includ:

- Limited overview for a simple review of temperature and spark ignition
- Full assessment for an extensive analysis of temperature and spark ignition

Preliminary Evaluation

Preliminary evaluations offer valuable guidance on standards and requirements, and highlight important areas to consider during development

- Preliminary design review
- On-site assessment
- Intrinsic safety technical reviews

Consulting Services

Our consultants assist throughout the product development process to prevent product failures and reach the market with speed and efficiency, offering services including:

- Market requirements
- Market selection
- Design guidance
- Document preparation

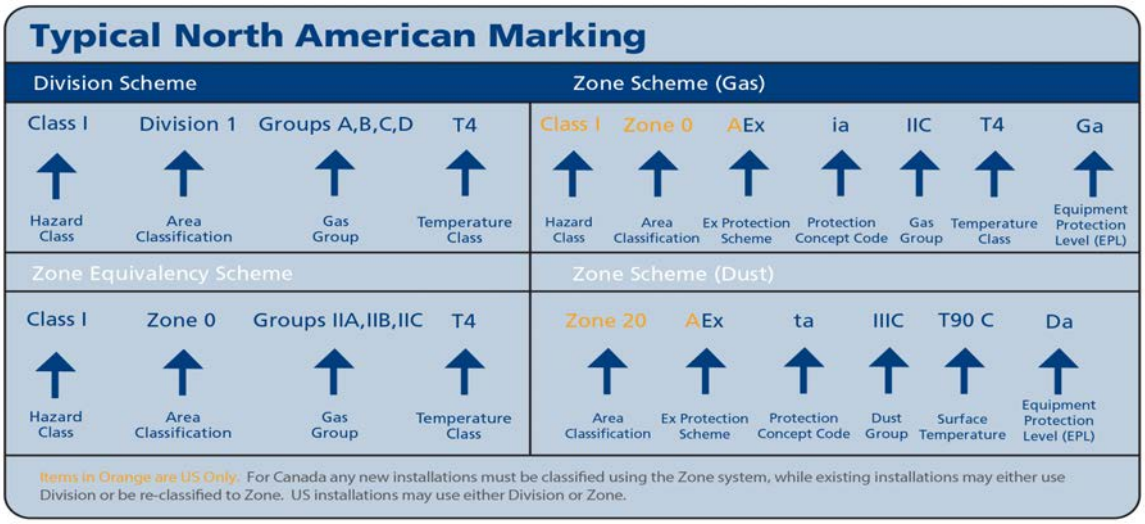
SATELLITE™ Data Acceptance Program

Our SATELLITE™ Data Acceptance Program allows for testing in your own facilities on your own timetable, while achieving certification to a number of widely recognized certification marks, including:

- ETL Mark
- S mark
- Warnock Hershey mark
- ASTA Diamond mark
- BEAB approved mark
- Quality and Performance mark

North America

Typical North American Marking



Items in Orange are US Only. For Canada any new installations must be classified using the Zone system, while existing installations may either use Division or be re-classified to Zone. US installations may use either Division or Zone.

Enclosure Type Ratings [NEC®& CEC®]

Type	Area	Brief Definition
1	Indoor	General Purpose
2	Indoor	Protection against angled dripping water
3, 3S	Indoor / Outdoor	Protection against rain, sleet, dirt, snow and windblown dust
3R	Indoor / Outdoor	Protection against rain, sleet, dirt and snow
4, 4X	Indoor / Outdoor	Protection against rain, snow, hose directed water and corrosion
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

Protection Concepts [NEC® & CEC®][1]

Type of Protection	Ex Code	EPL	Zone[2]	North American Standard ISA/UL/CSA	Basic Concept of Protection
Electrical Equipment - Zone "Ex" Scheme					
General Requirements	-	Ga Da Gb Db Gc Dc	0,1,2,20, 21,22	60079-0	General requirements for all Ex equipment
Intrinsic Safety[3]	ia	Ga Da	0, 20	60079-11	Limit energy of sparks & surface temperature
	ib	Gb Db	1, 21		
	ic	Gc Dc	2, 22		
Increased Safety *(ec pending)*	eb	Gb Db	1, 21	60079-7	No arcs, sparks or hot surfaces
Non-Sparking	nA	Gc	2	60079-15	
Flame-Proof	da	Ga	0	60079-1	Contain the explosion and extinguish the flame
	db	Gb	1		
	dc	Gc	2		
Powder-Filled	q	Gb	1	60079-5	
Enclosed Break	nC	Gc	2	60079-15	
Purge and Pressurization	px	Gb	1	60079-2	Prevent ingress of explosive atmosphere and limit surface temperature
	py	Gb	1		
	pz	Gc	2		
	pD	-	21, 22	ISA 61241-0 & ISA 61241-2	
Encapsulation	ma	Ga Da	0, 20	60079-18	
	mb	Gb Db	1, 21		
	mc	Gc Dc	2, 22		
Restricted Breathing	nR	Gc	2	60079-15	
Sealed Device	nC	Gc	2	60079-15	
Oil Immersion	o	Gb	1	60079-6	
Dust-Protected	ta	Da	20	60079-31	
	tb	Db	21		
	tc	Dc	22		
	tD	-	21,22	ISA 61241-0 & ISA 61241-1	
Optical Radiation[4]	op pr	Gb Db	1, 21	ISA 60079-28	Protection against release of optical energy
	op is	Ga Da	0, 20		Limitation of optical energy
	op sh	Ga Da	0, 20		Optical system interlocking

Electrical Equipment - Division Scheme and Zone Equivalency

Type of Protection	Class	Division & Zone	Type	North American Standard	Basic Concept of Protection
General Requirements	I, II, III I -	Division 1, 2 Zone 0, 1, 2 Zone 20, 21, 22	-	FM 3600	Required for all equipment evaluated to FM Standards
Non-Arcing / Non-Incendive	I, II III I -	Division 2 Division 1, 2 Zone 2 Zone 22	-	ISA 12.12.01, CSA No. 213, FM 3611	Energy Limitation, Non-arcing/sparking, Sealing, and Ingress Protection
Explosion-Proof	I I	Division 1 Zone 1	-	UL 1203, CSA No. 30, FM 3615	Contain the explosion and extinguish the flame
Purge and Pressurization	I, II I	Division 1 Zone 1	X	NFPA 496, FM 3620	Prevent ingress of explosive atmosphere and limit surface temperature
	I, II I	Division 1 Zone 1	Y		
	I, II I	Division 2 Zone 2	Z		
Dust-Tight	II -	Division 2 Zone 22	-	ISA 12.12.01 CSA No. 213	
	III -	Division 1, 2 Zone 22			
Dust Ignition-Proof	II -	Division 1 Zone 20, 21	-	UL 1203, CSA No. 25, FM 3615, FM 3616	
Intrinsic Safety	I II, III I -	Division 1 Division 1 Zone 0 Zone 20	-	ISA/UL/CSA 60079-11 UL 913, CSA No. 157, FM 3610	Limit energy of sparks and surface temperature

Note 1: In the United States, suitability for equipment in mining applications is per approval by the Mine Safety and Health Administration (MSHA). Intertek can test and evaluate equipment to ACRI standards or equivalent, per US National Standards, providing test reports for your submittal to MSHA.

Note 2: For US Zone Ex Scheme: Zone 0, 1 and 2 "Ex" markings are preceded by "Class I," and "Ex" is preceded by "A."

Note 3: For associated intrinsically safe apparatus suitable for installation in a hazardous location, the symbol for the type of protection ("ia" or "ib") is enclosed within square brackets on the marking, e.g., "AEx d [ia] IIC T4." 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.

Note 4: Neither optical protection nor optical radiation is addressed by the NEC® or CEC®.

North America/ATEX/IECEx

Atmosphere Groups

Substance	Hazard Class	Division Groups	Zone Groups
Acetylene	Class I Flammable Gases	Group A	IIC
Hydrogen		Group B	IIB + H2
Ethylene		Group C	IIB
Propane		Group D	IIA
Methane		Group D	IIA[6]
Combustible Metal Dusts	Class II Combustible Dusts	Group E[5]	IIIC
Combustible Carbonaceous Dusts		Group F	IIIB
Combustible Dusts not in Group E or F (Flour, Grain, Wood, Plastics, Chemicals)		Group G	IIIB
Combustible Fibers and Flyings	Class III Fibers and Flyings	Not Applicable	IIIA

Note 5: Group E is applicable to Class II Division 1 only
Note 6: Methane is a group IIA Gas for non-mining applications

Other Useful Standards

Standard Types	IEC Standards	US & CAN Standards
Area Classification - Gases, Vapors and Mists	IEC 60079-10-1	NFPA 497
Area Classification - Combustible Dusts, Fibers, Flyings	IEC 60079-10-2	NFPA 499
Electrical Equipment Installation	IEC 60079-14	NFPA 70 [NEC®]/CSA C22.1 [CEC®]
Electrical Equipment Inspection and Maintenance	IEC 60079-17	NFPA 70B
Electrical Equipment Repair and Overhaul	IEC 60079-19	-
Material Characteristics for Gas and Vapor Classification	IEC 60079-20-1	NFPA 497
Material Characteristics for Dust Classification	IEC 60079-20-2	NFPA 499
Application of Quality Systems for Equipment Manufacture	ISO/IEC 80079-34	-
Quality Management Systems	ISO 9001	ISO 9001

Classification of Divisions and Zones

Hazard Level	Division Scheme	Zone Scheme Gas/Dust	Type of Explosive Atmosphere
Continuous Hazard	Division 1	Zone 0 / Zone 20	Continually present
Intermittent Hazard		Zone 1 / Zone 21	Likely to occur during normal operations
Hazard Under Abnormal Conditions	Division 2	Zone 2 / Zone 22	Not likely to occur during normal operations, but may occur for short periods

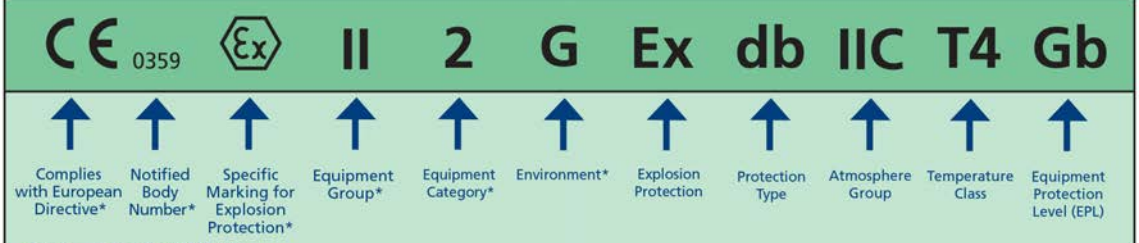
Temperature Classification[7]

Max. Surface Temperature	NEC® 500 / CEC®	NEC® 505 / IEC - Group II
450° C (842°F)	T1	T1
300° C (572°F)	T2	T2
280° C (536°F)	T2A	
260° C (500°F)	T2B	
230° C (446°F)	T2C	
215° C (419°F)	T2D	
200° C (392°F)	T3	T3
180° C (356°F)	T3A	
165° C (329°F)	T3B	
160° C (320°F)	T3C	
135° C (275°F)	T4	T4
120° C (248°F)	T4A	
100° C (212°F)	T5	T5
85° C (185°F)	T6	T6

Note 7: For Group I applications (ATEX and IECEx only), electrical apparatus has fixed temperature limits of 150°C (where layers of coal dust can form) and 450°C (where coal dust is not expected to form a layer).

ATEX and IECEx

Typical ATEX & IECEx Marking



*ATEX only (ATEX 2014/34/EU)

ATEX Directive (Additional Market Access)

Intertek can now issue ATEX Notified Body certificates out of the US - in addition to capabilities from the UK - speeding time to market for North American manufacturers. For more information contact icenter@intertek.com.

IECEx Scheme (Additional Market Access)

Manufacturers of Ex equipment can obtain certificates of conformity, accepted at a national level for all countries participating in the IECEx Scheme.

A certificate of conformity may be obtained from any certification body accepted into the Scheme. The certificate will attest (1) the equipment design conforms to relevent IEC Standards, and (2) the product is manufactured under a quality control program assessed and registered though a Quality Assessment Report (QAR) by an accredited IECEx Certification Body (ExCB).

On March 31, 2015, the United States Coast Guard (USCG) published final rule 80 FR 16980, applicable to Mobile Offshore Drilling Units (MODU), floating Outer Continental Shelf (OCS) facilities, and vessels, other than offshore supply vessels regulated under 46 CFR Subchapter L, constructed after April 2, 2018, that engage in OCS activities. The rule implication is that any equipment installed after April 2, 2018, on rigs, MODUs or OSVs in the U.S. Outer Continental Shelf must be certified or listed in accordance with either National Regulations by an approved agency (e.g., a third-party certification body), or the IECEx Scheme. The USCG does NOT permit the use of equipment certified solely under the ATEX Directive.

Intertek has IECEx Testing Laboratories (ExTLs) in the US, UK, Italy and India and is an IECEx Certification Body (ExCB) in the US and the UK. For more information contact icenter@intertek.com, or visit www.IECEx.com.

Other CE Directives That May Apply[8]

Electromagnetic Compatibility (EMC)	2014/30/EU
Low Voltage[9]	2014/35/EU
Machinery Directive	2006/42/EC
Medical Devices Directive	93/42/EEC
Pressure Equipment Directive (PED)	97/23/EC
Radio Equipment Directive (RED)	2014/53/EU
Restriction of Hazardous Substances (RoHS)	2002/95/EC

Note 8: Intertek is a provider of evaluation and certification to these directives and their Harmonized Standards, where applicable
Note 9: Excludes equipment for use in explosive atmospheres - see ATEX Annex II 1.2.7

Equipment Categories & Protection Levels[10]

ATEX Category	Equipment Protection Level	Typical Equipment Zone Suitability
1 G	Ga	Zones 0, 1, 2
1 D	Da	Zones 20, 21, 22
2 G	Gb	Zones 1, 2
2 D	Db	Zones 21, 22
3 G	Gc	Zone 2
3 D	Dc	Zone 22
M1	Ma	Very high level of protection for mines
M2	Mb	High level of protection for mines

ATEX Categories vs Zones of Use[10]

Equipment Category ATEX 2014/34/EU	Zone of Use	
	Gas, Vapors, & Mist	Dust
Category 1	Zone 0, 1 & 2	Zone 20, 21 & 22
Category 2	Zone 1 & 2	Zone 21 & 22
Category 3	Zone 2	Zone 22

Note 10: Unless the explosion protection risk assessment states otherwise

Functional Safety [IEC 61508 Safety Systems][11]

Standard #	Title/Scope
IEC/EN 61508-1	Functional Safety of electrical/electronic/programmable electronic safety-related systems - Part 1: General Requirements
IEC/EN 61508-2	Functional Safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/ programmable electronic safety-related items
IEC/EN 61508-3	Functional Safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software Requirements
IEC/EN 61508-4	Functional Safety of electrical/electronic/programmable electronic safety-related systems - Part 4: Definitions and Abbreviations
IEC/EN 61508-5	Functional Safety of electrical/electronic/programmable electronic safety-related systems - Part 5: Examples of methods for the determination of safety integrity levels
IEC/EN 61508-6	Functional Safety of electrical/electronic/programmable electronic safety-related systems - Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3
IEC/EN 61508-7	Functional Safety of electrical/electronic/programmable electronic safety-related systems - Part 7: Overview of techniques and measures

Note 11: The IEC/EN 61508 series of standards sets out the requirements for electrical, electronic, and programmable safety-related systems, covering the design, implementation, operation, and maintenance as necessary for the assigned Safety Integrity Level (SIL).

According to the system application, four SILs are defined and assigned to the system. The standard is also the basis for ATEX-related safety devices, EN 50495.

Protection Concepts [ATEX and IECEx]

Type of Protection	Ex Code	EPL	Zone(s)	IEC/EN Standard	Basic Concept of Protection
Electrical Equipment					
General Requirements	-	All[12]	0,1,2,20,21,22	60079-0	General requirements for all Ex equipment
Intrinsic Safety	ia	Ga Da Ma	0, 20	60079-11	Limit energy of sparks & surface temperature
	ib	Gb Db Mb	1, 21		
	ic	Gc Dc	2, 22		
Increased Safety	eb	Gb Db Mb	1, 21	60079-7	No arcs, sparks or hot surfaces
	ec	Gc Dc	2, 22		
Non-Arcing	nA	Gc	2	60079-15	
Flame-Proof	da	Ga	0	60079-1	Contain the explosion and extinquish the flame
	db	Gb Mb	1		
	dc	Gc	2		
Powder-Filled	q	Gb Mb	1	60079-5	
Enclosed Break	nC	Gc	2	60079-15	
Sealed Device	nC	Gc	2	60079-15	Prevent ingress of explosive atmosphere and limit surface temperature
Purge and Pressurization	pxb	Gb Db Mb	1, 21	60079-2	
	pyc	Gb Db	1, 21		
	pzc	Gc Dc	2, 22		
Encapsulation	ma	Ga Da Ma	0, 20	60079-18	
	mb	Gb Db Mb	1, 21		
	mc	Gc Dc	2, 22		
Restricted Breathing	nR	Gc	2	60079-15	
Liquid Immersion	ob	Gb	1	60079-6	
Liquid Immersion	oc	Gc	2	60079-6	
Dust-Protected	ta	Da	20	60079-31	
	tb	Db	21		
	tc	Dc	22		
Optical Radiation	op pr	Gb Db	1, 21	60079-28	Protection against release of optical energy
	op is	Ga Da	0, 20		Limitation of optical energy
	op sh	Ga Da	0, 20		Optical system interlocking

Non-Electrical Equipment

Type of Protection	IECEx Code/ ATEX Code	EPL	Zone	ISO/IEC Standard (IECEx)	EN Standard (ATEX)	Basic Concept of Protection
General Requirements	h -	All[12]	0,1,2,20,21,22	80079-36	13463-1	Basic methods & requirements
Flow-Restricted Enclosure	- fr	Gc Dc	2, 22	-	13463-2	Relies on tight seals, closely machined joints, and tough enclosures to restrict the breathing of the enclosure
Flame-Proof Enclosure	- d	All[12]	1, 21	-	13463-3	
Constructional Safety	ch c	All	0,1,2,20,21,22	80079-37	13463-5	Ignition hazards mitigated by good engineering methods
Control of Ignition Sources	bh b	All	0,1,2,20,21,22	80079-37	13463-6	Control equipment fitted to detect malfunctions
Liquid Immersion	kh k	All	0,1,2,20,21,22	80079-37	13463-8	Enclosure uses liquid to prevent contact with explosive atmospheres
Purge & Pressurization	p	Gb Db Gc Dc	1, 2, 21, 22	60079-2	60079-2	Prevent ingress of explosive atmosphere & limit surface temp.
Ignition Hazards & Risk Assessment	-	All	0,1,2,20,21,22	80079-36	1127-1	Basic concepts and methodology, & ignition hazard assessment

Note 12: Evaluation per EN 50303 is additionally required for ATEX, Category M1

Ingress Protection Codes [13] [IEC 60529]

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
3	Objects > 2.5mm	3	Spraying
4	Objects > 1.0mm	4	Splashing
5	Dust-Protected	5	Jetting
6	Dust-Tight	6	Powerful jetting
		7	Temporary immersion
		8	Continuous immersion
		9	High pressure and temperature water jet

Atmosphere Groups [ATEX & IECEx]

Group	Environment	Location	Typical Substance
I	Gases, Vapors and Mists	Coal Mining	Methane (Firedamp)
IIA		Surface and Other Locations	Methane, Propane, etc.
IIB			Ethylene
IIC			Hydrogen, Acetylene, etc.
IIIA	Combustible Dusts		Combustible Flyings
IIIB			Non-Conductive
IIIC			Conductive

Note 13: Refer to IEC 60034-5 for Ingress Protection of rotating electrical machines

Equipment Groups [ATEX]

Equipment Group	ATEX Equipment Category	Atmosphere	Equipment Protection Level (EPL)	Required Protection Performance & Operation
I (Mines with Firedamp)	M1	Methane & Dust	Very High Ma	Two faults, Remain energized and functioning
I (Mines with Firedamp)	M2	Methane & Dust	High Mb	Severe normal operation, De-energize in exp. atm.
II (All Other Areas)	1G, 1D	Gas, Vapor, Mist, Dust	Very High	Two faults
II (All Other areas)	2G, 2D	Gas, Vapor, Mist, Dust	High	One fault
II (All Other Areas)	3G, 3D	Gas, Vapor, Mist, Dust	Low	Normal operation

Global Market Access

We streamline the conformity process and ensure access into markets throughout the world with our global market access services, including:

- Compliance evaluations
- Design reviews
- Market and country-specific research into regulatory requirements
- Approval planning and management

Working with our expert global team ensures a smooth road to market for hazardous location products. Our connection to a network of approval organizations worldwide provides manufacturers with an expanded array of certified component parts to choose from for greater flexibility and continuity.

Locate Our Hazardous Locations Centers Around the World

Visit www.intertek.com/hazloc for more information