

# Hazardous Locations & Explosive Atmospheres

## Guide to Equipment Certification Requirements



Visit [www.intertek.com/hazardous-locations/resources](http://www.intertek.com/hazardous-locations/resources) for more engineering and compliance-related resources.



## North America

Typical North American Marking									
Division Scheme				Zone Scheme (Gas)					
Class I	Division 1	Groups A,B,C,D	T4	Class I	Zone 0	AEx	ia	IIC	T4 Ga
↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Hazard Class	Area Classification	Gas Group	Temperature Class	Hazard Class	Area Classification	Ex Protection Scheme	Protection Concept Code	Gas Group	Temperature Class
Zone Equivalency Scheme				Zone Scheme (Dust)					
Class I	Zone 0	Groups IIA,IIB,IIC	T4	Zone 20	AEx	ta	IIIC	T90 C	Da
↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Hazard Class	Area Classification	Gas Group	Temperature Class	Area Classification	Ex Protection Scheme	Protection Concept Code	Dust Group	Surface Temperature	Equipment Protection Level (EPL)
Items in Blue 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. Intertek has the ability to issue combined ETL certification for the US and Canada, offering efficiency and speed to market for global manufacturers entering North America. Contact Intertek for more information. Please note, Class I marking has now been removed in NEC 2020. However, product standards still reference this marking.									

Protection Concepts [NEC & CEC]¹					
Type of Protection	Ex Code	EPL	Zone²	North American Standard ISA/UL/CSA	Basic Concept of Protection
Electrical Equipment - Zone "Ex" Scheme					
General Requirements	-	Ga Da Db Dc	0,1,2,20,21,22	60079-0	General requirements for all Ex equipment
Intrinsic Safety³	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	eb	Gb	1	60079-7	No arcs, sparks or hot surfaces
	ec	Gc	2		
Non-Sparking	nA*	Gc	2	60079-15	
	da	Ga	0		
Flame-Proof	db	Gb	1	60079-1	Contain the explosion and extinguish the flame
	dc	Gc	2		
	q	Gb	1		
Pressurization	px	Gb	1, 21	60079-2	
	py	Gb	1, 21		
	pz	Gc	2, 22		
Pressurized room	pb	Gb	1	C60079-13 / UL 60079-13	
	pc	Gc	2		
	vc⁴	Gc	2		
Encapsulation	ma	Ga Da	0, 20	60079-18	Prevent ingress of explosive atmosphere and limit surface temperature
	mb	Gb Db	1, 21		
	mc	Gc Dc	2, 22		
Restricted Breathing	nR	Gc	2	60079-15	
Sealed Device	nC	Gc	2	60079-15	
Liquid Immersion	ob	Gb	1	60079-6	
	oc	Gc	2		
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

Electrical Equipment - Division Scheme and Zone Equivalency					
Type of Protection	Class	Division & Zone	Type	North American Standard	Basic Concept of Protection
Non-Arcing / Non-Incendive¹	I, II III I -	Division 2 Division 1, 2 Zone 2 Zone 22	-	UL121.201, CSA C22.2 No. 213	Energy Limitation, Non-arcing/sparking, Sealing, and Ingress Protection
Explosion-Proof²	I I I	Division 1 Zone 1	-	UL 1203, CSA C22.2 No. 30	Contain the explosion and extinguish the flame
Purge and Pressurization¹	I, II I I	Division 1 Zone 1	X	NFPA 496	Prevent ingress of explosive atmosphere and limit surface temperature
	I, II I I	Division 1 Zone 1	Y		
	I, II I I	Division 2 Zone 2	Z		
Dust-Tight¹	II II II	Division 2 Zone 22	-	UL121.201, CSA C22.2 No. 213	
	III -	Division 1, 2 Zone 22	-		
Dust Ignition-Proof¹	II -	Division 1 Zone 20, 21	-	UL 1203, CSA C22.2 No. 25	
Intrinsic Safety	I, II, III I -	Division 1 Zone 0 Zone 20	-	ISA/UL/CSA C22.2 No.60079-11 UL 913, CSA C22.2 No. 157	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 Alternative Case Resolution Initiative (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., (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., (ia) IIC T4. In this case, a temperature class is not included.

Note 4: Protection type "vc" is not recognized by the NEC.

\* Product standard has removed this type of protection, however, equipment already approved for this protection method is still recognised by the NEC & CEC.

¹ NOTE Intertek has the Custom Panel Builders Program for Hazardous Locations Panels to address these standards. Additionally panels providing intrinsically safe outputs are also included.

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 ranged 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

## ABOUT INTERTEK

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## North America/ATEX/IECEx/UKEx

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	IIA⁵
Combustible Metal Dusts	Class II Combustible Dusts	Group E⁵	IIIC
Combustible Carbonaceous Dusts		Group F	IIIB
Combustible Dust 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 & CA 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	ISO/IEC 80079-20-1	NFPA 497
Material Characteristics for Dust Classification	ISO/IEC 80079-20-2	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 21¹	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

¹ Note: Zone 1 and Zone 21 products are not suitable for use in Division 1 areas.

Temperature Classification⁷		
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	T3
230°C (446°F)	T2C	
215°C (419°F)	T2D	
200°C (392°F)	T3	T4
180°C (356°F)	T3A	
165°C (329°F)	T3B	
160°C (320°F)	T3C	
135°C (275°F)	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, IECEx and UKEx 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, IECEx and UKEx

Typical ATEX, IECEx and UKEx Marking									
UK CA CE	XXXX¹	Ex	II	2	G	Ex	db	IIC	T4 Gb
↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Complies with UKCA Requirements	Notified Body Number*	Specific Marking for Explosion Protection**	Equipment Group**	Equipment Category**	Explosion Protection	Atmosphere Group	Protection Type	Temperature Class	Equipment Protection Level (EPL)
Complies with European Directive*									
*ATEX only (ATEX 2014/34/EU) **ATEX and UKEx +XXXX is 2575 for Intertek's Italy Notified Body or 2903 for Intertek's Canadian Notified Body									

ATEX Directive 2014/34/EU	
Intertek has the ability to issue ATEX Notified Body certificates, offering efficiency and speed to market for global manufacturers entering Europe and beyond. Contact Intertek for more information.	

IECEx Scheme	
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 relevant IEC Standards, and (2) the product is manufactured under a quality control program assessed and registered through a Quality Assessment Report (QAR) by an accredited IECEx Certification Body (ExCB).	
Intertek has IECEx Testing Laboratories (ExTLs) across North America, Europe, and Asia, and is an IECEx Certification Body (ExCB). For more information visit <a href="http://www.IECEx.com">www.IECEx.com</a> .	

UKEx - UK Statutory Instrument 2016 No.1107	
Intertek has the ability to issue UKEx and UKExNI Approved Body certificates, for global manufacturers entering the UK. UKEx requirements are currently closely aligned to ATEX requirements. Contact Intertek for more information.	

Other CE Directives That May Apply⁸	
Electromagnetic Compatibility (EMC)	2014/30/EU
Low Voltage⁹	2014/35/EU
Machinery Directive	2006/42/EC
Medical Device Regulation	2017/745/EU
Pressure Equipment Directive (PED)	2014/68/EU
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 Levels¹⁰			ATEX, UKEx Categories vs Zones¹⁰	
ATEX, UKEx Category	Equipment Protection Level	Typical Equipment Zone Suitability	Equipment Category	Zone of Use
				Gas, Vapors, & Mist
				Dust
1 G	Ga	Zones 0, 1, 2	Category 1	Zone 0, 1 & 2
1 D	Da	Zones 20, 21, 22		Zone 20, 21 & 22
2 G	Gb	Zones 1, 2	Category 2	Zone 1 & 2
2 D	Db	Zones 21, 22		Zone 21 & 22
3 G	Gc	Zone 2	Category 3	Zone 2
3 D	Dc	Zone 22		
M1	Ma	Very high level of protection for mines		
M2	Mb	High level of protection for mines		

Note 10: Unless the explosion protection risk assessment states otherwise

CompEx Training	
Course	Description
Ex F	Basic theory of hazardous areas (2 Days)
Ex01 - Ex04	Electrical/Instrumentation installation, maintenance & inspection (Gas & Vapours) (5 Days)
Ex05 - Ex06	Electrical/Instrumentation installation, maintenance & inspection (Combustible Dust) (3 Days)
Ex11	Mechanical Competency for EN 13463 Parts 1, 5 and 6 (3 Days)
Ex12	Application Design Engineers (5 Days)
Ex14	Responsible Person (4 Days)

Note: Courses are available as CompEx qualifications, City and Guilds qualifications or Intertek's own Certificate of Attendance. Depending on the requirements, training can be delivered at one of our training centers, at the customer's site or virtually.

Functional Safety	
Intertek has a Functional Safety Conformity Assessment Program for industrial automated machinery and robotics. This program offers manufacturers design evaluation, testing, and certification with the Intertek Functional Safety (FS) Mark, to illustrate compliance to rigorous standards assessing product safety and performance. Scan the QR code for more information on Intertek's Functional Safety program.	



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Increased Safety	eb	Gb Mb	1	60079-7	No arcs, sparks or hot surfaces
	ec	Gc	2		
Flame-Proof	da	Ga	0	60079-1	Contain the explosion and extinguish the flame
	db	Gb Mb	1		
	dc	Gc	2		
Powder-Filled	q	Gb Mb	1	60079-5	
Sealed Device	nC	Gc	2	60079-15	
Pressurization	pxb	Gb Db Mb	1, 21	60079-2	
	pyb	Gb Db	1, 21		
	pzc	Gc Dc	2, 22		
Pressurized room	pb	Gb	1	60079-13¹²	Prevent ingress of explosive atmosphere and limit surface temperature
	pc	Gc	2		
	vc	Gc	2		
Encapsulation	ma	Ga Da Ma	0, 20	60079-18	Prevent ingress of explosive atmosphere and limit surface temperature
	mb	Gb Db Mb	1, 21		
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Restricted Breathing	nR	Gc	2	60079-15	
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