

HAZARDOUS AREA GUIDE ATEX & IECEx (Zones/Groups)

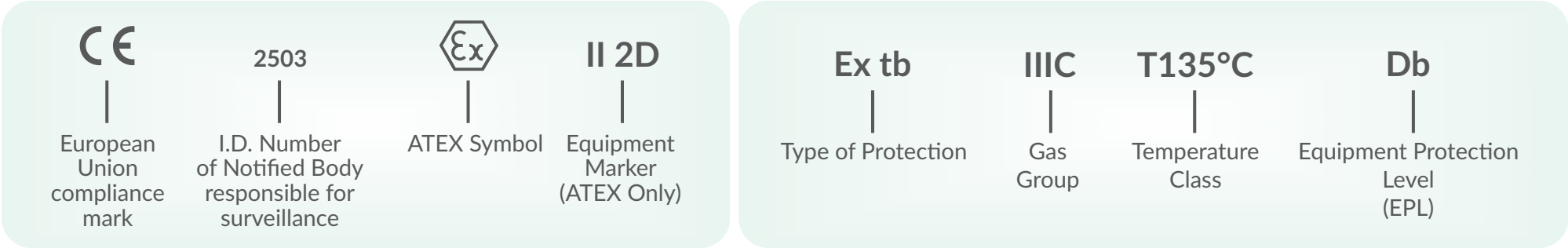
Typical Equipment Marking for Gas Atmospheres



2014/34/EU ATEX Directive Marking

EN/IEC 60079-0 General Requirements Marking

Typical Equipment Marking for Dust Atmospheres



2014/34/EU ATEX Directive Marking

EN/IEC 60079-0 General Requirements Marking

Gas Zones				
Gas Zones	Definition	ATEX Category	EPL	Required Protection
Methane	Mines with methane and dust. Equipment remains energised in explosive atmosphere	M1	Ma	Two Faults
Methane	Mines with methane and dust. Equipment is de-energised in explosive atmosphere	M2	Mb	Severe Normal Operation
Zone 0	Explosive atmosphere present continuously or for long periods, frequently	1G	Ga	Two Faults
Zone 1	Explosive atmosphere is likely to occur under normal conditions, occasionally	2G	Gb	One Fault
Zone 2	Explosive atmosphere is unlikely to occur under normal conditions, short periods	3G	Gc	Normal Operation

Dust Zones				
Dust Zones	Definition	ATEX Category	EPL	Required Protection
Zone 20	Explosive atmosphere present continuously or for long periods, frequently	1D	Da	Two Faults
Zone 21	Explosive atmosphere is likely to occur under normal conditions, occasionally	2D	Db	One Fault
Zone 22	Explosive atmosphere is unlikely to occur under normal conditions, short periods	3D	Dc	Normal Operation

Enclosure Ingress Protection (IP) Level	
Enclosure Ingress Protection (IP) Level: To EN/IEC 60529	
First Number (Solid objects / dust)	Second Number (Water)
0 No protection	0 No protection
1 Objects > Ø50 mm	1 Vertically dripping water
2 Objects > Ø12.5 mm	2 Vertically dripping water with enclosure tilted by 15°
3 Objects > Ø2.5 mm	3 Sprayed water up to 60° from the vertical
4 Objects > Ø1.0 mm	4 Sprayed water from all directions
5 Dust protected	5 Water jets
6 Dust tight	6 Powered water jets
-	7 Temporary submersion < 1m depth
-	8 Extended submersion > 1m depth

Ambient Temperature Range (Tamb)	
Tamb =	Temperature relating to the immediate surroundings of the equipment (assumed to be -20°C to +40°C, unless stated)

Protection Concept - Electrical - Gas	
Type of Protection (electrical - gas)	Reference
General Requirements	EN/IEC 60079-0
Flameproof - Ex d / da / db / dc	EN/IEC 60079-1
Purge/Pressurised - Ex p / pxb / pyb / pzc	IEC 60079-2
Quartz/Sand Filled - Ex q / qb / qc	EN/IEC 60079-5
Oil Immersion - Ex o / ob / oc	EN/IEC 60079-6
Increased Safety - Ex e / eb / ec	EN/IEC 60079-7
Intrinsic Safety - Ex i / ia / ib / ic	EN/IEC 60079-11
Non Sparking - Ex nA / nC / nL	EN/IEC 60079-15
Encapsulation - Ex m / ma / mb / mc	EN/IEC 60079-18
Optical Radiation - Ex op is / op sh / op pr	EN/IEC 60079-28
Trace Heating Systems - Ex e / Ex 60079-30-1	EN/IEC 60079-30-1
Special Protection Ex s	EN/IEC 60079-33
Caplights	EN/IEC 60079-35-1
Controlled Spark Duration Power-i	TS 60079-39
Process Sealing	TS 60079-40
Flame Arresters	EN 16852
Diesel Engines	EN 1834-1,2,3

Protection Concept - Electrical - Dust	
Type of Protection (electrical - dust)	Reference
General Requirements	EN/IEC 60079-0
Enclosure - ta / tb / tc	EN/IEC 60079-31
Purge/Pressurised - Ex p / pxb / pyb / pzc	EN/IEC 60079-2
Intrinsic Safety - Ex i / ia / ib / ic	EN/IEC 60079-11
Encapsulation - Ex m / ma / mb / mc	EN/IEC 60079-18

Protection Concept - Non-Electrical		
Type of Protection (non-electrical) (gas & dust)	Reference (ATEX only)	IECEx
General Requirements	EN 80079-36	IEC / ISO 80079-36
Flow Restricting Enclosure - fr	EN 13463-2	-
Flameproof - d	EN 13463-3	-
Constructional Safety - c / h	EN 80079-37	IEC / ISO 80079-37
Control of Ignition - b / h	EN 80079-37	IEC / ISO 80079-37
Pressurisation - p	EN 60079-2	-
Liquid Immersion - k / h	EN 80079-37	IEC / ISO 80079-37

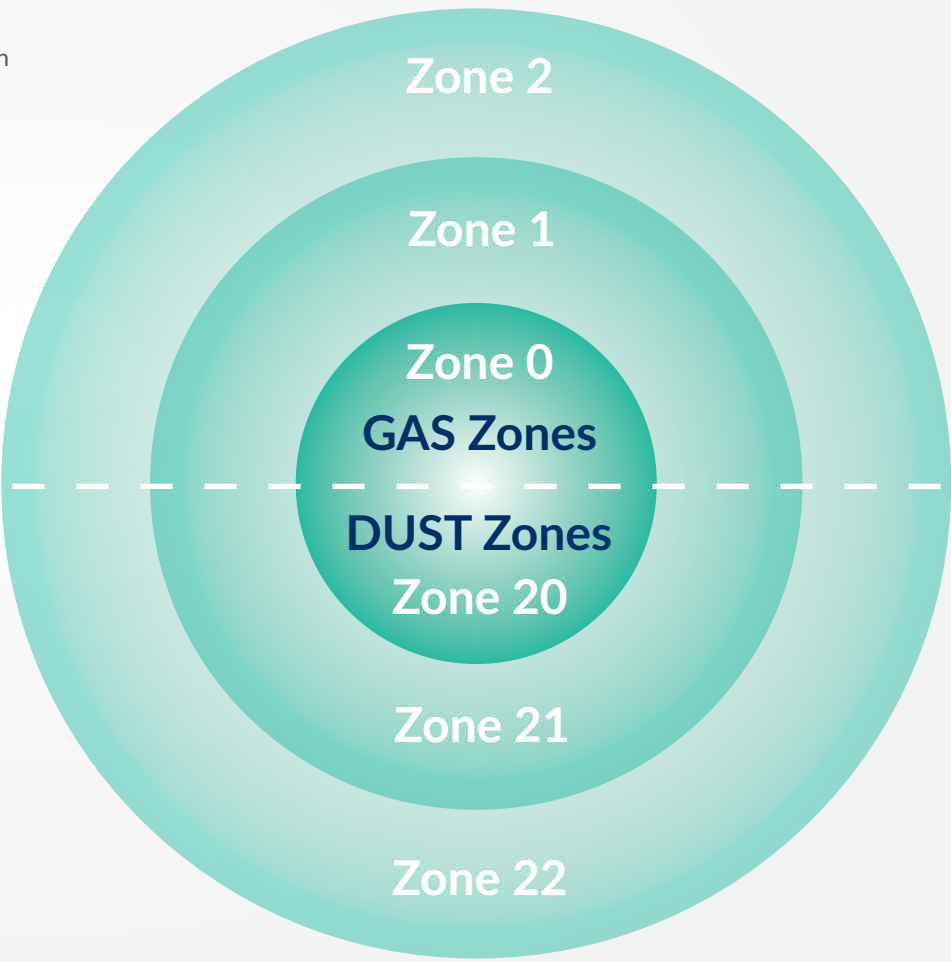
Gas Groups	
Gas Groups	Gases are classified according to the ignitability of the gas/air mixture as defined in EN/IEC 60079-20-1
IIA	Acetic Acid, Acetone, Ammonia, Butane, Cyclohexane, Propane, Gasoline (petrol), Methane (natural gas, non-mining), Toluene, Xylene, Methanol (methyl alcohol), Propane-2-ol (iso-propyl alcohol)
IIB	Group IIA gases plus, Di-ethyl ether, Ethylene, Ethanol Methyl ethyl ketone (MEK), Propane-1-ol (n-propyl alcohol)
IIC	Group IIA and IIB gases plus, Acetylene, Hydrogen

Dust Groups	
Dust Groups	Dusts are classified by the types of material that make up the dust
IIIA	Combustible Fibres and Flyings
IIIB	Group IIIA dusts plus, Non-Conductive Dusts
IIIC	Group IIIA and IIIB dusts plus, Conductive Dusts

Equipment Groups	
Equipment Group	Definition
Group I	Electrical equipment intended for use in mines susceptible to fire damp
Group II	Electrical equipment intended for use in explosive gas atmospheres
Group III	Electrical equipment intended for use in explosive dust atmospheres

Temperature Class (T Class)	
Temperature Class (T Class)	Highest temperature achieved under the most adverse equipment rating and heating conditions. (Flashpoint temperature of some gases)
T1: 450°C	Ammonia (630°C), Hydrogen (560°C), Methane (537°C), Propane (470°C)
T2: 300°C	Ethylene (425°C), Butane (372°C), Acetylene (305°C)
T3: 200°C	Cyclohexane (259°C), Kerosene (210°C)
T4: 135°C	Di-ethyl Ether (160°C)
T5: 100°C	-
T6: 85°C	Carbon Disulphate (95°C)

Zones of Use
Explosive Atmospheres



GAS Zones

Suitable for Zone 0, 1 & 2

ATEX Group & Category: II 1G
IECEx Equipment Protection Level: Ga
Types of protection (electrical): ia, da, ma, op is
Types of protection (non-electrical, ATEX): c, b, k
Types of protection (non-electrical, IECEx): h

Suitable for Zone 1 & 2

ATEX Group & Category: II 2G
IECEx Equipment Protection Level: Gb
Types of protection (electrical): db, eb, ib, mb, ob, pxb, pyb, qb, op is, op pr, op sh
Types of protection (non-electrical, ATEX): d, c, b, p, k, h
Types of protection (non-electrical, IECEx): d, p, h

Suitable for Zone 2 only

ATEX Group & Category: II 3G
IECEx Equipment Protection Level: Gc
Types of protection (electrical): dc, ec, ic, mc, nA, nC, nR, oc, pzc, qc
Types of protection (non-electrical, ATEX): fr, d, c, b, p, k, h
Types of protection (non-electrical, IECEx): fr, d, p, h

DUST Zones

Suitable for Zone 20, 21 & 22

ATEX Group & Category: II 1D
IECEx Equipment Protection Level: Da
Types of protection (electrical): ta, ia
Types of protection (non-electrical, ATEX): c, b, k, h
Types of protection (non-electrical, IECEx): fr, d, p, h

Suitable for Zone 21 & 22

ATEX Group & Category: II 2D
IECEx Equipment Protection Level: Db
Types of protection (electrical): tb, ib, mb
Types of protection (non-electrical, ATEX): d, c, b, p, k, h
Types of protection (non-electrical, IECEx): d, h

Suitable for Zone 22 only

ATEX Group & Category: II 3D
IECEx Equipment Protection Level: Dc
Types of protection (electrical): tc, ic, mc
Types of protection (non-electrical, ATEX): fr, d, c, b, p, k, h
Types of protection (non-electrical, IECEx): h

Specialists in design and manufacture of Instrumentation
for Hazardous Locations and Explosion Proof applications



HAZARDOUS AREA GUIDE NORTH AMERICA

Typical Equipment Marking for North America



Class I

Zone 0

AEx

ia

IIC

T4

Hazard Class

Area Classification

Approved to US Standards

Protection Concept Code

Gas Group

Temperature Class

NEC® 500

NEC® 505

Protection Concepts							
Type of Protection	Code	Cty	Class	Division/Zone	Standard	Basic Concept of Protection	
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	ISA 60079-0 CSA 60079-0		
US		Class I	Division 1 & 2				
Increased Safety		AEx e Ex e	US CA	Class I Class I	Zone 1 Zone 1		ISA 60079-7 CSA E60079-7
Non-Incendive	(NI) (NI)	US CA	Class I Class I	Division 2 Division 2	ISA 12.12.01/FM 3611 C22.2 No. 213	No arcs, sparks or hot surfaces	
Non-Sparking	AEx nA EX nA	US CA	Class I Class I	Zone 2 Zone 2	ISA 60079-15 CSA E60079-15		
Explosion Proof	(XP) (XP)	US CA	Class I Class I	Division 1 Division 1	UL 1203 C22.2 No. 30	Contain the explosion and extinguish the flame	
Flame Proof	AEx d Ex d	US CA	Class I Class I	Zone 1 Zone 1	ISA 60079-1 CSA 60079-1		
Power Filled	AEx q Ex q	US CA	Class I Class I	Zone 1 Zone 1	ISA 60079-5 CSA E60079-5		
Enclosed Break	AEx nC Ex nC	US CA	Class I Class I	Zone 2 Zone 2	ISA 60079-15 CSA E60079-15	Limit energy of sparks and surface temperature	
Intrinsic Safety	(IS)	US	Class I	Division 1	UL 913 / FM 3610 C22.2 No. 157		
	AEx ia	US	Class I	Zone 0	ISA 60079-11		
	AEx ib	US	Class I	Zone 1	ISA 60079-11		
	EX ia	CA	Class I	Zone 0	CSA E60079-11		
	Ex ib	CA	Class I	Zone 1	CSA E60079-11		
Limited Energy	AEx nC Ex nL	US CA	Class I Class I	Zone 2 Zone 2	ISA 60079-15 CSA E60079-15		
Pressurized	Type X	US	Class I	Division 1	NFPA 496 (FM 3620)	Keep flammable gas out	
	Type X	CA	Class I	Division 1	NFPA 496		
	Type Y	US	Class I	Division 1	NFPA 496 (FM 3620)		
	Type Y	CA	Class I	Division 1	NFPA 496		
	Type Z	US	Class I	Division 2	NFPA 496 (FM 3620)		
	Type Z	CA	Class I	Division 2	NFPA 496		
	AEx px	US	Class I	Zone 1	ISA 60079-2		
	Ex px	CA	Class I	Zone 1	CSA E60079-2		
	AEx py	US	Class I	Zone 1	ISA 60079-2		
	Ex py	CA	Class I	Zone 1	CSA E60079-2		
AEx pz	US	Class I	Zone 2	ISA 60079-2			
Ex pz	CA	Class I	Zone 2	CSA E60079-2			
Restricted Breathing	AExnR Ex nR	US CA	Class I Class I	Zone 2 Zone 2	ISA 60079-15 CSA E60079-15		
Encapsulated	AEx ma	US	Class I	Zone 0	ISA 60079-18		
	AEx m	US	Class I	Zone 1	ISA 60079-18		
	Ex m	CA	Class I	Zone 1	CSA E60079-18		
AEx mb	US	Class I	Zone 1	ISA 60079-18			
Oil Emmersion	AEx o EX o	US CA	Class I Class I	Zone 1 Zone 1	ISA 60079-6 CSA E60079-6	Keep combustible dust out	
Electrical Equipment for Combustible Dust - Class II & Class III							
General Requirements	Ex	US	Class II	Division 1 & 2	FM 3600		
		CA	Class II	Division 1 & 2	FM 3600		
		US	Class III	Division 1 & 2			
		US	Class III	Division 1 & 2 Zone 20, 21, 22	ISA 60079-0		
Dust Ignition Proof	(DIP)	US CA	Class II Class II	Division 1 Division 1	UL 1203 CSA C22.2 No. 25		
Dust Protected	(NI)	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 tD (DIP) A21 (DIP) A22	US CA CA	Class II Class II	Zone 21 Division 1 Division 2	ISA 60079-31 CSA E61241-1-1 CSA E61241-1-1		
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 US		Zone 20 Zone 21	ISA 61241-18 ISA 61241-18		Keep combustible dust out
Pressurisation	(PX)	US	Class II	Division 1	NFPA 496 (FM 3620)		
	(PX)	CA	Class II	Division 1	NFPA 496		
	(PY)	US	Class II	Divisi on 1	NFPA 496 (FM 3620)		
	(PY)	CA	Class II	Division 1	NFPA 496		
	(PZ)	US	Class II	Division 2	NFPA 496 (FM 3620)		
	(PZ)	CA	Class II	Division 2	NFPA 496		
AEx pD	US		Zone 21	ISA 61241-2			
Intrinsic Safety	(IS)	US	Class II	Division 1	UL 913 / FM 3610	Limit energy of sparks and surface temperature	
	(IS)	CA	Class II	Division 1	CSA C22.2 No. 157		
	AEx iaD	US		Zone 20	ISA 61241-11		
	AEx ibD	US		Zone 21	ISA 61241-11		
	(IS)	US	Class III	Division 1	UL 913 / FM 3610		
(IS)	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.							

Atmosphere Groups			
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	Class II Combustible 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		

Temperature Classification			
Max. Surface Temperature	NEC® 500 CEC®	NEC® 505	IEC - Group II
450° C (842°F)	T1	T1	T1
300° C (572°F)	T2	T2	T2
280° C (536°F)	T2A		
260° C (500°F)	T2B		
230° C (446°F)	T2C		
215° C (419°F)	T2D	T3	T3
200° C (392°F)	T3		
180° C (356°F)	T3A		
165° C (329°F)	T3B		
160° C (320°F)	T3C	T4	T4
135° C (275°F)	T4		
120° C (248°F)	T4A	T5	T5
100° C (212°F)	T5		
85° C (185°F)	T6	T6	T6
Note: For Group I (ATEX/IEC) applications, electrical apparatus has fixed temperature limits i.e., 150° C and 450°C.			

Classification of Divisions and Zones			
Type of Area	NEC and CEC*	ATEX and IEC	Definitions
Continuos hazard	Division 1	Zone 0 / Zone 20	A place in which an explosive atmosphere is continually present
Intermittent hazard	Division 1	Zone 1 / Zone 21	A place in which an explosive atmosphere is likely to occur in normal operation
Hazard under abnormal conditions	Division 2	Zone 2 / Zone 22	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			

Enclosure NEMA Type Ratings		
NEMA 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

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