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EXPLOSIVE GAS ATMOSPHERES (e.g. Class I Division System)

Includes flammable gases, flammable liquid-produced vapors, and combustible liquid-produced vapors



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Area classifications

Division 1:

Where ignitable concentrations of flammable gases, flammable liquid-produced vapors or combustible liquid-produced vapors **can exist** under normal operating conditions

Zone 0:

Where ignitable concentrations of flammable gases, flammable liquid-produced vapors or combustible liquid-produced vapors **are present continuously or for long periods of time** under normal operating conditions

Zone 1:

Where ignitable concentrations of flammable gases, flammable liquid-produced vapors or combustible liquid-produced vapors **are likely to exist** under normal operating conditions

Division 2:

Where ignitable concentrations of flammable gases, flammable liquid-produced vapors or combustible liquid-produced vapors **are not likely to exist** under normal operating conditions

Zone 2:

Where ignitable concentrations of flammable gases, flammable liquid-produced vapors or combustible liquid-produced vapors **are not likely to exist** under normal operating conditions

Groups

Divisions 1 and 2:

A Acetylene
B Hydrogen
C Ethylene
D Propane

Zones 0, 1 and 2:

IIC Acetylene and hydrogen
IIB+H2 Hydrogen
IIB Ethylene
IIA Propane

Temperature classifications

Divisions 1 and 2:

T1 ≤450°C
T2 ≤300°C
T2A ≤280°C
T2B ≤260°C
T2C ≤230°C
T2D ≤215°C
T3 ≤200°C
T3A ≤180°C
T3B ≤165°C
T3C ≤160°C
T4 ≤135°C
T4A ≤120°C
T5 ≤100°C
T6 ≤ 85°C

Zones 0, 1 and 2:

T1 ≤450°C
T2 ≤300°C
—
—
—
—
T3 ≤200°C
—
—
—
T4 ≤135°C
—
T5 ≤100°C
T6 ≤ 85°C

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Division system electrical equipment protection techniques

Area	Protection techniques	Applicable certification documents	
		UL Mark	C-UL Mark
Div. 1	• Intrinsic safety	ANSI/UL 913	CSA 157 or CSA 60079-11
	• Explosion-proof	ANSI/UL 1203	CSA 30
	• Purged/pressurized, Type X or Y	ANSI/NFPA 496	ANSI/NFPA 496
	• Optical radiation	ANSI/UL 60079-28	CSA 60079-28
	• Special protection	ANSI/UL 60079-33	—
	• Any Class I, Zone 0 technique	See Zone 0 techniques	See Zone 0 techniques
Div. 2	• Enclosed break	ANSI/UL 121201	CSA 213
	• Hermetically sealed	ANSI/UL 121201	CSA 213
	• Nonincendive	ANSI/UL 121201	CSA 213
	• Non-sparking	ANSI/UL 121201	CSA 213
	• Oil-immersed	ANSI/UL 121201	CSA 213
	• Purged/pressurized, Type Z	ANSI/NFPA 496	ANSI/NFPA 496
	• Sealed	ANSI/UL 121201	CSA 213
	• Optical radiation	ANSI/UL 60079-28	CSA 60079-28
	• Special protection	ANSI/UL 60079-33	—
	• Any Class I, Division 1 technique	See above	See above
	• Any Class I, Zone 0, 1 or 2 technique	See zone techniques	See zone techniques

Note: References in one area to any protection techniques from another area require those other area techniques to be for the same gas atmosphere and with a suitable temperature class.

EXPLOSIVE GAS ATMOSPHERES (e.g. Class I Division System)

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Zone System Electrical Equipment Protection Techniques (Equipment Protection Levels)

Area	Protection techniques (equipment protection levels)	Applicable certification documents			
		UL Mark	C-UL Mark	IECEx	ATEX/UKEx
Zone 0	• Flame-proof, “da” (Ga)	ANSI/UL 60079-1	CSA 60079-1	IEC 60079-1	EN 60079-1
	• Intrinsic safety, “ia” (Ga)	ANSI/UL 60079-11	CSA 60079-11	IEC 60079-11	EN 60079-11
	• Encapsulation, “ma” (Ga)	ANSI/UL 60079-18	CSA 60079-18	IEC 60079-18	EN 60079-18
	• Optical radiation, “op” (Ga)	ANSI/UL 60079-28	CSA 60079-28	IEC 60079-28	EN 60079-28
	• Special protection, “s” (Ga)	ANSI/UL 60079-33	—	IEC 60079-33	—
	• Class I, Div 1 intrinsic safety	ANSI/UL 913	CSA 157	—	—
Zone 1	• Flame-proof, “db” (Gb)	ANSI/UL 60079-1	CSA 60079-1	IEC 60079-1	EN 60079-1
	• Pressurization, “pxb”/“pyb” (Gb)	ANSI/UL 60079-2	CSA 60079-2	IEC 60079-2	EN 60079-2
	• Powder filling, “q” (Gb)	ANSI/UL 60079-5	CSA 60079-5	IEC 60079-5	EN 60079-5
	• Liquid immersion, “ob” (Gb)	ANSI/UL 60079-6	CSA 60079-6	IEC 60079-6	EN 60079-6
	• Increased safety, “eb” (Gb)	ANSI/UL 60079-7	CSA 60079-7	IEC 60079-7	EN 60079-7
	• Intrinsic safety, “ib” (Gb)	ANSI/UL 60079-11	CSA 60079-11	IEC 60079-11	EN 60079-11
	• Encapsulation, “mb” (Gb)	ANSI/UL 60079-18	CSA 60079-18	IEC 60079-18	EN 60079-18
	• Optical radiation, “op” (Gb)	ANSI/UL 60079-28	CSA 60079-28	IEC 60079-28	EN 60079-28
	• Special protection, “s” (Gb)	ANSI/UL 60079-33	—	IEC 60079-33	—
	• Any Zone 0 technique	See above	See above	See above	See above
	• Any Class I, Div 1 technique	See CID1 techniques	See CID1 techniques	—	—

EXPLOSIVE GAS ATMOSPHERES (e.g. Class I Division System)

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Zone System Electrical Equipment Protection Techniques (Equipment Protection Levels) CONTINUED

Zone 2	• Flame-proof, “dc” (Gc)	ANSI/UL 60079-1	CSA 60079-1	IEC 60079-1	EN 60079-1
	• Pressurization, “pzc” (Gc)	ANSI/UL 60079-2	CSA 60079-2	IEC 60079-2	EN 60079-2
	• Liquid immersion, “oc” (Gc)	ANSI/UL 60079-6	CSA 60079-6	IEC 60079-6	EN 60079-6
	• Increased safety, “ec” (Gc)	ANSI/UL 60079-7	CSA 60079-7	IEC 60079-7	EN 60079-7
	• Intrinsic safety, “ic” (Gc)	ANSI/UL 60079-11	CSA 60079-11	IEC 60079-11	EN 60079-11
	• Enclosed break, “nC” (Gc)	ANSI/UL 60079-15	CSA 60079-15	IEC 60079-15	EN 60079-15
	• Hermetically sealed, “nC” (Gc)	ANSI/UL 60079-15	CSA 60079-15	IEC 60079-15	EN 60079-15
	• Nonincendive, “nC” (Gc)	ANSI/UL 60079-15	CSA 60079-15	IEC 60079-15	EN 60079-15
	• Non-sparking, “nA” (Gc)	ANSI/UL 60079-15	CSA 60079-15	IEC 60079-15	EN 60079-15
	• Restricted breathing, “nR” (Gc)	ANSI/UL 60079-15	CSA 60079-15	IEC 60079-15	EN 60079-15
	• Sealed, “nC” (Gc)	ANSI/UL 60079-15	CSA 60079-15	IEC 60079-15	EN 60079-15
	• Encapsulation, “mc” (Gc)	ANSI/UL 60079-18	CSA 60079-18	IEC 60079-18	EN 60079-18
	• Optical radiation, “op” (Gc)	ANSI/UL 60079-28	CSA 60079-28	IEC 60079-28	EN 60079-28
	• Special protection, “s” (Gc)	ANSI/UL 60079-33	—	IEC 60079-33	—
	• Any Zone 0 or 1 technique	See above	See above	See above	See above
	• Any Class I, Div 1 or 2 technique	See Class I techniques	See Class I techniques	—	—

Note 1: Zone 0, 1 and 2 general requirements are contained in ANSI/UL 60079-0 (UL Mark), CSA 60079-0 (C-UL Mark), IEC 60079-0 (IECEx) and EN 60079-0 (ATEX/UKEx).

Note 2: INMETRO certification requirements in support of the UL-BR INMETRO Mark are determined by Portaria 115 dated March 23, 2022, with the associated Brazilian NBR Ex standards harmonized with the comparable IECEx standards noted above.

Note 3: References in one area to any protection techniques from another area require these other area techniques to be for the same gas atmosphere and with a suitable temperature class.

EXPLOSIVE GAS ATMOSPHERES (e.g. Class I Division System)

Includes flammable gases, flammable liquid-produced vapors, and combustible liquid-produced vapors

Zone system non-electrical equipment protection techniques (equipment protection levels)

Area	Protection Techniques	Applicable Certification Documents			
		UL Mark	C-UL Mark	IECEX	ATEX/UKEx
Zone 0	• Constructional safety, “c” (Ga)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Control of ignition source, “b” (Ga)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Liquid immersion, “k” (Ga)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Flame-proof, “da” (Ga)	ANSI/UL 60079-1	CSA 60079-1	IEC 60079-1	EN 60079-1
Zone 1	• Constructional safety, “c” (Gb)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Control of ignition source, “b” (Gb)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Liquid immersion, “k” (Gb)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Flame-proof, “db” (Gb)	ANSI/UL 60079-1	CSA 60079-1	IEC 60079-1	EN 60079-1
	• Pressurization, “pxb”/“pyb”(Gb)	ANSI/UL 60079-2	CSA 60079-2	IEC 60079-2	EN 60079-2
	• Any Zone 0 technique	See above	See above	See above	See above
Zone 2	• Flow-restricting enclosure, “fr”	—	—	—	EN 13463-2
	• Constructional safety, “c” (Gc)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Control of ignition source, “b” (Gc)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Liquid immersion, “k” (Gc)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Flame-proof, “dc” (Gc)	ANSI/UL 60079-1	CSA 60079-1	IEC 60079-1	EN 60079-1
	• Pressurization, “pzc” (Gc)	ANSI/UL 60079-2	CSA 60079-2	IEC 60079-2	EN 60079-2
	• Any Zone 0 or 1 technique	See above	See above	See above	See above

Note 1: Zone 0, 1 and 2 general requirements are contained in ANSI/UL 80079-36 (UL Mark), ISO 80079-36 (C-UL Mark & IECEX) and EN ISO 80079-36 (ATEX/UKEx).

Note 2: References in one area to any protection techniques from another area require those other area techniques to be for the same gas atmosphere and with a suitable temperature class.

EXPLOSIVE DUST ATMOSPHERES (e.g. Class II & III Division Systems)

Includes combustible dust, combustible fibers/flyings and ignitable fibers/flyings



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Area classifications

Class II, Division 1:

Where ignitable concentrations of combustible dust **are present** under normal operating conditions

Note: Locations where metal combustible fibers/flyings are present shall be classified as Class II, Division 1, Group E.

Zone 20:

Where ignitable concentrations of combustible dust, combustible fibers/flyings or ignitable fibers/flyings **are present continuously or for long periods of time** under normal operating conditions

Zone 21:

Where ignitable concentrations of combustible dust, combustible fibers/flyings or ignitable fibers/flyings **are likely to exist occasionally** under normal operating conditions

Class II, Division 2:

Where ignitable concentrations of combustible dust **are not present** under normal operating conditions

Zone 22:

Where ignitable concentrations of combustible dust, combustible fibers/flyings or ignitable fibers/flyings **are not likely to occur** under normal operating conditions

Class III, Division 1:

Where explosible mixtures of nonmetal combustible fibers/flyings **are present** under normal operating conditions or where ignitable fibers/flyings **are handled manufactured or used**

Class III, Division 2:

Where explosible mixtures of nonmetal combustible fibers/flyings **are not present** under normal operating conditions or where ignitable fibers/flyings **are stored or handled other than in the process of manufacture**



EXPLOSIVE DUST ATMOSPHERES (e.g. Class II & III Division Systems)

Includes combustible dust, combustible fibers/flyings and ignitable fibers/flyings

Groups

Class II, Divisions 1 and 2		Zones 20, 21 and 22:	
E	Metal combustible dusts — Div. 1 only	IIIC	Metal combustible dusts/fibers/flyings — Zones 20 and 21 only
F	Carbonaceous combustible dusts	IIIB	Other than metal combustible dusts
G	Combustible dusts not in Group E or Group F	IIIB	Other than metal combustible dusts

Class III, Divisions 1 and 2:		Zones 20, 21 and 22:	
•	Nonmetal combustible fibers/flyings	IIIA	Other than metal combustible fibers/flyings
•	Ignitable fibers/flyings		

Temperature classifications

Class II, Divisions 1 and 2:					
T1	≤450°C	T2D	≤215°C	T4	≤135°C
T2	≤300°C	T3	≤200°C	T4A	≤120°C
T2A	≤280°C	T3A	≤180°C	T5	≤100°C
T2B	≤260°C	T3B	≤165°C	T6	≤ 85°C
T2C	≤230°C	T3C	≤160°C		

Zones 20, 21 and 22: None

Note: For Zones 20, 21 and 22, equipment shall be marked to show the maximum surface temperature.

Class III, Division 1 and 2: None.

Note: Article 503 of the NEC limits the maximum surface temperature so as not to cause excessive dehydration or gradual carbonization. Appendix J of the CE Code limits the maximum surface temperature for Class III to 165°C for equipment not subject to overloading and to 120°C for equipment that may be overloaded.

EXPLOSIVE DUST ATMOSPHERES (e.g. Class II & III Division Systems)

Includes combustible dust, combustible fibers/flyings and ignitable fibers/flyings

Division system electrical equipment protection techniques

Area	Protection techniques	Applicable certification documents	
		UL Mark	C-UL Mark
Div. 1	• Intrinsic safety (Classes II and III)	ANSI/UL 913	CSA 157 or CSA 60079-11
	• Dust ignition-proof (Class II)	ANSI/UL 1203	CSA 25
	• Pressurized, Type X or Y (Class II)	ANSI/NFPA 496	ANSI/NFPA 496
	• Dust-tight (Class III)	ANSI/UL 121201	CSA 213
	• Hermetically sealed (Class III)	ANSI/UL 121201	CSA 213
	• Nonincendive (Class III)	ANSI/UL 121201	CSA 213
	• Sealed (Class III)	ANSI/UL 121201	CSA 213
	• Optical radiation	ANSI/UL 60079-28	CSA 60079-28
	• Special protection	ANSI/UL 60079-33	—
	• Any Zone 20 technique (Classes II and III)	See Zone 20 techniques	See Zone 20 techniques
Div. 2	• Dust-tight (Class II)	ANSI/UL 121201	CSA 213
	• Hermetically sealed (Class II)	ANSI/UL 121201	CSA 213
	• Nonincendive (Class II)	ANSI/UL 121201	CSA 213
	• Sealed (Class II)	ANSI/UL 121201	CSA 213
	• Pressurized, Type Z (Class II)	ANSI/NFPA 496	ANSI/NFPA 496
	• Optical radiation (Class II)	ANSI/UL 60079-28	CSA 60079-28
	• Special protection (Class II & III)	ANSI/UL 60079-33	—
	• Any CIID1 or CIID1 technique	See above	See above
• Any Zone 20, 21, 22 technique (Class II and III)	See zone techniques	See zone techniques	

EXPLOSIVE DUST ATMOSPHERES (e.g. Class II & III Division Systems)

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Zone system electrical equipment protection techniques (equipment protection levels)

Area	Protection techniques (equipment protection levels)	Applicable certification documents			
		UL Mark	C-UL Mark	IECEX	ATEX/UKEx
Zone 20	• Enclosure, “ta” (Da)	ANSI/UL 60079-31	CSA 60079-31	IEC 60079-31	EN 60079-31
	• Intrinsic safety, “ia” (Da)	ANSI/UL 60079-11	CSA 60079-11	IEC 60079-11	EN 60079-11
	• Encapsulation, “ma” (Da)	ANSI/UL 60079-18	CSA 60079-18	IEC 60079-18	EN 60079-18
	• Optical radiation, “op” (Da)	ANSI/UL 60079-28	CSA 60079-28	IEC 60079-28	EN 60079-28
	• Special protection, “s” (Da)	ANSI/UL 60079-33	—	IEC 60079-33	—
	• Any CIID1 technique	See CIID1 techniques	See CIID1 techniques	—	—
Zone 21	• Enclosure, “tb” (Db)	ANSI/UL 60079-31	CSA 60079-31	IEC 60079-31	EN 60079-31
	• Pressurization, “pxb”/“pyb” (Db)	ANSI/UL 60079-2	CSA 60079-2	IEC 60079-2	EN 60079-2
	• Intrinsic safety, “ib” (Db)	ANSI/UL 60079-11	CSA 60079-11	IEC 60079-11	EN 60079-11
	• Encapsulation, “mb” (Db)	ANSI/UL 60079-18	CSA 60079-18	IEC 60079-18	EN 60079-18
	• Optical radiation, “op” (Db)	ANSI/UL 60079-28	CSA 60079-28	IEC 60079-28	EN 60079-28
	• Special protection, “s” (Db)	ANSI/UL 60079-33	—	IEC 60079-33	—
Zone 22	• Any Zone 20 technique	See above	See above	See above	See above
	• Any CIID1 technique	See CIID1 techniques	See CIID1 techniques	—	—
	• Enclosure, “tc” (Dc)	ANSI/UL 60079-31	CSA 60079-31	IEC 60079-31	EN 60079-31
	• Pressurization, “pzc” (Dc)	ANSI/UL 60079-2	CSA 60079-2	IEC 60079-2	EN 60079-2
Zone 22	• Intrinsic safety, “ic” (Dc)	ANSI/UL 60079-11	CSA 60079-11	IEC 60079-11	EN 60079-11
	• Encapsulation, “mc” (Dc)	ANSI/UL 60079-18	CSA 60079-18	IEC 60079-18	EN 60079-18
	• Optical radiation, “op” (Dc)	ANSI/UL 60079-28	CSA 60079-28	IEC 60079-28	EN 60079-28
	• Special protection, “s” (Dc)	ANSI/UL 60079-33	—	IEC 60079-33	—
	• Any Zone 20, 21 technique	See above	See above	See above	See above
	• Any CIID1, CIID2 technique	See Class II techniques	See Class II techniques	—	—

Note 1: Zone 20, 21 and 22 general requirements are contained in ANSI/UL 60079-0 (UL Mark), CSA 60079-0 (C-UL Mark), IEC 60079-0 (IECEX) and EN 60079-0 (ATEX/UKEx).

Note 2: INMETRO certification requirements in support of the UL-BR INMETRO Mark are determined by Portaria 115 dated March 23, 2022, with the associated Brazilian NBR Ex standards harmonized with the comparable IECEx standards noted above.

Note 3: References in one area to any protection techniques from another area require those other area techniques to be for the same dust atmosphere and with a suitable temperature class.

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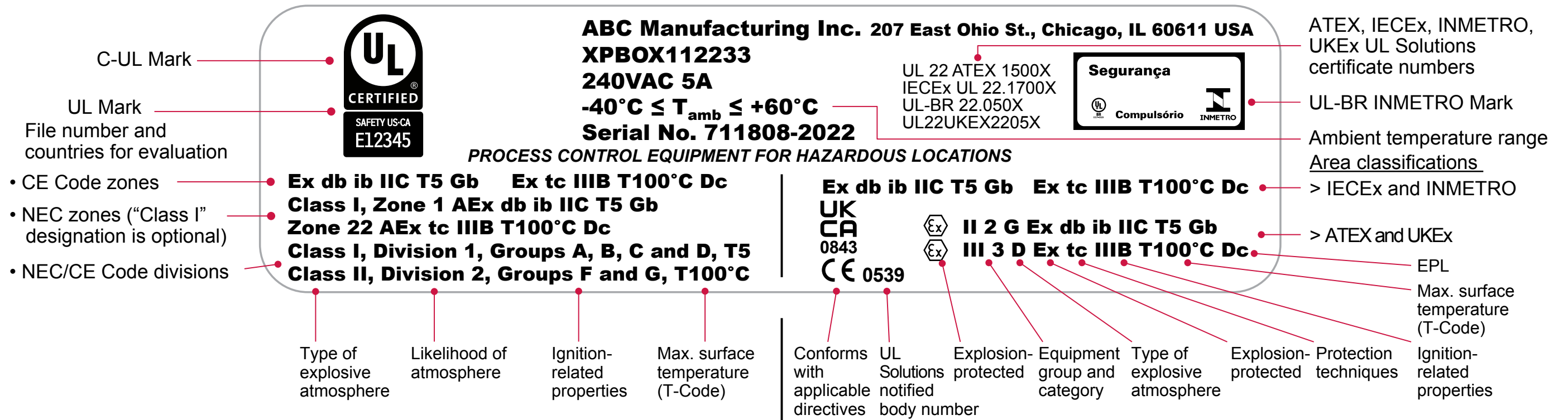
Zone system non-electrical equipment protection techniques (equipment protection levels)

Area	Protection Techniques	Applicable Certification Documents			
		UL Mark	C-UL Mark	IECEX	ATEX/UKEx
Zone 20	• Constructional safety, “c” (Da)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Control of ignition source, “b” (Da)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Liquid immersion, “k” (Da)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Enclosure, “ta” (Da)	ANSI/UL 60079-31	CSA 60079-31	IEC 60079-31	EN 60079-31
Zone 21	• Constructional safety, “c” (Db)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Control of ignition source, “b” (Db)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Liquid immersion, “k” (Db)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Pressurization, “pxb”/“pyb” (Db)	ANSI/UL 60079-2	CSA 60079-2	IEC 60079-2	EN 60079-2
	• Enclosure, “tb” (Db)	ANSI/UL 60079-31	CSA 60079-31	IEC 60079-31	EN 60079-31
	• Any Zone 20 technique	See above	See above	See above	See above
Zone 22	• Flow-restricting enclosure, “fr”	—	—	—	EN 13463-2
	• Constructional safety, “c” (Dc)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Control of ignition source, “b” (Dc)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Liquid immersion, “k” (Dc)	ANSI/UL 80079-37	ISO 80079-37	ISO 80079-37	EN ISO 80079-37
	• Pressurization, “pzc” (Dc)	ANSI/UL 60079-2	CSA 60079-2	IEC 60079-2	EN 60079-2
	• Enclosure, “tc” (Dc)	ANSI/UL 60079-31	CSA 60079-31	IEC 60079-31	EN 60079-31
• Any Zone 20 or 21 technique	See above	See above	See above	See above	

Note 1: Zone 20, 21 and 22 general requirements are contained in ANSI/UL 80079-36 (UL Mark), ISO 80079-36 (C-UL Mark & IECEX) and EN ISO 80079-36 (ATEX/UKEx).

Note 2: References in one area to any protection techniques from another area require those other area techniques to be for the same dust atmosphere and with a suitable temperature class.

Markings



Note 1: Equipment protection levels (EPLs) are used to provide additional details regarding the level of protection against ignition in explosive atmospheres. EPLs are designated by a letter: "G" for gas, "D" for dust or "M" for mining, followed by a letter "a" for very high, "b" for high or "c" for enhanced level of protection.

Note 2: Under the ATEX Directive (2014/34/EU) and the UKEx Regulation (SI 2016 No. 1107), equipment categories are similar to EPLs in function and designation as follows: Equipment Category 1G, 2G, 3G, 1D, 2D, 3D, M1, M2 = EPL Ga, Gb, Gc, Da, Db, Dc, Ma, Mb, respectively.

Ingress Protection (IP) Codes

Comparison of IP Codes

First numeral	Protection against access to hazardous parts by:	Protection against entry of solid objects:	Second numeral	Protection against entry of water:
0	No protection	No protection	0	No protection
1	The back of a hand	Objects greater than 50 mm	1	Vertically falling water drops
2	A finger	Objects greater than 12.5 mm	2	Vertically falling water drops when enclosure tilted up to 15°
3	A tool	Objects greater than 2.5 mm	3	Spraying water
4	A wire	Objects greater than 1.0 mm	4	Splashing water
5	Dust	Dust-protected	5	Water jets
6	Dust	Dust-tight	6	Powerful water jets
			7	Temporary immersion in water
			8	Continuous immersion in water
			9	High pressure and temperature water jets



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