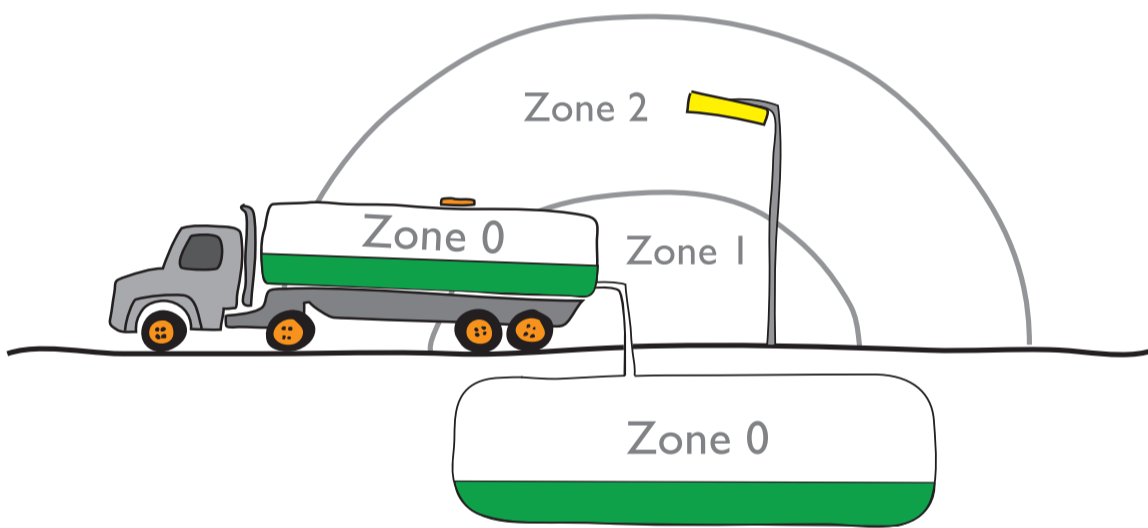




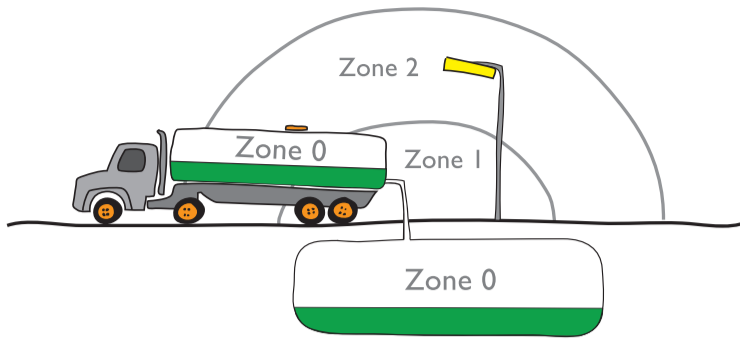
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EQUIPMENT CERTIFICATION GUIDE FOR HAZARDOUS AREAS

ATEX AND IECEX EX ENCLOSURE GUIDE



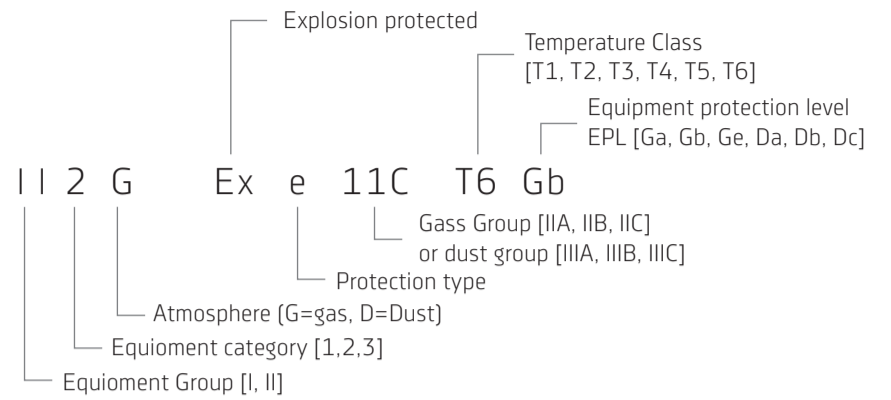
ATEX AND IEC EX ENCLOSURE GUIDE



CENELEC Classification EN 60079 10
IEC Classification IEC 60079 10

ATEX Classification ATEX Directive 94/9/EC
US Classification ANSI/INFA70 NEC Article 505

TYPICAL ATEX AND IEC EX EQUIPMENT MARKING



EXPLOSION PROTECTION CONCEPTS

Type of Protection	Symbol Basic	Schematic Representation	Basic Concept of Protection	Typical Zone	Gas Group	IEC/EN Standard	Typical IEC EPL
General Requirements			General findings for constructive type and testing of electrical equipment intended Ex atmospheres			EN 50014	
Protection of Electrical Equipment for Gases and Vapours - G							
Increased Safety	e		No arcs, sparks or hot surfaces. Enclosure ≥IP54	1,2	II	60079-7	Gb
Non sparking	nA			2		60079-15	Gc
Flameproof	d		Contain the explosion	1,2	II	60079-1	Gb
Enclosed Break	nC			2		60079-15	Gc
Encapsulation	ma			0,1,2	II	60079-18	Ga
	mb			Gb			
	mc			Gc			
Sealed/Heretic Sealing	nC		Exclude fuel	2	II	60079-15	Gc
Restricted Breathing	nR						Gc
Oil Filled	o			1,2	II	60079-6	Gb
Pressurised	px			1,2	II	60079-2	Gb
	py			Gb			
	pz			Gc			
Intrinsic Safety	ia		Limit circuit energy and hot surfaces	0,1,2	II	60079-11	Ga
	ib			Gb			
	ic			Gc			
Optical Radiation	op sh		Inherently safe	0,1,2	II	60079-28	Ga
	op is			Gb			
	op pr			Gb			
Sand Filled	q		Quench the flame	1,2	II	60079-5	Gb
Protection of Electrical Equipment for Combustible Dusts - D							
Intrinsic Safety	ia		Use of enclosure and energy limitation	20, 21, 22	III	60079-11	Da
	ib			Db			
	ic			Dc			
Enclosure	ta		Exclude dusts by use of enclosure	20, 21, 22	III	60079-31	Da
	tb			Db			
	tc			Dc			
Encapsulation	ma		Exclude dust	20, 21, 22	III	60079-18	Da
	mb			Db			
	mc			Dc			
Presurised enclosure	pD		Exclusion of a potentially Explosive atmosphere	21, 22	III	61241-4	Dc

INGRESS PROTECTION RATINGS

IP [EN60529]				IK [EN62262]		
First Numeral Protection from Solid Bodies		Second Numeral Protection from Liquids		The Numeral Protection from Impact		
0		No special protection	0		No special protection	
1		Large foreign bodies, diam. >50mm	1		Water dripping/falling vertically	
2		Medium-sized foreign bodies, diam. >12mm	2		Water dripping/falling at an angle (up to 15° degrees from the vertical)	
3		Small foreign bodies, diam. >2.5mm	3		Spray water (any direction up to 60° degrees from the vertical)	
4		Granular foreign bodies, diam. >1mm	4		Spray/splashing water from all directions, (limited ingress permitted)	
5		Dust protected; dust deposits are permitted, but their volume must not affect the function of the unit.	5		Low pressure water jets from all directions, (limited ingress permitted)	
6		Complete protection	6		High pressure jets from all directions	
			7		Temporary immersion, 1m for 30 minutes	
			8		Permanent Immersion or defined pressure*	
				00		No special protection
				01		Protected against 0.15J impact
				02		Protected against 0.2J impact
				03		Protected against 0.35J impact
				04		Protected against 0.5J impact
				05		Protected against 0.7J impact
				06		Protected against 1.0J impact
				07		Protected against 2.0J impact
				08		Protected against 5.0J impact
				09		Protected against 10.0J impact
				10		Protected against 20.0J impact

* Second numeral '8' is defined as 'submersion at a depth and length of time to be agreed between manufacturer and user'

GAS / ATMOSPHERE GROUPS IEC EX AND ATEX

Group	Environment	Typical Location	Typical Gas / Substance
I	Gases and Vapours	Underground Mining	Underground Methane (Firedamp)
IIA			Acetone, Methane, propane
IIB			Ethylene, Hydrogen Sulphide
IIC		Hydrogen, Acetylene, Carbon Disulphide	
IIIA	Combustible Dusts	Above Ground	Combustible fibres & flyings
IIIB			Combustible dusts - non conductive
IIIC			Combustible dusts - conductive

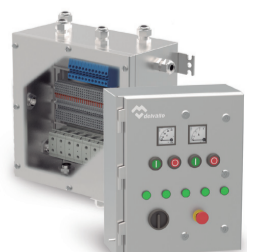
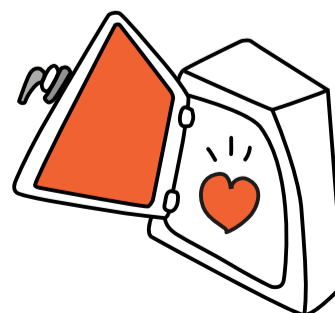


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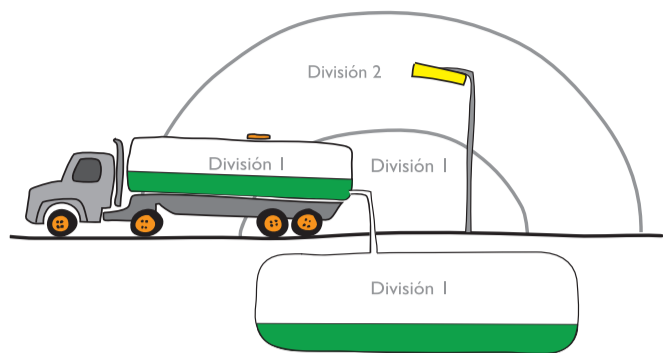
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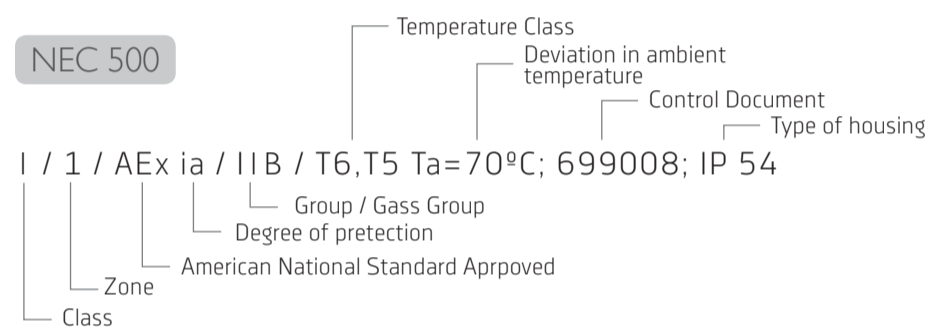
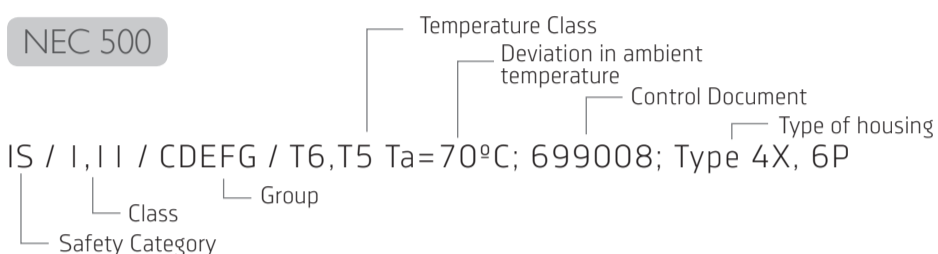
EQUIPMENT CERTIFICATION GUIDE FOR HAZARDOUS AREAS

NORTH AMERICA



US Classification ANSI / NFPA70 NEC Article 500

TYPICAL NEC EQUIPMENT MARKING



NEMA ENCLOSURE PROTECTION, CANADA, US

According to NEMA 250

TYPE	Application	Definition
1	Indoor	General Purpose – Protection against falling dirt
2	Indoor	Protection against falling dirt; dripping and light splashing of liquids
3	Indoor / Outdoor	Protection against falling dirt; rain, sleet, snow, windblown dust and external formation of ice
3R	Indoor / Outdoor	Rain Proof and Ice/Sleet Proof - Protection against falling dirt; rain, sleet, snow and external formation of ice
3S	Indoor / Outdoor	Dust Tight, Rain Tight and Ice/Sleet Proof - Protection against falling dirt; rain, sleet, snow, windblown dust and in which the external mechanisms remain operable when ice laden
4	Indoor / Outdoor	Water Tight and Dust Tight - Protection against falling dirt; rain, sleet, snow, windblown dust, splashing water and hose directed water and that will be undamaged by the external formation of ice on the enclosure
4x	Indoor / Outdoor	Water Tight, Dust Tight and Corrosion Resistant - Protection against falling dirt; rain, sleet, snow, windblown dust, splashing water; hose directed water and corrosion that will be undamaged by the external formation of ice on the enclosure
5	Indoor	Dust Tight and Drip Tight - Protection against falling dirt; settling airborne dust, lint, fibers, falyings, dripping and light splashing of liquids
6	Indoor / Outdoor	Temporary Submersion - Protection against falling dirt; hose-directed water temporary submersion at a limited depth and that will be undamaged by the external formation of ice on the closure
6P	Indoor / Outdoor	Prolonged Submersion - Protection against falling dirt; hose-directed water temporary submersion at a limited depth and that will be undamaged by the external formation of ice on the closure
12	Indoor	Dust Tight and Drip Tight - Enclosures with knockouts that provide protection against falling dirt; circulating dust, lint, fibers and flyings; and against dripping and light splashing of liquids
12K	Indoor	Dust Tight and Drip Tight - Enclosures with knockouts that provide protection against falling dirt; circulating dust, lint, fibers and flyings; and against dripping and light splashing of liquids
13	Indoor	Dust Tight and Drip Tight - Protection against falling dirt; circulating dust, lint, fibers and flyings; and against spraying, splashing and seepage of water, oil and non-corrosive coolants

NORTH AMERICA EXPLOSION PROTECTION CONCEPTS

Type of protection	Code	Basic concept of protection	Class	Typical Division / Zone	Applicable Standard
Protection of Electrical Equipment for Gases and Vapours-Class I					
Flameproof	AEx d	Contain the explosion	Class I	Zone 1, 2	ISA 60079-1
Explosion proof	XP		Class I	Division 1	UL 1203
Enclosed Break	AE x nC		Class I	Zone 2	ISA 60079-15
Increased Safety	AEx e	No arcs, sparks or hot surfaces	Class I	Zone 1, 2	ISA 60079-15
Non Sparking	AEx nA		Class I	Zone 2	ISA 12.12.01/FM3611
Non Incendive	NI	Quench the flame	Class I	Division 2	ISA 60079-5
Sand Filled	AEx q		Class I	Zone 1, 2	ISA 60079-5
Intrinsic Safety	AEx ia	Limit circuit energy and hot surfaces	Class I	Zone 0, 1, 2	ISA 60079-11
	AEx ib		Class I	Zone 1, 2	UL913/FM3610
	IS		Class I	Division 1	UL913/FM3610
Limited Energy	AEx nC	Exclude fuel	Class I	Zone 2	ISA 60079-15
Encapsulation	AEx m		Class I	Zone 1, 2	ISA 60079-18
	AEx ma		Class I	Zone 0, 1, 2	
	AEx mb		Class I	Zone 1, 2	
Oil Filled	AEx o	Class I	Zone 1, 2	ISA 60079-6	
Pressurised	Type X	Exclude fuel	Class I	Division 1	NFPA496/FM3620
	Type Y		Class I	Division 1	
	Type Z		Class I	Division 2	
	AEx px		Class I	Zone 1	ISA 60079-2
	AEx py		Class I	Zone 1	
	AEx pz		Class I	Zone 1	
Restricted Breathing	AEx nR	Class I	Zone 2	ISA 60079-15	
Protection of Electrical Equipment for Combustible Dust Class II & III					
Dust Ignition Proof	DIP	Exclude combustible dust	Class II	Division 1 & 2	UL1203
Dust Protected	NI		Class II	Division 2	ISA 12.12.01/FM3611
Protection by Enclosure	AEx tD		Class II	Zone 2	ISA 60079-31
Encapsulation	AEx ma D	Exclude combustible dust		Zone 20, 21, 22	ISA 61241-18
	AEx ma D			Zone 21, 22	
Intrinsic Safety	AEx ia D	Limit circuit energy and hot surfaces		Zone 20, 21, 22	ISA 61241-11
	AEx ib D			Zone 21, 22	
	IS		Class II	Division 1	
IS	Class III	Division 1			

COMPARISON

Classification of zones and Divisions

Type of area	NEC	ATEX and IEC	Definition
Continuous hazard	Division 1	Zone 0 Zone 20	Explosive atmosphere is continually present
Intermittent hazard	Division 1	Zone 1 Zone 21	Explosive atmosphere is likely to occur in normal operation
Hazard under abnormal conditions	Division 2	Zone 2 Zone 22	Explosive atmosphere is unlikely to occur but if it does, will exist only for a short period

Equipment intended for use in zone 1 areas cannot be used in Division 1 areas as this covers zone 0 rated areas also.

COMPARISON OF IP AND NEMA ENCLOSURE RATINGS

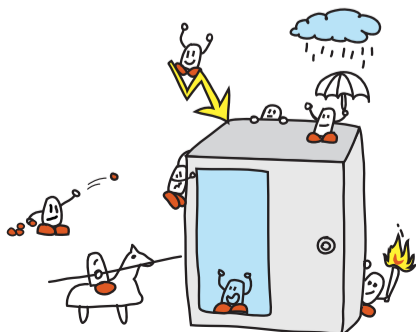
Enclosure Type	According to NEMA 250									
	IP 20	IP 22	IP 24	IP 53	IP 54	IP 55	IP 66	IP 67	IP 68	
1	■									
2		■								
3			■							
3R				■						
3S					■					
4						■				
4x							■			
5					■					
6								■		
6P									■	
12					■					
12K						■				
13									■	

This comparison is for guidance only. It is the responsibility of the user to ensure the enclosure rating is suitable for the given application.

TEMPERATURE CLASSIFICATION

Max Surface Temperature (°C)	ZONES		DIVISIONS	
	ATEX/IEC*	NEC 505	NEC 500	Max Surface Temperature (°C)
450	T1	T1	T1	450
300	T2	T2	T2	300
			T2A	280
			T2B	260
			T2C	230
			T2D	215
200	T3	T3	T3	200
			T3A	180
			T3B	165
			T3C	160
135	T4	T4	T4	135
			T4A	120
100	T5	T5	T5	100
85	T6	T6	T6	85

* For ATEX/IEC applications applies to Group II gases only. Group I applications have different classification.



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